

PERSONAL COMPUTER

THE COMPLETE COMPUTING WEEKLY

NEWS

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We pick up
the Ajile ...

... and Pro-Test it for price,
power and portability.

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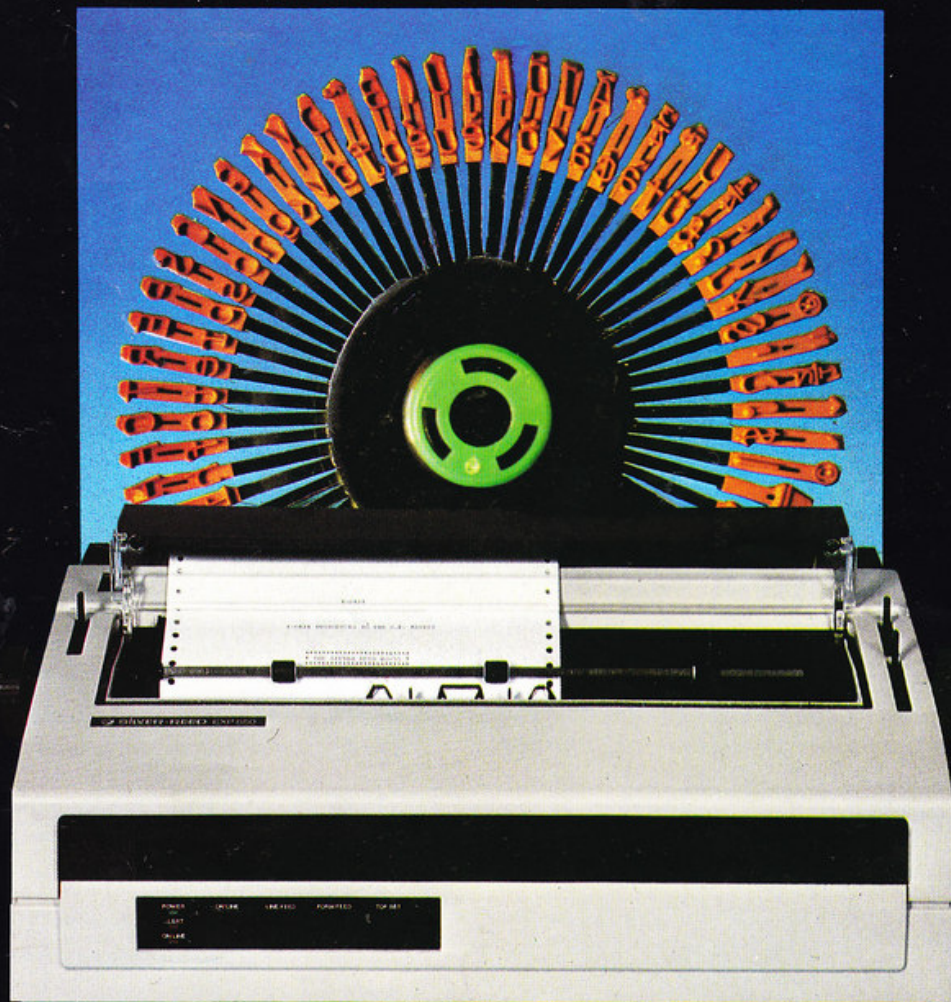
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Micropaedia

Disk Drives: Part 2

Avoiding the crash, illustrated anatomy of the drive, comparison chart — and future developments.

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Four pages of the liveliest General Election coverage you're likely to find this side of the English Channel, with reviews of election night software on PCs, the manifesto of the Basic Party, the preparations of the computerised media, and the attitudes of the party leaders themselves to microcomputer technology. As a bonus, the PCN Plot-o-meter, your own guide to the outcome. All this on pages 2 to 5 — and back in the real world on page 6 Kodak promises 10Mb on a floppy

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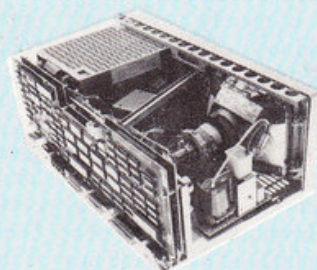
Ian Scales hunts down the slickest stick in the West.

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Max Phillips' verdict on this diminutive IBM-compatible. It's superbly designed, and the real state-of-the-art.

CHARACTER SET EDITORIAL: Editor Cyndy Miles Deputy editor Geof Wheelwright Production editor Keith Parish Sub-editors Peter Worlock, John Lettice News editor David Guest News writers Ralph Bancroft, Wendie Pearson Software editor Shirley Fawcett Systems editor Max Phillips Hardware editor Richard King Peripherals editor Ian Scales Listings editor Sandra Grandison Editor's assistant Harriet Arnold Art director Jim Dansie Art editor David Robinson Assistant art editor Floyd Sayers Art assistant Dolores Fairman Publisher Fiona Collier Publishing manager Mark Eisen Publishing assistant Jane Green ADVERTISING: Advertisement manager Nic Jones Assistant advertisement manager Sue Hunter Sales executives Robert Stallibrass, Matthew Parrott, Bettina Williams, Ian Whorley, Sarah Barron, Roxanna Johnston, Christian McCarthy Production manager Eva Wroblewska Advertisement assistant Jenny Dunne Subscription enquiries Simon Maggs Subscription address 53 Frith Street London W1A 2HG 01-439 4242 Editorial address 62 Oxford Street London W1A 2HG 01-636 6890 Advertising address 62 Oxford Street London W1A 2HG 01-323 3211 Published by VNU Business Publications, Evelyn House, 62 Oxford Street London W1A 2HG © VNU 1983. No material may be reproduced in whole or in part without written consent from the copyright holders. Photoset by Quickset, 184-186 Old Street, London EC1. Printed by Chase Web Offset, St Austell, Cornwall. Distributed by Seymour Press, 334 Brixton Road, London SW9, 01-733 4444. Registered at the PO as a newspaper

Future in question



By all accounts next week's General Election will be the most important in many years, in that the result could shape the country for much further into the future than the lifetime of the next Parliament.

Micro technology will be a prominent feature of the future so PCN asked the leaders of the three main

parties for their views of various aspects of the technology. The responses written on their behalf are printed here.

It may not help you to decide which way to vote on June 9, but it is important to know where the people who could be running the country stand.

research and development of 'fifth generation' computers is inadequate compared to the 100 per cent Government funding available in Japan?

5. How would you protect Britain's undoubted leadership in the software field and what would your Government do to reform the confused state of copyright protection for computer software?

6. How do you view the impact of information technology over the next five years? Does it provide the opportunity to create new jobs or pose a threat to existing ones?

1. In the light of the results of Information Technology Year what action would your Government take to develop computer literacy?

2. What support would your Gov-

ernment give to educational computing and vocational training?

3. What action would your Government take to help British micro-computer manufacturers compete

with their overseas competitors and fight off the growing Japanese threat?

4. How would your Government respond to criticism that support for

THE PARTIES REPLY



CONSERVATIVE

1 and 2. IT year was a tremendous success, it greatly increased people's awareness of the importance of Information Technology. Our Micros-in-Schools scheme has put one micro in every secondary school and, now, into half our primary schools. In addition, we have now extended the scheme to cover peripherals like printers and VDUs. We have also installed a complete computer system in every teacher training college and are setting up ITECs to train young and unskilled unemployed people in computer and electronic skills. This programme will be extended to provide evening courses for adults.

3. The micro industry is one of our great successes. There are over 50 companies

making micros in Britain. Sinclair is the first company in the world to sell over one and a half million of them. We have the highest penetration of micros per capita of any country in the world, and last year their sales increased by a phenomenal 400 per cent. We are examining the different levels of tariffs as between components and finished goods in the light of the anxiety expressed by some manufacturers. We will pursue this matter in the EEC.

4. Alvey is the largest co-operative research programme we have ever undertaken. It will involve £350 million over five years. No other European country has a programme on this scale. British companies, universities and government are coming together to pool their resources.

5. We are looking at this matter and a Green Paper on it was issued last year. It would be idle to pretend there is an easy answer. Britain's software industry is outstanding and we must do everything possible to encourage it. We launched the £10 million software products scheme last year. This provides funding of 33½ per cent for pioneering software projects.

6. I believe profoundly that the new information technologies will create great job opportunities as we move towards an information-based society. Some will be in manufacturing, but many more will come

from the application of it. Many new services will spring up — ordering holiday bookings via a teletext screen, mobile telephones, electronic publishing, pocket televisions, mobility aids for the elderly and handicapped, and lessons by video.

We must ensure that Britain does not miss out on the opportunities of the micro-chip revolution. We have shown our commitment by appointing a Minister and increasing the funding for this area from £50 million in 1979 to £200 million a year today.

The Alliance does not even have a spokesman in this area, and in their Manifesto they devote precisely 49 words to innovation and technology. The Labour Party are Johnny-come-latelies in this field. They have had no new ideas for four years. They would shackle the development of cable TV and restore and extend British Telecom's monopoly. Worst of all, they would nationalise part of our highly successful electronics industry. Nationalisation has failed in the older industries; it would be a tragedy if it were now allowed to kill off the new.

We are creating a technological power house in Britain to rejuvenate our industrial base and carry it into the next century. Labour would create an industrial museum.

Kenneth Baker



LABOUR

1. In our Manifesto we state that we will 'increase technological literacy in schools and give boys and girls equal opportunities to study science and technology'. We must restore cuts in education so that adequate computer facilities are available in all

schools. The present Government's one micro per school is merely paying lip service to pupils' real needs. Teachers must be trained, through initial in-service training, to equip their pupils with basic computer skills. The Open University and Open Tech should be used to provide such skills for the majority of adults. We need to make people more aware of IT. According to a Policy Study Institute Survey 59 per cent of firms thought IT82 had made no impact.

2. In our Manifesto we state that we will 'promote the supply of engineers and technicians, including women, to meet the needs of industry and the community'. This requires a substantial increase in educational computing and vocational computer training, by stepping up courses in further

and higher education and increasing opportunities for retraining through increasing provision for day and block release and paid educational leave.

3. Many publications such as NEDC and ACARD reports have stressed the much greater degree of central planning and intervention in electronics by more successful competitors like France, West Germany and Japan. The message, in fact, is the exact reverse of what the Government constantly claims: our competitors are more successful because they do not need to rely so heavily on 'market forces'. They do not believe that streamlined planning of electronics growth hampers the industry's ability to innovate or respond to technological changes. The evidence suggest it improves it. Nor do our

key competitors delegate policy for growth sectors like electronics to numerous official agencies — as the British Government does. In the key areas of UK information technology, there are at present 21 different Government executive bodies with responsibility for some aspect of official IT policy, many of them duplicating each others' activities and many working towards entirely different goals — if any.

4. The National Computing Centre has already expressed concern that the Alvey Report on fifth-generation computers omitted communications and that the funding of the industrial elements to 50 per cent was too limited. The Government has not met the recommendations in full. The report's recommendations on funding of advanced information technology must be implemented. We would also wish to have

more trade union consultation on the development of a programme.

5. The Labour Party is very concerned that the innovation and computerisation of companies is only improving slowly compared with our competitors. At present there is every sign that future growth will be held back by existing skill shortages in key occupations. A recent survey of the Policy Studies Institute revealed micro and electronics skill shortages in two-thirds of establishments using microelectronics in products and processes. Our new Planning Department will set up effective joint machinery with the Manpower Services Commission to monitor trends and ensure that training programmes fully reflected changing workforce requirements. A Labour Government would give serious consideration to a review of copyright protection.

6. As we state in Labour's Manifesto, 'the fall in output, together with the lack of planning and retraining, has meant that new technology has brought major job losses in some sectors'. New technology brings opportunities for more leisure, for new and existing products and for cutting out dangerous and boring jobs. Failure to introduce new techniques would lead to our industry falling even further behind our competitors. We do not believe that we face a collapse of work or permanent technological unemployment, but there is no doubt that certain occupations, particularly in services such as banking and insurance, will be adversely affected. Labour's approach is to encourage the development and application of information technology while planning to ensure that the benefits are evenly shared and the costs of change are minimised.



ALLIANCE

1. Generalised computer literacy can only be improved by a combined programme for both children and adults. We would therefore encourage and support the extensions, where appropriate, of:

- The already widespread use of micro computers in primary and secondary schools.
- The provision of courses in computers and computing already offered to adults by the Open University, especially those designed for teachers and industrialists.
- The provision of similar courses by other providers of adult education.

2. The previous answer covers educational computing other than in higher education. Here we are committed to improving the financing of higher education in general. In particular we would encourage

the extension of computer science provision. We see vocational computer training as an important part of our programme of training for all 16-19 year olds, whether employed or not. We are aware that present training programmes in computing are still inadequate in that many participants remain under-trained at the end. We would encourage selection for these programmes on the basis of aptitude rather than qualification.

3. It is virtually impossible to answer this question without the detailed knowledge of the state of the industry and the state of the national economy that is available only to the party in power. In general terms we see the encouragement of technologically-based modern industry as a very high priority in our economic policy. We would therefore want to do all that we could to help British microcomputer manufacturers. We see the industry as already strong in the field of computers for educational and leisure activities but as much weaker in the field of the more sophisticated machines required by industry and the professions.

4. We would look sympathetically on the recommendations of the Alvey Report that a higher percentage of Government funding should be available to British firms.

5. There are two measures which we

would take to help preserve the current British lead. The first is to maintain and expand our efforts in higher education and in computer science. The second is to encourage those firms involved in software production by contracting out of them the needs of Government for new software. The problems of copyright are formidable in almost every field including computer software. There is only one way of tackling them successfully and that is by international action but we would be supportive of any efforts to solve the problem, even partially.

6. We see the increasing impact of information technology on manufacturing industry, on service industries, on the social and educational services, and on leisure and hobbies as an irreversible trend over the next decade. It is in our view impossible for Britain to opt out of this change. It can bring enormous benefits and can transform the quality of life for the better. In terms of jobs over the next five years the effect is likely to be a balance, which may well be close, between the creation of new ones and the elimination of old ones. We shall take firm and effective measures — particularly in the field of education, training and retraining — to counter any transitional loss of the jobs.

Lord Kilmarnock

PCN PLOT'O'METER

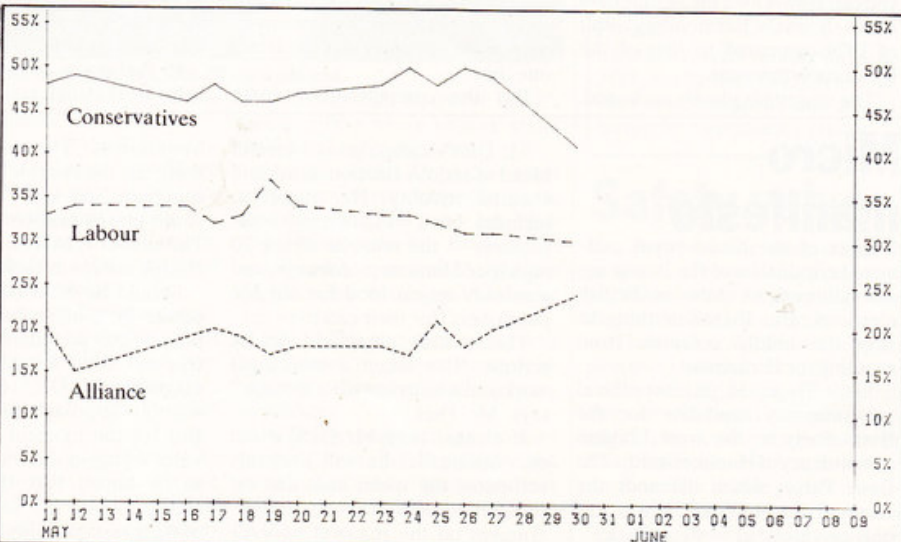
By Nigel Cross

As part of its election coverage PCN brings you the PCN Plot'o'meter, your own day-by-day guide to the progress of the main parties towards the finishing post of June 9.

Running on an Apple II with a Watanabe DigiPlot, the Plot'o'meter program takes details from the national opinion polls published in the daily press and translates them into a comprehensive chart. It allows for more than one poll each day and adjusts the figures to take into account different sample sizes.

The last reliable data we were able to use on the Plot'o'meter dated from May 30, and the result is the chart below. It shows the early wavering of all three parties.

Like a page in an IBM manual, we've deliberately left half the chart blank to let you complete the lines between now and June 9. Keep your eye on the polls.



Computer countdown

By Ralph Bancroft

Put out the cat, plug in, turn on, tune in and settle back for the public computer extravaganza of all time. Thursday night is election night.

Better still, power up your micro and try to beat the big boys at their own game.

Each election the broadcasting organisations try to outdo each other and race to see who can produce the results first. This election is no exception. In addition to seeing who can log the results first they will be competing to see who can do it with the most colour. For this is the colour graphics election.

ITN's *The Nation Decides* will feature Peter Sissons operating a VT80 graphics computer. This machine was designed and built by ITN itself and produces the most amazing colour graphics. For a taste of what it can do, watch Channel Four's evening news programme. Roughly three-quarters of the captions used are generated by the VT80.

This computer has a screen resolution of 1024 pixels per television line (there are about 576 viewable lines on the average television screen). Instead of addressing each pixel individually, the VT80 stores all of the information as shapes that can be recalled and placed anywhere on screen. The machine uses 16-bit words and has 256K of memory.

The VT80 is just the graphics output end of ITN's computer system. As the results are phoned in from each election count they are fed into a VAX 11/750 which has 4Mb of memory and 500Mb of backing store on Winchester hard disks. This machine does all the number-crunching, calculating the percentage share of the poll, turnout and swing and also updating the forecast of the final result.

A second VAX 11/750 takes the results of this number crunching and prepares it for presentation on screen by the VT80. A third VAX minicomputer will operate on

standby ready to take over if any of the other machines should fail.

Over at the BBC Peter Snow will be the person in charge of the computer. He will be sitting at a Fluke console that can generate graphic displays which should give ITN a good run for its money. Behind the scenes the BBC will also be using a VAX and will be supplementing it with three Quantel graphics processors and a Flair graphics processor.

Both TV organisations will be linking their computers directly into the teletext services, Ceefax and Oracle. On both systems the service will be essentially the same. One page will be used to display the latest result to come in. Other pages will show the results in individual constituencies.

A special results service will also be available on Prestel. It will be run by Hatfield Polytechnic, which has drafted in a team of sixth-formers from local schools to help collate the information and key in the

results. A Research Machines micro has been used for indexing the constituencies and three Bishops-gate Intelligence terminals with 40 page buffers will be used on the night to edit the pages before uploading via Prestel's Duke computer in London.

There will be three separate indices to help users find the information they want. A 'how the famous fared' index will give speedy access to the pages featuring well known names. An alphabetical index can be used when the name of a constituency is known. Finally a regional index will help those who are not sure of the constituency name, only the general area.

In addition to the results pages, there will be an election news magazine with news stories, predictions and the views of the pundits.

Hatfield Poly's emphasis on getting the information right is well placed. British embassies around the world have been equipped with Prestel sets to keep up to date.

Blocked votes

By Wendie Pearson

Camsoft's Election Analyst, supposed to turn you into an election fiend, is useful for any kind of election. So when the big day is over you can use it for by-elections, union elections or just for presenting statistics. It runs on the Lynx.

You enter data that is related to the election, and the program sorts candidates into order by number of votes polled. Tabulated results will give you percentages and Election Analyst produces bar charts.

These amazing charts, like rainbow-coloured skyscrapers on the move, appear as if from nowhere and crawl up and down the screen. They will also give you percentage swings for and against competing parties, and if you're feeling lazy, you can always load the sample data which shows the Bermondsey result of 1979 compared to that of the by-election this year.

The cassette is plainly packaged,

but it's what's inside that counts. You get a note of the six possible operations and the rest is up to you.

You will be struck by the brilliant colours that Camsoft has put together, and the whole thing is really almost too neat to be true — certainly very colourful.

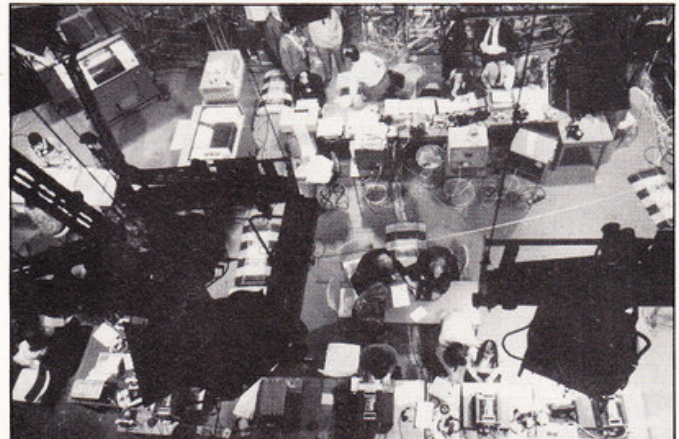
But there is only so much you can do with bar charts. Your attention may begin to wander after ten minutes or so, and the program has some quirks.

It shows its disgust by ignoring words when it really wants numbers, but refuses to say 'number please'.

Another interesting feature is the way this program accepts 'no' when it asks you for a candidate.

With relatively little user memory available to you on the Lynx you will be restricted in the amount of data you can actually analyse at any one time.

But the compensations come



The Election Analyst package from Camsoft gives you a taste of the analytical procedures of the BBC experts.

partly from the software and partly from the machine. There is liberal use of double-height characters, a thoughtful touch that enhances the already strong graphics. Generally the Lynx makes the most of this electoral rainbow.

If the main attraction of the software is visual, you might prefer

to play with something a little more silly. But for practising a bit of amateur futurology it could be a lot of fun.

Election Analyst costs £7.90 from Camsoft.

You can buy it from Spectrum Centres in various towns around the country.

Micro manifesto

Princes of the blood royal, convicted criminals and the insane are not allowed to vote in British elections. But there's nothing to stop the mildly eccentric from standing for Parliament.

Peter Dick, 36, is the official parliamentary candidate for the Basic Party in the west London constituency of Hammersmith. The Basic Party, which demands the removal of VAT from micros, has only one member — Peter Dick.

Mr Dick's campaign is a careful blend of serious electioneering and cheerful frivolity. His manifesto includes two shameless vote-catchers — the removal of the 70 mph speed limit on motorways, and a subsidy on cat food for old age pensioners (for their cats).

The serious aspect is deadly serious. 'I've taken a month off work and it's costing me a fortune,' says Mr Dick.

If elected (and Mr Dick is not over-optimistic) he will probably soft-pedal the speed limit and cat food proposals and press the Government on the removal of VAT

from micros. 'The most important thing in the world today is the computer,' he says. 'The quicker youth grasps machines the better. The answer is to remove VAT and classify micros as tools, not toys.'

Should he hold the balance of power in a hung Parliament the possibilities are almost boundless: free cat food for all, unbridled mayhem on UK roads, and a sensible approach to technology. But for the moment he is a lone voice crying in the wilderness. It is to be hoped that the voters of Hammersmith are fully conscious of their responsibility.



Peter Dick and his pet subjects.

Into the swing on your own PC

By David Guest

When the first returning officer of the night steps forward with the first result of the election you could have an overall forecast a couple of seconds later.

Not by courtesy of the massed ranks of experts in the studios of the BBC and ITV, but from your own personal computer. Impex Portable Software is selling a program called Swingometer that runs either on a Sinclair ZX81 system with 16K or on an Osborne 1.

The program has a distinguished pedigree. Designed by Christopher Munkton, a special advisor to the Prime Minister, it has been running in Downing St for several months. It didn't exactly pick the date for Mrs Thatcher, but it confirmed a general feeling that with a lead as strong as the opinion polls gave us, June was a good time, says Mr Munkton. He adds: 'It did tell us that unless

Labour was able to get within five points of us, the Alliance was no threat.'

PCN tested the version for the Osborne. It requires MBasic and loads from drive B, putting not only the program but also the results of the last general election into memory. With a minimum of fancy preliminaries it presents you with options:

- To forecast the result based on national opinion polls — on the strength of a poll conducted on May 24 (Conservatives 47.5 per cent, Labour 32.5, Alliance 19) it predicted a Conservative majority of 212 seats.

- To give more precise forecasts based on regional opinion polls — it uses the 11 regions of the Gallup organisation but showed some confusion over the exact location of Rochdale.

- To calculate the swings from

by-elections and use them in a national forecast.

- To make forecasts for individual seats or blocks of seats to work out what might happen in your area — Harrow East looks safe for the Tories barring an outbreak of mass hysteria.

- To enter the results as they come in on the night of June 9, producing instantly updated forecasts from the very first result.

Running the program on opinion polls and invented data two weeks before the election is a pleasantly-relaxed exercise. The software has a hint of polish and it is very responsive.

But if you want to use it on June 9, try to find somebody who will watch the television or listen to the radio while you peer at the Osborne. Keying in figures could become frantic when the results start to flow.

Also, take care of the numeric keys. Entry validation is efficient but the program accepts zeroes too readily and is prone to steam ahead with an analysis based on noughts.

A neat practical feature is its capacity to work with either percentages, as the opinion polls present

their results, or with figures, as the results will come in. It calculates swings three ways and offers a variety of summaries.

On the question of its accuracy, Swingometer stores the results from the last election and makes a rough estimate of how those results would have been affected if the new boundaries had applied. In the instruction booklet it points out that its predictions will gradually become more reliable as results come in, which seems like stating the obvious.

The program's output is unsophisticated; it just displays or prints lists and tables of results.

Swingometer comes with a lucid instruction booklet which includes a full list of constituencies, with the numbers by which the program recognises them.

The version for Sinclair machines costs £9.95 plus 50p for postage and packing; for the Osborne you pay £29.95, again plus 50p; and from June 4 a version for the Jupiter Ace should be available at £26.

Impex Portable Software is at Bedford House, Hockliffe St, Leighton Buzzard, LU7 8EZ, 0525-371597.

The aid of the parties

By Sandra Grandison

As the election heats up, the four political parties' computers are busily biting away.

At Conservative Central Office, a heavyweight ICL ME29 mini equipped with 4Mb of main storage, 180Mb of backing storage, five VDUs and a heavy-duty line printer has some big number-crunching tasks on its menu.

The machine does direct-mail campaigns, routine word processing, administrative jobs and political analysis. The most important function that the computer has performed was during the three-day interval between local elections and Mrs Thatcher's decision to call the election.

The votes polled by 28,000 candidates were fed into the computer to produce conclusions that helped persuade the Prime Minister to go for June 9.

In addition to the ICL ME29, the Conservative Party owns a multi-micro DRS 20 model 40 with two model 10 intelligent work stations equipped with double floppy disk drives and two letter-quality printers. And behind the scenes an ageing NCR 8250 ticks away doing most of the accounts, and holds names and addresses used for mailouts to candidates and agents.

The Liberal headquarters opted for Digico Prince machines, which are fairly standard business micros. They bought two and have one on loan.

This party uses the micros to write and distribute financial appeals, *Liberal News* and other



Working for the Conservatives, DRS 20 workstations.

political literature, and for routine office administration.

'In due course we will be computerising the accounts,' says Hugh Jones, secretary-general of the Party. 'At the moment we're in two minds — whether to add to the micros or whether to have a central unit with two terminals.'

Labour's plans to introduce modern micros had to be shelved when the General Election date was announced. At the moment they are coping with an ICL 2903 bought in 1976.

James Taite, of the party's finance department, said: 'We use the ICL 2903 for all the election expenses we charge our constituen-

cies. After the elections there's going to be a whole rethink about our computer equipment.'

On the Social Democrat front computers have chipped in in several ways. The party has Wotton Jeffrey's bureau handling its membership system and a Shelton Signet micro dealing with internal accounts.

The SDP is also the first party to use Prestel to communicate with regional offices and parliamentary candidates.

Its Prestel pages are used to send press releases, briefing papers and so on to the 15 individual candidates and six regional offices hooked up to the service.

ELECTION NIGHT GUIDE

BBC Television

10.40pm-4am 'Election 83'
5.30am-6am Special Ceefax service on screen giving a review of results so far.
6am-10am Breakfast Time: news roundup.
10am-4pm 'Election 83'.
Continuous Ceefax service with latest results and results for individual constituencies.

ITV Television

10pm-4am 'The Nation Decides'.
6am-10am TV AM: news roundup.
10am-4pm 'The Nation Decides'.
Continuous Oracle service with latest results and results for individual constituencies.

Prestel

Election results service on page 2885, run by Hatfield Polytechnic with news magazine and constituency by constituency results.

Safety valve

Bug-Byte is deliberately saving its program, General Election, until after the election for people who are disgruntled with the result.

'The result could be bad news for people on less than £40,000 a year,' said marketing manager John Phillips. 'It will help them vent their anguish by letting them make up new parties like Nuclear Prawn or the Save The Whale party.'

General Election will run on the Spectrum. It will set you back £5.95.

Kodak claims superfloppy

Ten megabytes on a 5¼in floppy is the promise of Eastman Kodak.

The company claims it will have a range of floppy disks using vertical recording available by the end of this year. This technique involves putting the magnetic impulses on their ends, enabling many more of them to be contained on a length of track.

Kodak claims its product will bear as much as 10 Mb on a 5¼in floppy at not more than 50 per cent above the price of a conventional floppy.

It was expected to be years before disk and media manufacturers managed to make a vertical recording system available to the public. But Kodak seems to have exploited its experience in coating camera film to steal the march on other companies known to be in the race, including Toshiba, Xerox and the Japanese giant Matsushita.

It remains to be seen whether any other company is manufacturing drives to make use of the new medium.

We'll let you know . . .

PCN Charts

PCN Charts follows the rise and fall of the UK's best-selling micros. This fortnightly top-of-the-shops list tells you what's selling best over the counter; it does not take account of mail order and does not count deposit-only orders. This week's figures show the number of machines sold in the two-week period ending a week before publication date (in this case June 3), so these charts tell the story in high streets between May 13 and May 27.

Machine prices quoted are for the no-frills models and include VAT. Information for the PCN Charts is culled from retailers and dealers throughout the country and compiled by MRIB, London. They will be updated every alternate week . . . so watch for the arrows to follow the ups and downs of the best-sellers.

Top Twenty up to £1,000

	MODEL	PRICE	DISTRIBUTOR
▶ 1 (1)	Sinclair Spectrum	£99	(SI)
▲ 2 (5)	BBC Model B	£399	(AC)
▼ 3 (2)	Sinclair ZX81	£40	(SI)
▼ 4 (3)	Oric 1	£100	(OR)
▲ 5 (10)	Dragon 32	£200	(DR)
▼ 6 (4)	Atari 400	£150	(AT)
▶ 7 (7)	Lynx 48	£225	(CA)
▶ 8 (8)	Newbrain A	£228	(GR)
▼ 9 (6)	Commodore Vic 20	£170	(CO)
▼ 10 (9)	Atari 800	£300	(AT)
▲ 11 (11)	Epson HX20	£472	(EP)
▲ 12 (13)	Sharp MZ80 A	£549	(SH)
▲ 13 (14)	Texas TI 99	£150	(TI)
▲ 14 (19)	Colour Genie	£224	(LO)
▲ 15 (—)	Nascom 3	£549	(LL)
▼ 16 (12)	Commodore 64	£345	(CO)
▼ 17 (16)	Sharp PC1500	£170	(SH)
▼ 18 (15)	Jupiter Ace	£90	(JU)
▼ 19 (17)	Apple IIe	£969	(AP)
▼ 20 (18)	Acorn Atom	£174	(AC)

Top Ten over £1,000

▲ 1 (3)	Osborne 1	£1,581	(OS)
▼ 2 (1)	Sirius 1	£2,754	(ACT)
▲ 3 (7)	Apple III	£2,780	(AP)
▲ 4 (4)	IBM PC	£2,392	(IBM)
▼ 5 (5)	Commodore 8032	£1,129	(CO)
6 (2)	Olivetti M20	£2,754	(OL)
▲ 7 (7)	Superbrain II	£2,070	(IC)
▼ 8 (8)	HP 86A	£1,541	(HP)
▶ 9 (—)	Sanyo MBC 1000	£1,195	(SA)
▲ 10 (—)	DEC Rainbow	£2,714	(DEC)

AC — Acorn Computers. ACT — ACT Sirius. AP — Apple Computers. AT — Atari International. CA — Computers. CO — Commodore. DEC — Digital. DR — Dragon Data. GR — Grundy Business. HP — Hewlett-Packard. IBM — IBM. IC — Icarus Computers. JU — Jupiter Cantab. LO — Lowe Electronics. LL — Lucas Logic. OL — Olivetti. OR — Oric. OS — Osborne Computers Corporation. SA — Sanyo. SH — Sharp. SI — Sinclair. TE — Texas Instruments.

Romik's new dimensions

New games bringing you 3D monsters and 4D space cubes for the Dragon, Spectrum and ZX81 will be in the shops next week.

The games, from Romik, include the £9.99 Romik Cube for the Dragon which features three cube games on one tape — practice cube, 4D time cube and 4D space cube. With this one you can use up to 27 colours at a time.

Games for the Spectrum are Colour Clash (several games in one) at £7.99, Three-D Monster

Maze at £6.99, Spectra Smash (a bomber-type) and Breakout on one tape for £6.99, and Galactic Trooper at £5.99.

Galactic Trooper is also coming out for the ZX81, and will be joined by Galaxy Jail Break, Bubble Bugs (which involves defending your fortress against invading bubbles) and Bank Robber — all at £4.99.

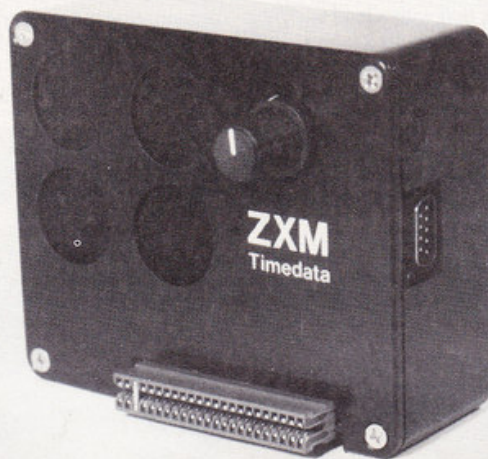
These will all be available from Romik dealers such as Curry's and Lasky's at their branches around the country.

Still counting

Lotus 1-2-3 is to get a foothold on machines 4, 5, 6, 7 and 8, with implementations just announced for the Wang Professional, the Zenith Z-100, Dynalogue's Hyperion, NEC's Advanced Personal Computer, and the DEC Rainbow.

This new database/spreadsheet/graphics package started life on the IBM and is due to appear this month on the Sirius/Victor and on the Texas Instruments Professional. But the DEC version marks 1-2-3's first move onto CP/M-86.

This autumn is the target date for the five new versions.



SOUND SPECTRUM — This modestly styled little unit is the latest means of giving your Sinclair vocal chords. It stops short of actual speech synthesis but offers a range of sound effects and its built-in amplifier and loudspeaker can boost your Spectrum's beeping noises. Called the ZXM Sound Box, it comes from Timedata. You can use it either on a ZX81 or a Spectrum, and it has a 9-pin I/O socket so you can use it with Atari or Commodore joysticks — other Sinclair add-ons can be plugged into the back of the unit. It costs £29.95 from Timedata, on Basildon (0268) 418121.

Acorn delays

By Geoff Wheelwright

The launches of both Telesoftware and Acorn's teletext adapters have been delayed until August at least.

An Acorn spokesman said last week that although field trials of the teletext adapter have been successfully completed, the company wanted more time to rewrite some of its software before broadcasting it on Ceefax for downloading through the adapter.

He added that the BBC had also requested more time to improve its central library of programs before going on the air with the service.

But a letter sent out by Vector Marketing to customers who had ordered the teletext adapter as early as January told them that

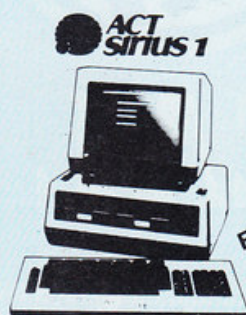
some hardware adjustments were also taking place.

'The field trials . . . have indicated various areas where the operation of the software both in the teletext ROM and the BBC Ceefax computer can be usefully extended. In addition to making the unit more user friendly, these improvements will noticeably reduce the time to download a program and make provision for future extensions to the BBC Teletext service.'

The letter also said that the start of Telesoftware broadcasts will be timed to coincide with the launch of the adapter in August. Ceefax currently broadcasts computer programs, but only as on-screen listings.

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Golf	32K	Bug Byte	02B003	£5.50
Dragon Quest 1	16K	Bug Byte	02B004	£11.50
Fruit Machine	B	Bug Byte	03B006	£5.50
B.B.C. Airlift	B	Bug Byte	02B007	£5.50
Polaris	32K	Bug Byte	02B008	£5.50
B.B.C. Chess	32K	Bug Byte	02B009	£8.00
B.B.C. Backgammon	A/B	Bug Byte	02B010	£8.00
B.B.C. Multitile	16K	Buy Byte	02B011	£15.00
B.B.C. Micro Derby	A/B	Bug Byte	02B012	£5.50
Swoop B/A	32K	Micropower	24B029	£6.95
Alien Destroyers	32K	Micropower	24B030	£6.95
Galactic Commander	32K	Micropower	24B031	£6.95
Timetrek	32K	Micropower	24B032	£6.95
Laser Command B/A	32K	Micropower	24B033	£6.95
Astro Navigator B/A	32K	Micropower	24B034	£4.95
Chess B/A	32K	Micropower	24B035	£6.95
Footer B/A	32K	Micropower	24B036	£6.95
Adventure		Micropower	24B037	£6.95
Cowboy Shootout	32K	Micropower	24B038	£5.95
Munchyman		Micropower	24B039	£5.95
Seek		Micropower	24B040	£5.95
Eldorado Gold B/A	32K	Micropower	24B041	£5.95
Roulette B/A	32K	Micropower	24B042	£4.95
Reversi 2 B/A	32K	Micropower	24B043	£4.95
Filer		Micropower	24B044	£8.95
Micro Budget		Micropower	24B045	£6.95
Constellation B/A	32K	Micropower	24B046	£5.95
Disassembler		Micropower	24B047	£5.95
World Geography	32K	Micropower	24B048	£5.95
Where B/A	32K	Micropower	24B049	£5.95
Junior Maths Pack	32K	Micropower	24B050	£5.95
Startrek/Candyfloss	A or B	I.J.K. Software	33B001	£6.50
6 Games	A or B	I.J.K. Software	33B002	£4.50
Mutant Inv/Breakout	A or B	I.J.K. Software	33B003	£6.50
Beep Beep B or A	32K	I.J.K. Software	33B004	£4.50
Beepmunch B or A	32K	I.J.K. Software	33B005	£6.50
Super Hangman B or A	32K	I.J.K. Software	33B006	£4.50
3D Maze B or A	32K	I.J.K. Software	33B007	£4.50
Invaders A		I.J.K. Software	33B008	£5.50
Invaders B or A	32K	I.J.K. Software	33B009	£7.50
Wordpro B or A	32K	I.J.K. Software	33B010	£10.50
Atlantis/Scramble	32K	I.J.K. Software	33B011	£7.50
Flags	32K	I.J.K. Software	33B012	£4.50
Hyperdrive	32K	I.J.K. Software	33B013	£6.50
Strato Bomber	32K	I.J.K. Software	33B014	£7.50
Creative Graphics	A/B	Acornsoft	53B051	£9.95
Arcadians	B	Acornsoft	53B052	£9.95
Sliding Block Puzzles	B	Acornsoft	53B053	£9.95
Snapper	B	Acornsoft	53B054	£9.95
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G8 Super Program 8		ICL	27E131	£4.95
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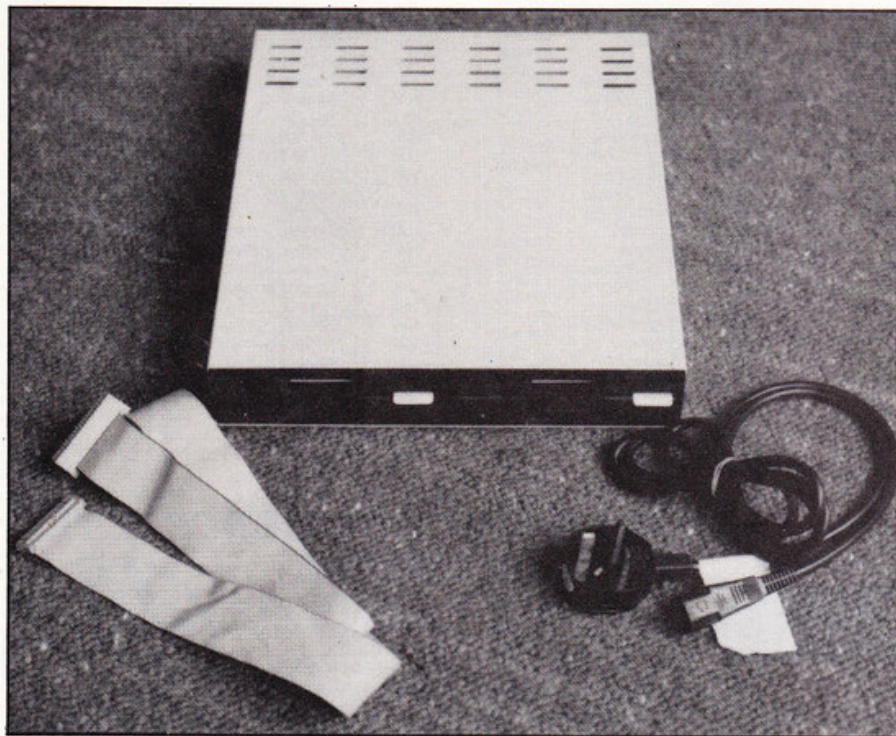
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Is Basic a low level language?

I am writing to say a few things about the language Basic, you know, that great, all time best, The language. At the moment there is only one home computer that comes with an alternative — the Jupiter Ace from Jupiter Cantab that runs Forth. Now I'm not saying that we should all rush to the shops and buy an Ace; rather, I am pleased there is one intelligent company that realises the shortcomings of Basic.

PCN £10 Star Letter



The newcomer to computing is led to believe that Basic is the language that he will use for the rest of his life, and that there is no reason why he should look elsewhere. Of course there are quite a few other languages available for most computers — the ZX Spectrum already has three versions of Forth, Pascal, Logo and Lisp.

A few more are promised, but it is always a bother first having to LOAD it off tape (after all, how many people can afford a disk drive, even Sinclair users), and then finding that you have run out of memory. What is needed therefore is a plug-in language chip on all computers. It's available on the Beeb up to a point, but there are still quite a few machines you can't plug cartridges into.

You only need to pause for a moment, ask yourself — how many word-processing packages or space games are written in Basic and you realise how little Basic has to offer. It's not really fair as far as the beginner is concerned, because he is

being deprived of the chance to write something really great.

First he's got to get to know the way his machine works, and then dive into machine code. If he were able to program in Logo or Forth perhaps (which are just as easy to learn as Basic) he could be writing Star Trek or something equally impressive.

As you may have guessed, I am quite impressed by Forth. It is a very flexible language — in fact in a way you are writing your own language. It runs up to ten times faster than Basic, uses less memory and is more exciting to program in. It's still not quite as fast as machine code, but then what does that matter, it's still fast. By the way, ten out of ten for your series on Forth a few weeks ago.

It remains to be seen whether computer manufacturers will change their ideas. Whether they do or they don't, it is time people were shown what they are missing.

Chris Haine,
Rugby, Warwickshire

Something to byte into

I am in my mid 30s and have just ventured into the land of computers, with the purchase of a Vic 20, an experience I am finding enjoyable. But oh, oh, the jargon and abbreviations!

So I started reading PCN for enlightenment, which I now receive in snippets with each issue. But I would like to speed up the process, so could I suggest an ongoing feature for consideration, such as a glossary of terms and possibly a potted history to show their derivation, which would explain to us geriatrics what every school boy apparently knows.

For starters how about IEEE, RS232, and why 1,024 bytes to the kilobyte? (SI Unit K = 1,000).

D Furness,
Springhead, Oldham

I am considering publishing a newcomers-start-here page, but just for starters:

■ IEEE refers to the IEEE-488 standard interface, which is a defined standard for attaching equipment to computers. It's usually associated with scientific applications, but is used for printers and disk drives.

■ RS232 is another standard interface. It's not a very good

standard but you can usually get cables and software together so that RS232 devices will talk to each other. Its main uses are for printers, terminals and modems.

■ K in the SI system is 1,000 and K in computers is 1,024. This is simply because 1,000 is such a silly number in the binary numbers that computers understand. It's 1111101000. K=1,024 is used because it's the nearest number to 1,000 that's a sensible power of two. It's 2¹⁰ or 1000000000 — Ed.

The Dragon double-up

I would like to point out the unfair deal the Dragon 32 has been receiving lately. In tests, no mention is made about the Dragon's double speed. This cuts all the benchmark times in half, giving an impressive speed. The fast and slow modes are mentioned for the ZX81, so why isn't double speed taken into account for the Dragon? No mention either for the most powerful 8-bit CPU in the world — far better than the Z80 or 6502.

With the 6809, languages such as Pascal can be run at great speeds, so machine code isn't needed. With advanced graphics and sound, a proper keyboard, interfaces already built in, good editing, a re-numbering command, 32K RAM and automatic scrolling, the Dragon is well worth the price of £199.

Any little thing is picked on, such as the lack of lower case. Who needs lower case anyway? The Dragon is a powerful machine, and it should be recognised by all, not just Dragon owners.

Philip Kirthan,
Harrogate, North Yorkshire.

POKE 65495,0 to speed up the Dragon doesn't work on all machines and should be avoided. The 6809 is a powerful chip but its software that counts. It will be a while before you can run Pascal on a Dragon — Ed.

Cheap at twice the price?

In PCN (week ending April 29) you mention the new Star DP510 printer in PCN Monitor and state that 'pricing seems

good — the DP510 will cost £349 + VAT...'. However, in PCN (week ending May 13) in a test of the DP510 you say that 'at £289 + VAT it is not going to set the world running to the door of the suppliers...'. Please make up your minds, at £349 it is good value, but at £289 you do not think so. I have one of these and think it is good value for money, especially when compared with Epson at £100 more, etc.

S R Linter,
Prestel no. 227750600

We were victims of timing here. The Monitor story was based on the printer's spec sheet and looked promising. The Pro-Test was based on the printer's original price of £349 and judged accordingly. Just as we went to press we found the price had dropped to £289 + VAT. All we could do at that stage was change the price. We couldn't redo the review. At least, as a weekly, we could do that much though! Sorry for the confusion — Ed.

Are you feeling boxed-in?

Micronet can save lives! (Well, nearly.) You can guess the frustration of having a brand new twin disk drive and no 8271 disk controller for the disk interface.

It seemed that even the cardboard box looked sad all wrapped up. So what could I possibly do?

I sent a message out via Mailbox on Micronet. (PCN replied to my plea with a few ideas — unfortunately they proved fruitless but thanks anyway). So I sent out first to all shops and then decided to try all members whose names started with the letter A. This could have been a long job but luckily, within a week, I had a positive reply. A chap in Birmingham who has a spare one!

We agreed a price and within three days I had the drives working perfectly. All negotiations except one via Mailbox. Many friends of mine who bought drives at the same time are staring at full cardboard boxes feeling very jealous.

So, apart from a great system that's a lot of fun as well as functional, it is possible to find someone to help you on your

way through the frustrations of computer life (lyrical what!). So, if this is published thanks to all those who bothered to reply, PCN included.

If anyone is on the brink of joining Micronet I can recommend it wholeheartedly.

Ian Osborne,
Prestel 013979384

Thanks Ian, and remember, PCN's Prestel number is 016366890 — Ed.

The low-down on Prestel payouts

Concerning the use of Prestel, I do not feel the costs have been highlighted sufficiently in PCN.

When you join Micronet you pay £57 and receive an acoustic modem and software to talk to Prestel. As the cost is subsidised, you must agree to subscribe for at least one year, after which the choice of renewal is yours.

Quarterly costs are: Prestel £5, Micronet £8. So, after the first year, you could remain a Prestel user for only £5 a quarter.

It should be remembered there is no time connect charge after 6pm and before 8am weekdays, after 1pm Saturdays and all day Sunday. There is a telephone charge (of course), but this is only 32p for one hour on the local/cheap rate band, which is when most will use it.

Finally, it has been said that 'unlike Micronet, most pages have frame charges'. The opposite is true, most do not.

At the moment, the standard of indexing on Micronet is pretty poor and should not be taken as representative of the rest (see Viewfax, page 258 for a good example).

One other complaint, page 0 of Prestel is only accessible to Gnetters by keying 40, a ludicrous situation, to which Prestel should never have agreed.

Perhaps we could look for a change here?

Justin Barley,
Prestel No: 013813026

Short shrift from the shops

At the moment I am in the dilemma of choosing a micro for under £200, with the shortlist being Oric 1 48K, Acorn Electron, Dragon, and 48K Spectrum, in that order.

The Oric 1 seems about the

best of the aforementioned on account of its decent keyboard, excellent graphics, advanced sound and expandability: disk drive, printer, communications modem, hi-fi etc.

The Electron falls down on availability but has the appeal of BBC Basic. The Dragon seems a good all-rounder, if a little pricey and the Spectrum wins hands down on price, but as for those keywords...

So, armed with my shortlist I decided to do my own 'bench-tests' of these four with the aid of Newcastle's computer shops. I aimed to learn as much as possible about each one, try each one and finally find the cheapest shop, with an eye to software as well as hardware.

Unfortunately, the first shop I visited put me off high street dealers straight away. I entered the shop and was immediately asked 'Can I help you?' I asked about Oric software and was told 'No'.

I asked about Oric hardware and was told 'If you want to play arcade games, go to the arcade and play'.

I saw an Oric and tried to make 'computer conversation' with just straight 'yes' and 'no' answers. I keyed in a quick FOR...PRINT CHR\$(X), NEXT loop and when RUN was told thank you and given a hard stare.

I promptly CLEARED out of the shop not wishing to give it £200 for a computer.

If I hadn't known computers better I would have been totally put off the idea of a home computer, but I persevered and was amazed by courteous, polite and helpful service given by W H Smith, Dixons, Laskys, Binns and Camera Mart, who provided me with yet another alternative — the Lynx.

So come on, the majority of computer shops are great, but the minority, well...

The first shop has lost an order of £169.95 and a possible £100-£200 for a disk drive.

On the subject of Oric, will there be software available à la Spectrum?

CJ Appleby,
Peterlee, Co Durham

Sadly, short shrift in computers shops is a widespread problem. The more people who complain, the quicker we might see improvements! And yes, Oric software is on the way. So far only standard stuff has appeared, but be patient, there's great potential here — Ed.

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CBM 8096 users can at last make full use of their 64K Expansion Memory... with PM96, the only product that offers sophisticated, yet simple, dynamic memory management... as well as 17 extra commands that work with CBM Basic IV. 82K of memory is available to the user, with 56K for programs (up to 16 together!), and 26K for variables (maintained even while editing or loading!). The new Basic commands include all the TOOLKIT functions, plus PRINT USING, IF-THEN-ELSE, STOP KEY disable, HARDCOPY screen dump, CALL, FETCH, PLOT (50 by 150), WINDOW, and more. PM96 comes with a User Reference Manual, Quick Reference Guide, Disk with demo programs, and UD11 Support Rom.

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MICROWAVES

Got a tip? Send it to PCN and get a cash reward. £5 for every hint printed

If you've got something to crow about... a bit of magic that'll make the world a better place for micro users, then send it to PCN Microwaves—our regular readers' hints and tips page. We'll pay you £5 if we print it. We'll pay you even more if your little gem gets our vote as microwave of the month. Think on... and write to Microwaves, PCN, 62 Oxford Street, London W1A 2HG.

Go to the top of your Oric

This subroutine allows 48K Oric programmers to print on the top line of the screen which is normally used for Oric's messages. Just set $M\$ = \text{"Text to print"}$ and $GOSUB 110$. You can make the text flash by adding the line $120 M\$ = CHR\$(\#C) + M\$$.

In the unlikely event that you've got a 16K Oric, you should subtract 8000 hex from all the addresses used.

Colin Failes,
Glasgow.

```
100 REM PRINT M$ ON TOP LINE OF
    SCREEN
110 FOR I = #BBB3 TO #BBB3 + 36:
    POKE I,32: NEXT I
130 FOR I = 1 TO LEN(M$): POKE
    #BBB3 + I, ASC ( MID$(M$, I,
    1)): NEXT I
140 RETURN
```

Into the Dragon at high speed

Dragon users who find IN-KEYs too slow for their liking might like to read the keyboard directly. These addresses should be PEEKed to see which of the arrow keys is pressed.

Left 343
Right 344
Up 341
Down 342

If the key is pressed down, you'll get a value of 223, otherwise the PEEK will return 255. Using a statement like $IF PEEK(341) = 223 THEN$... would allow you to simulate auto repeating keys.

Peter Talks,
Warwick.

Tandy on the circle line

This program (above right) draws a circle on the screen. But it does it using $R^2 = X^2 + Y^2$ rather than the inefficient sine

Lynx chip unveiled

Lots of letters about the Lynx do wonderful things using the output ports &86 and &87. The reason they do so much is that they give access to the Lynx's 6845 chip.

To access the registers, you specify which you want with $OUT \&86,x$ where x is the register number from 0 to 17. The new value is then sent with $OUT \&87,x$ with x being the value from 0 to 255.

Ian McNeill,
Belfast

```
10 RS=R*R
20 FOR X1=X-R TO X+R
30 IF X1>127 OR X1<0 THEN 70
40 Y1=0.56*SQR(RS-(X1-X)*(X1-X))
50 GOSUB 80
60 Y1=-Y1:GOSUB 80
70 NEXT: RETURN
80 IF Y+Y1>0 AND Y+Y1<48 THEN SET(X1,Y+Y1)
90 RETURN
```

Tandy program

and cosine method you see in many listings. The program is written for a TRS80 level II (Models 1 or 3) but could easily be converted to run on any Basic machine.

The 0.56 in line 40 is just to adjust the shape of the circle for the Tandy's screen. You may need to change it for your own micro. The rest of the program is straightforward. X and Y are the co-ordinates of the centre of the circle. R is its radius.

Derek Grainger,
Fleetwood, Lancashire.

Attributed to the Oric

I've been an Oric owner since early March. I had to learn without the proper manual so it was quite a surprise to find (PCN, 29 April-6 May) that you could use $CHR\$(27)$ followed by certain letters to obtain single lines of coloured text.

I've always used the following list. For example, $PRINT CHR\$(128); CHR\$(150); \text{"HELLO"}$ produces a black 'hello' on a cyan background.

I discovered this list purely by experimentation — there may be others.

Note that $CHR\$(138, 139, 142 \text{ and } 149)$ need two identical program lines to achieve the desired effect.

Frank Prior,
Chigwell, Essex.

$CHR\$(128)$ — Black Foreground (Text & Graphics)
 $CHR\$(129)$ — Red Foreground (Text & Graphics)

0	Total number of horizontal characters	Write only
1	Total number of displayed horizontal characters	Write only
2	Horizontal sync position	Write only
3	Sync width	Write only
4	Total number of vertical lines	Write only
5	Vertical total adjust	Write only
6	Total number of displayed vertical lines	Write only
7	Vertical sync position	Write only
8	Interlace and skew	Write only
9	Maximum raster address	Write only
10	Cursor start raster	Write only
11	Cursor end raster	Write only
12	Ram start address (high byte)	Read only
13	Ram start address (low byte)	Read only
14	Cursor position (high byte)	Read only
15	Cursor position (low byte)	Read only
16	Light pen (high byte)	Read only
17	Light pen (low byte)	Read only

same PRINT line, the cursor is moved ten spaces to the right and not just to column 30.

One way round this is to use POS . You can subtract the position of the cursor from the column you want to tab to. For example, to put two messages at columns 20 and 30 you could use $PRINT SPC(20-POS(0)); \text{"HELLO"}; SPC(30-POS(0)); \text{"GOODBYE"}$.

Chris Thompson,
Orpington, Kent.

Hang on to your variables

Many Lynx owners may not know how to save variables with their programs. You can do it with this routine... it also saves PROTECT levels and INK and PAPER colours.

```
1000 CODE EB 21 F6 61 E5
    2A 1F 62 E5 21 00 00 C3 FF
    3E
1010 REM "PROGRAM NAME"
1020 CALL LCTN (1000), LCTN (1010)
1030 REM "Program will run from here"
```

Save your program with $RUN 1020$. To load the program, use $MLOAD \text{"PROGRAMNAME"}$.

M Valentine,
Shrewsbury, Shrops

Find the character

It's often useful to be able to tell what character is at a particular place on the screen. On a 16K ZX81 you could use a subroutine like this:

```
1000 PRINT X,Y:
1010 LET P = PEEK (PEEK
    16398 + 256* PEEK 16399)
1020 LET A$ = CHR$(P)
1030 RETURN
```

This returns the character at X, Y in $A\$$.
James R Mortleman,
London E18

$CHR\$(130)$ — Green Foreground (Text & Graphics)
 $CHR\$(131)$ — Yellow Foreground (Text & Graphics)
 $CHR\$(132)$ — Blue Foreground (Text & Graphics)
 $CHR\$(133)$ — Magenta Foreground (Text & Graphics)
 $CHR\$(134)$ — Cyan Foreground (Text & Graphics)
 $CHR\$(135)$ — White Foreground (Text & Graphics)
 $CHR\$(136)$ — Black Foreground (Text & Graphics)
 $CHR\$(137)$ — Graphics
 $CHR\$(138)$ — Double Height Text
 $CHR\$(139)$ — Double Height Graphics
 $CHR\$(140)$ — Flashing Text
 $CHR\$(141)$ — Flashing Graphics
 $CHR\$(142)$ — Flashing Double Height Text
 $CHR\$(143)$ — Double Height Flashing Graphics
 $CHR\$(144)$ — Black Background
 $CHR\$(145)$ — Red Background
 $CHR\$(146)$ — Green Background
 $CHR\$(147)$ — Yellow Background
 $CHR\$(148)$ — Blue Background
 $CHR\$(149)$ — Magenta Background
 $CHR\$(150)$ — Cyan Background
 $CHR\$(151)$ — White Background

Print format is POSSible

TAB on the Oric can be a problem, even when you've discovered that you need to add 10 to it to persuade it to work.

TAB can work just like the SPC function, so if you $TAB(20)$ and $TAB(30)$ on the



'The ZX Spectrum — your personal computer', by Ian McLean, Simon Rushbrook Williams and Peter Williams, published by Prentice/Hall International at £5.95 (paperback 221 pages).

Some books can turn you off straight away. You know the sort I mean — all the books that tell you how to make your first million in 30 minutes through the application of a positive mental attitude. They set out to build up your morale, then send you out into a series of problems to be tackled.

This book, unfortunately, is a little like this at the start. It sets the scene by telling you that your brain is potentially one million times as powerful as the largest of computers, and takes it from there. There's certainly a market for microcomputing books that start at the beginning, but the problem with this one is that the beginning turns out to be a lot further back than you'd ever have dreamed.

This really is the problem throughout the book: it'll certainly tell the absolute novice how to use the Spectrum, but it takes an inordinate amount of space to do it. Up to a certain point, you'll certainly become a polished programmer, but for the money, and in the space available, you should be able to learn more.

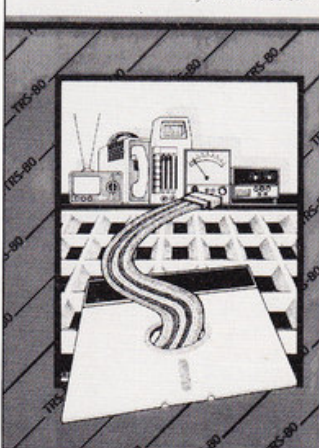
It's a pity, because the further you get into the book, the more useful it gets. If you can bear the elementary introductions to the music section, for example ('You will probably have heard of the musical scale: doh, re, me....') you'll learn quite a lot about music and the Spectrum. You won't learn that you'll need a fairly complex add-on set-up to get anything more useful than half a dozen kinds of beep out of it, but you've got to bear in mind that books of this sort are essentially partisan.

Certainly, it's a good

machine, and it could have been a good book too. But the parts that are useful to anyone but the absolute beginner are overshadowed by the rest. If the authors had aimed their sights a little higher, I feel they could have performed a greater service to the micro industry than they have done. **JL**

TRS-80 Models I, III, & Color Computer Interfacing Projects

By William Barden, Jr.



'TRS-80 Models I, III & Color Computer Interfacing Projects', by William Barden, published by Howard W Sams at £12.70 (paperback, 272 pages).

Marketed in the UK by Prentice Hall International, 0442-58531. This is one of those 'into the real world' books, dealing with computer interfacing techniques and projects for the Tandy TRS-80 model I, III, and Color Computer.

The author claims it's easy to interface to the real world, and that his book will show you how. Its 23 chapters are well laid out, and easy to read. There are lots of diagrams, charts, drawings, circuits, and program listings — in both machine code and Basic.

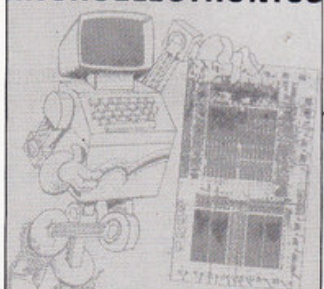
The projects covered range from the measurement of temperature to a half year clock. Some of the projects make extensive use of the hardware already built into the machines, such as the analogue to digital converters.

The interfacing techniques presented are applicable to other machines with a little modification. The projects are built on 'bread boards', and the layouts given are clear and easy to follow.

A basic knowledge of electronics would not go amiss, but don't be put off as the book contains a lot of good titbits, as well as useful sugges-

tions. As a bonus the internal design of the Tandy computers is given a good going over. **TJ**

MICROPROCESSORS AND MICROELECTRONICS



by Ian Williamson

A self-instruction course from Cambridge Learning

'Microprocessors and Microelectronics', by Ian Williamson, published by Cambridge Learning at £6.50 (paperback, 171 pages).

If you're on the lookout for a good but simple book on microelectronics, then this self-instruction course from Cambridge Learning may be the one you need.

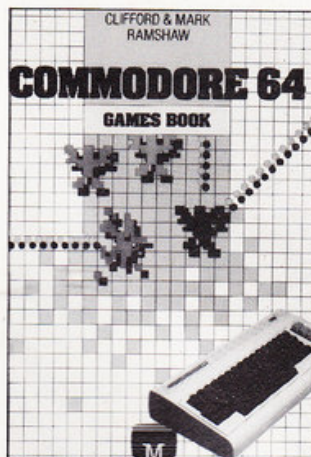
Microprocessors and Microelectronics runs to eight chapters covering such topics as microprocessor fundamentals at an easy to understand level, and progresses through semiconductor technology, number systems, digital logic, machine code and high-level languages.

Explanation of the logic and operation of microprocessors is given, and it tells you how to build up a complete system design using support chips. You can produce memories, TV controllers and versatile interface adaptors, for example.

The descriptive parts of the book are broken up by questions testing your knowledge with the answers provided on the next page in easily identifiable rectangular boxes. Each chapter begins with a summary, along with a list of key words contained in the chapter.

The book is littered with examples, diagrams, and cartoons. It's aimed at those with little prior knowledge, but after they've read it their grasp of what a microprocessor is, and what it can do, should be enhanced.

But the book is more than just a self-instruction course; it deals with various kinds of integrated circuits, magnetic bubble memory, digital logic design and flowcharting symbols. **TJ**



'Commodore 64 Games Book', by Clifford and Mark Ramshaw, published by Melbourne House (01-405 6347) at £5.95 (paperback, 192 pages).

Games books occupy a category of their own. They are, I suppose, the computer publication equivalent of pulp romances. The only qualities they should be required to possess are legibility, variety and a high ratio of program listings per pound.

The *Commodore 64 Games Book* seems to meet all the criteria. The listings price out at 20p each, the legibility is as adequate as can be expected when the programs are typeset from a dot-matrix printer, and the games featured vary from the sublime (*Invaders*) to the very sublime (*Poetry*).

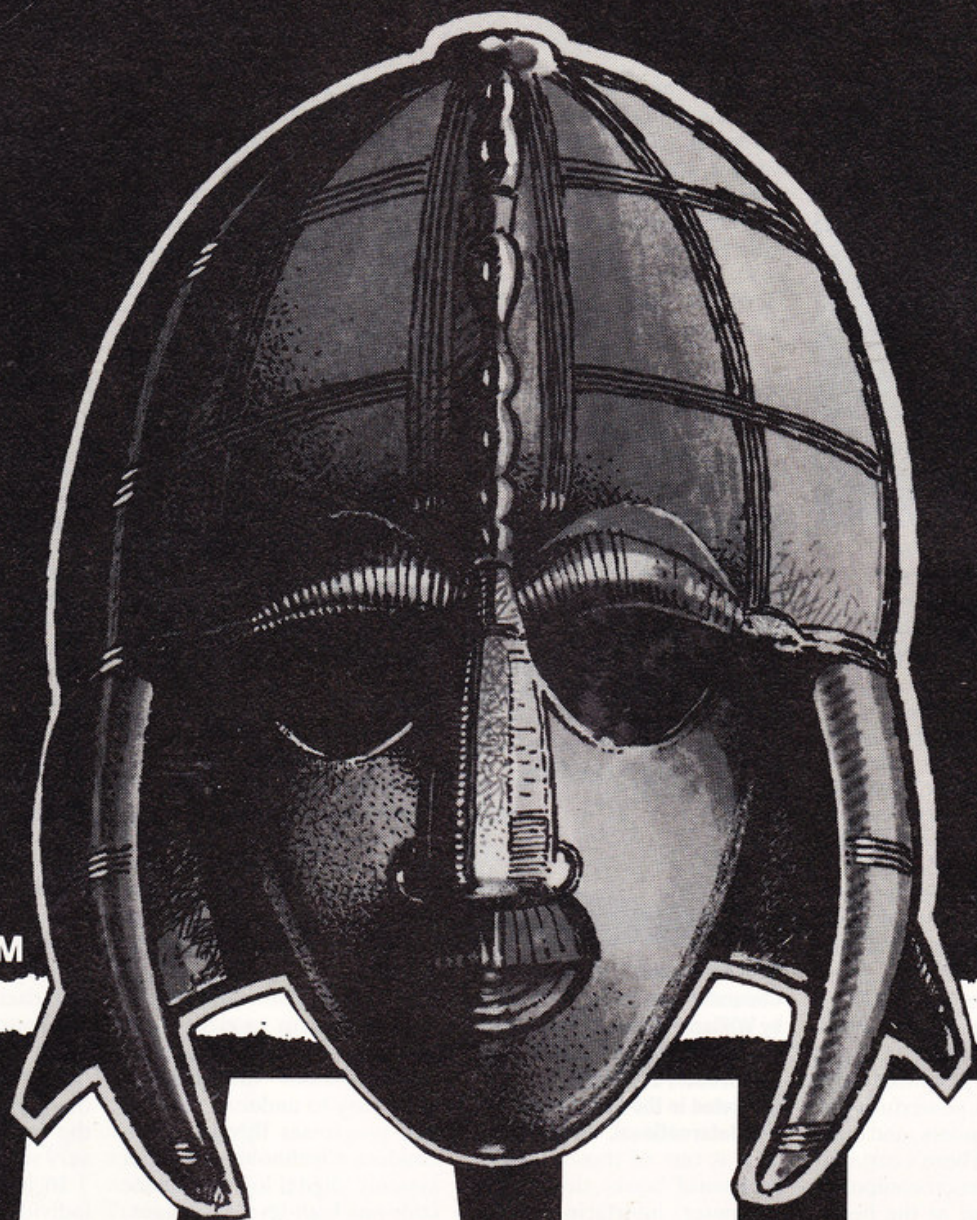
Including notes on how the individual programs actually set about putting things on screens seems to be almost mandatory in books of this kind, though the authors always seem to feel they've stumbled on something revolutionary. True to form each program listing has a preface which explains the program structure: defining each step and mapping the step with its first and last line numbers. The variables are also defined for reference.

The big advantage in slapping dot-matrix printing straight onto the page is the better than even chance that the listings won't be ridden with bugs. This doesn't mean that you'll get them to go first time, but if you don't, your keying-in is probably the culprit.

There are 30 games and here is a random sample of their titles: *Paranoid*, *Quack*, *Cats & Dogs*, *UFO*, *Cowboy Shoot-out*, *Flight Simulator*, *Earth Defence*, etc etc.

For a Commodore 64 games enthusiast who is also a speed typist with plenty of time on his hands, this book is a must. **IS**

48K SPECTRUM



WALL

“VALHALLA is an animated graphics adventure whose undisguised intention is to steal the title of "best micro adventure game bar none" from THE HOBBIT.

The 48K program which will be released on July 15, uses a new operating system MOVISOFT and boasts a number of HOBBIT-like features. There are 20 significant characters, each with their own aims and objectives.

You are a minor God set the task of recovering Odin's Golden Helmet. To complete this

you will also have to master three lesser tasks, one of which is to rescue IDUN, a maiden responsible for the Golden Apples which keep the Gods youthful.

The games' designer, LEGEND, claims that the program involves a sophisticated degree of interaction. For example, should an enemy overhear you telling a friend some important information, he will try to ruin your plans.

LEGEND stresses that the personality of each of the characters is genuinely independent "as opposed to pseudo independent behaviour

like Thorin sitting down and singing about gold or Gandalf walking off with your door for no reason".

The moving graphics are reportedly of cartoon quality, with both background and foreground movement illustrating the events of the plot.

Pretty impressive claims.

HOBBIT fans will no doubt feel both intrigued and sceptical..

Watch this space.”

...Graham Taylor,
Software Editor,
POPULAR COMPUTING WEEKLY -26th MAY'83

MOVISOFT



LEGEND

VALHALLA



ROUTINE INQUIRIES

Got a query? Max Phillips opens the pod door Hal. Send all those unanswerables here. No personal replies promised but you never know . . .

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

Moving up with the BBC

Q I am not clear about the upgrade for the BBC micro. If you upgrade your Model A to a Model B, is it as good as a new Model B? Would I be sensible to buy a Model B in the first place?

Miss S Riley,
Tooting, London.

A A 'Model A to Model B' upgrade does turn an A into a full blown Model B. You can also upgrade in stages . . . having the extra memory and interfaces fitted as you need them.

For a while, a Model A with 32K Ram was a popular configuration. You could run lots of Model B software without buying a full upgrade.

But it's better to buy a B straight off if you can . . . it's a much better configuration. If you buy an A, you'll only have to take it in for the upgrade after a week or two.

Plugging the Sinclair

Q I've a problem I cannot solve. Is it possible to buy a 5-pin DIN plug that fits a ZX81 for instance, with two small microphone jacks on the other end?

Martin Tims,
Watford, Herts

A I presume you are looking for a cassette lead with two jacks for the ZX81's MIC and EAR sockets at one end and a 5-pin DIN for a Record/Play-back socket at the other.

These should be very easy to find. Try your local hi-fi or electrical shops. A Tandy store would be a good starting point. If you can't get one, it won't cost the earth to have one made up for you.

If you can't find a friend or shop who'll do it, you could try the people who advertise leads for BBCs, Lynxes and so on in the classifieds of computer magazines. You may find them willing to do a special one-off

for you if they don't have stocks.

Once you've got your lead, you'll need to experiment as to which jack goes where. This will depend on the wiring of the DIN plug inside the cassette recorder.

Once you've found which way round they go, remember to label them!

Gain control of the MPF-II

Q I own a Microprofessor MPF-II and read with interest your review (*PCN*, issue 9). I wonder if you could help me with a few points.

When I try to run Apple programs, I can't poll the keyboard to control the spaceships and so on using the arrow keys.

Also, is there any way to find out where a program is in memory and how long it is?

T Willis,
Solihull, West Midlands

A Good news first. Basic pointers seem to be in the same place as they are in the Apple.

So you can use standard Apple stuff for finding out about your program. Locations 103 and 104 hold the address of the start of the program and 105 and 106 hold the address of the end of the program, give or take a few bytes.

So your program starts at $\text{PEEK}(103) + \text{PEEK}(104) * 256$ and ends at $\text{PEEK}(105) + \text{PEEK}(106) * 256$. The difference between these is the length of the program. Give or take a few bytes . . .

The keyboard's not so simple. The Apple programs won't use the arrow keys . . . the Apple hasn't got up/down keys so, of course, the programs won't be looking for them. You should find that if the program is supposed to use left and right arrows they do work.

If the keyboard is being read with the GET statement, then it's a simple matter to substitute in the right codes. Up is 112, Down is 113. Left and Right are as the Apple, 8 and 21. If you've the extension keyboard, the fire key generates a full stop or ASCII 46.

But the big problem is polling the keyboard directly using locations -16384 and -16368.

This is the standard Apple way of checking for single keypresses without bringing programs to a halt.

Although the Microprofessor uses the same locations, you can't just PEEK and POKE them Apple-style. So most Apple programs will have to be modified.

This involves a bit of machine code.

If you're interested in that sort of thing, your machine code routine should call SCAN1 at \$F043 to read the code into the Acc. C will be set if a key was pressed, otherwise it will be clear. You can then call IOSAVE at \$FF4A to save the 6502 registers. A surprise for Apple users . . . the Acc is saved to \$7FO. These routines are detailed on page 78 of the user guide.

If you don't like the sound of machine code, here's an inelegant but usable patch in Basic. In your program's initialisation section, insert the following lines:

```
FOR I=768 TO 773:READ B:
POKE I,B: NEXT I
DATA 32,67,240,76,74,255
```

This loads the machine code routine into the normally unused page 3 memory. To read the keyboard CALL 768 and set $K = \text{PEEK}(2032)$. This gives a result identical to $K = \text{PEEK}(-16384)$ on an Apple. You don't need to POKE -16368,0 afterwards as you would the Apple.

So to convert an Applesoft program to read keypresses on the Microprofessor, change any $K = \text{PEEK}(-16384)$ references to $\text{CALL } 768: K = \text{PEEK}(2032)$ and take out any POKE -16368,0 statements.

If you want to build the up and down arrows into the program, they generate codes 240 (up) and 241 (down). I did want to make this path into a nice shiny USR function, but it turns out that the USR restart address at \$E2F2 on the Apple has moved.

Don't ask me where to . . . I'm still looking.

To the heart of the Atari

Q My dad often borrows an Atari 400 from school. I have great fun using it but I'd like to know how to work the machine code on it.

Also, could you tell me how to generate random characters?

Martin Cubitt,
Rayleigh, Essex.

A Machine code programming is a fairly complex subject, even *Routine Inquiries* would think twice about teaching it in a short answer. If you're interested, you could try any of the machine code tutorials for the Atari at your local bookshop.

You'll also find that some non-specific texts such as Rodney Zaks' *Programming the 6502* will be a great help.

You can write short routines in machine code, using PEEK and POKE from Basic but you'll need to buy a monitor and an Assembler program if you're going to get at all serious.

Random characters are much easier. The simplest way is to use CHR\$ to generate the character and RND to pick it. RND(O) is usually used as part of the expression $\text{INT}(\text{RND}(\text{O}) * N) + L$ where N is the number of different numbers you want and L is the lowest number that could be generated. To pick random capital letters, we want to choose from 26 different numbers, starting at 'A', whose code is 65. Try:

```
10 PRINT CHR$(INT(RND(O)*26)+65):GOTO 10.
```

If you want to generate other characters, just use a table of the Atari's ASCII set (Appendix C, Atari Basic reference manual) to tell you the numbers to use with RND(O).

Electrons and Atomic theory

Q I bought an Acorn Atom 12K+12K in January and I'm not very satisfied with it. When I heard news of the August launch of the Acorn Electron, I decided to sell the Atom and buy an Electron instead. Do you think my decision is wise?

Sanjay Parmar,
Leicester

A It seems rather silly to sell your computer now only to wait at least two months for a machine no-one has ever seen.

If you're unhappy with the Atom, try to decide why. Then consider machines that make up for the Atom's deficiencies.

An Oric bug that isn't...

Q I think I have found a strange bug in the Oric's ROM. Try the following program:

```
10 INPUT A
20 PRINT A
30 GOTO 10
```

Enter the data 1,2,P,/, and,;. The numbers 1 and 2 are printed as you'd expect. P and / aren't printed... there's the message 'Redo from start'. But E is taken as the number 0 and no message is printed. Finally, the ; causes the unlisted 'Extra ignored' code to be printed. Can you explain what's happening?

Peter Regan,
Cardiff, S Wales

A There are bugs in the Oric's ROM, many of them strange, but this isn't one of them. INPUT A in line 10 asks for a number to be entered. P and / aren't numbers so the Oric asks to try again with 'Redo from start.' E really is part of a number. Microsoft Basic uses a scientific notation for numbers that are too big or too small to display and enter in the normal way. As an example 2E4 is 2 with four 0s after it, or 20000. Page 55 of the Oric manual introduces this notation.

By entering E on its own, the Oric thinks you've entered OEO which is, of course, zero. Lastly, semicolons and commas are used to separate data when you are responding to an INPUT with multiple variables.

INPUT A, B, C wants you to input three numbers, separated by commas. So if you enter a semicolon or a comma whenever you are responding to a single INPUT statement, the Oric thinks you are entering more than it needs. So it just ignores any surplus. Hence the message 'Extra Ignored'.

But don't worry if you still want an odd bug to play with. Try this program:

```
10 A=1
20 C=1
30 IF A=C THEN PRINT A
ELSE PRINT C
```

The questions is, 'What does the program print?' The answer is not one.

... And one to turn your Oric green

Q One of the oddities of the Oric's PLOT command is

that it will only plot a string. If you give it a number (eg PLOT 10, 10, 100) it plots CHR\$(100)... a 'd'. So if you tried a program such as:

```
10 INPUT X
20 PLOT 10, 20, "You have entered"
```

30 Plot 10,20,X
the Oric would convert the X into CHR\$(X) and print it at 10,20. To get round this, I used STR\$(X) instead of just X. Can you tell me why this prints the value of X in green at position 10, 20?

E H Wilson,
Sevenoaks, Kent

A It's perfectly simple—it's a ridiculous bug in the Oric's ROMs. The STR\$ function takes a number and converts it to a string containing its digits. The Oric goes one better than most computers because its STR\$ then sticks a Control B (CHR\$(2)) on the front of the string.

I've no idea how or why STR\$ does this. It's not a bug in the original Microsoft Basic but it's one of those extras Oric has thrown in to make sure there is 'no comparable competition'.

Most of the time, loose Control Bs on the front of strings will go unnoticed. But you'll come unstuck with functions like LEN and MID\$ if you try to use them. In particular, if you plot a string with a Control B in it, it turns text colour green. Hence your charming little PLOT statement.

It's best to chop off the Control B whenever you use STR\$. To do this, stick a flag BGD=1 at the start of all your programs. Then in an initialisation section of the program, include ZO=1: IF BGD=1 THEN ZO=2. Now instead of using STR\$, use MID\$(STR\$(X),ZO) throughout your programs.

This may seem a lengthy way of putting MID\$(STR\$(X),2) statements in your program. It is. But if you follow this procedure, when Oric fixes the bugs in the Rom, you only have to change the first line of your programs to BGD=0 and they will work perfectly.

If you've any other patches in the program, they should use BGD to test if it's a bugged machine or not. When fixed ROM machines become available, someone will discover a PEEK that distinguishes between the two versions of the Roms.

You can use this to set BGD

automatically. You may think that this is a horribly tiresome process but you could be the first on your block to develop programs that run on both bugged and unbugged machines.

Subject to verification

Q In a leaflet printed by Oric it says 'All types of information may be saved such as programs, data, arrays, blocks of memory, screen displays. After saving, correct recording may be verified before deleting the information in memory.'

How do you save data? How do you verify it? There appears to be no VERIFY command.

T Richardson,
Sale, Cheshire

A You can save anything you like on the Oric. You've just got to know how. There's no known Basic command to save arrays and Basic data but you should be able to fudge it using SAVE with the A and E parameters.

All you need to know is where the pointers to Basic's data are and how the information is organised. Oric should publish this information rather than let some poor soul go grubbing around memory for it.

The leaflet also implies there's a VERIFY command. Perhaps you're supposed to develop that yourself as well. I can't find any reference to VERIFY anywhere except in the famous 'no comparable competition' leaflet. I strongly suspect you're entitled to your money back if you want to push the point.

Oric says it is planning fixed ROMs but could give no details of when or how they will be available.

Hopefully, the ROMs will include file handling and VERIFY. In the meantime, SAVE everything at least twice. And keep waiting and hoping...

Micro of the future

Q Could you please give me some details about a computer made by Binatone?

D Dandy,
Bolton, Lancs

A There isn't one. Not yet anyway. Binatone original-

ly announced plans for a personal computer back in November. Goodies were to include colour, sound, 64K or 16K RAM at an ambitious starting price of £49.95.

But the Binatone hasn't been launched yet. I get three letters a week asking after it and Binatone probably gets more.

The company is still working on the machine though it's no longer quoting any price, never mind £50. It's best to leave Binatone alone and let it get on with the development. You can start thinking about buying one when it's launched.

Anyone interested in computing should buy a machine that's available. There will be something even better than the Binatone by the time it comes along.

There's just no point in waiting in this business.

Hands on that dream machine

Q Could you please tell me when I will be able to purchase the new Acorn Electron?

Could you give me your opinion on the Dragon 32 as a computer for games and education?

J Trotter,
Edinburgh

A Acorn is planning to launch the Electron in August, although the company hasn't specified which year. Seriously though, even if Acorn meets its revised deadline, the demand for the machine is likely to be so high that it will be a few months after that before you can find them in shop windows.

As for the Dragon, what's your opinion? Have you been to a dealer and tried some of the games? Have you been round to your local club and begged a go on one?

The Dragon is used mostly for playing games and learning to program. There's little educational software available for it.

It's a simple and conservative design and its phenomenal success has ensured that it's a reasonably safe buy.

But while you're in the shop looking at the Dragon, don't ignore the other machines. There are others with better games, both in terms of cost and quality. It pays to shop around now, rather than later.

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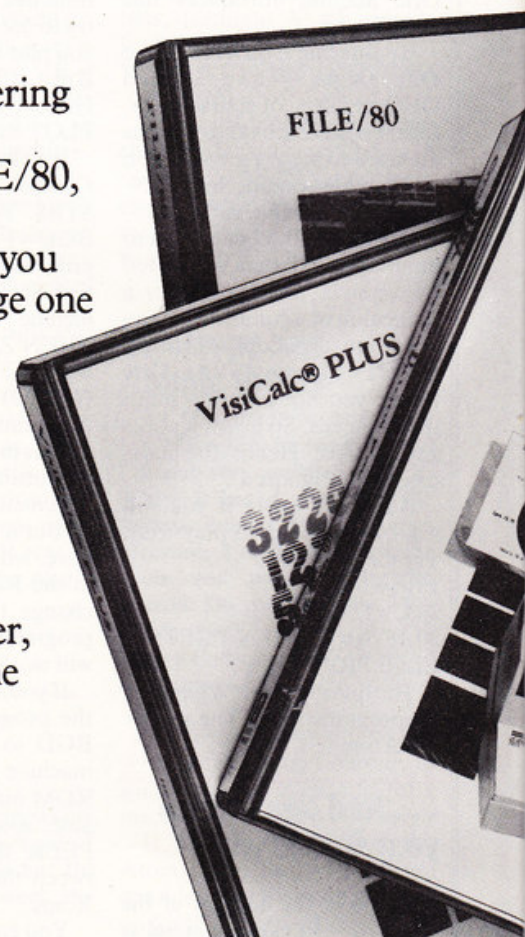
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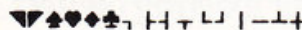


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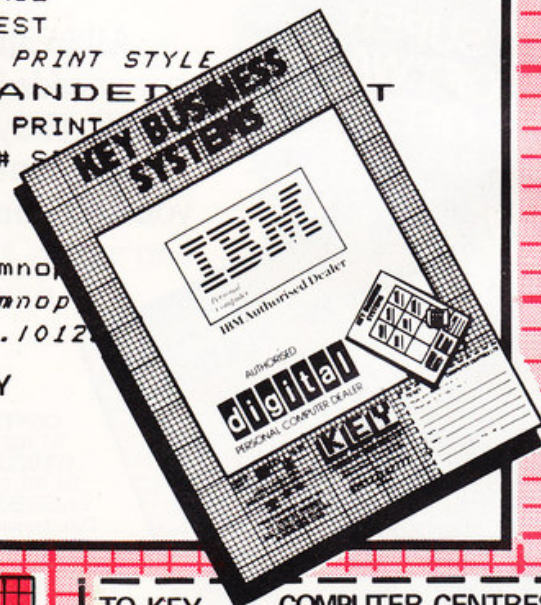


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Geof Wheelwright is the matchmaker for this marriage between Tandy Color and the Dragon.

A sideways switch



With a little work, meaningful conversation is possible between the Dragon and the Tandy.

The Tandy Color and Dragon computers have a lot in common — same processor, largely the same Basic, the same type of graphics and an ability to share much of each other's cartridge software.

You'll even find that programs written for the Dragon will often work on the Tandy without any modifications whatsoever, as long as you studiously type them in from a listing.

But when it comes to taking cassette software from one machine and loading it on the other, the famed compatibility begins to break down.

If you're simply exchanging programs with a friend who owns a Dragon (and you own a Tandy), just ask your friend to save programs under CSAVE "File Name". A and the file will be saved as an ASCII text

file. You can then simply LOAD the program on either machine, LIST it and it should run without further conversion.

Syntax Error

However, if you're trying to convert a commercial piece of software it's a different story. Although you're unlikely to have any problems getting a Dragon program to LOAD on your Tandy Color Computer (or vice-versa), you'll inevitably find that when you attempt to RUN it, a Syntax Error will be the response.

The reason for the error quickly becomes evident when you LIST the program. A simple FOR X=1TO15 statement comes out as FORXRENUM1PCLS15, while PRINT 2*3 becomes PRINT 2PUT3.

These odd transpositions are a built-in protection for the companies that make the

machines, ensuring that they can't be considered clones of each other.

If you start on the premise that the major difference in programs loaded from cassette is the interpretation of Basic reserved words and operators, you won't be far off the mark. The table below gives a list of words in Dragon's Microsoft Basic and shows the corresponding words that turn up on the Tandy when you load a Dragon program into the Color Computer.

Crossed words

Many of the words are exactly the same. Commands such as DATA, IF, INT, ON, PRINT and READ go unchanged in moving from a Dragon program to the Tandy's memory. But the IF statement isn't much good without a corresponding THEN — and THEN is read by the Tandy as SCREEN.

Even the equals sign is misread by the Tandy as RENUM. The easiest way to convert programs from one machine to another would be a word processor that can edit Basic and allow you a simple Search and Replace function to change all the words that have been misinterpreted.

But since word processing packages tend towards the pricey end of the software scale (especially ones that can edit Basic programs on low-cost micros), you ought to have an alternative conversion method.

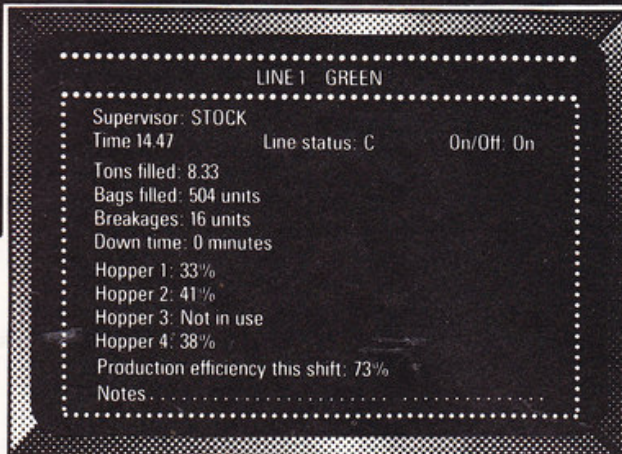
The alternative method would involve writing a machine-code routine which would contain all the information in a data table compiled from the information in the table. The machine code routine would check any program you loaded into it and replace any occurrence of tokens that were incorrect using the table as its source of information.

Otherwise, it's up to you — LOAD your program, LIST it, arm yourself with this table and start converting.

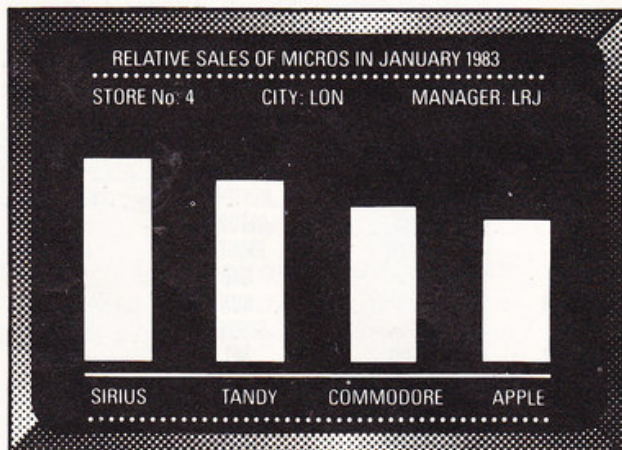
DRAGON	TANDY	DRAGON	TANDY	DRAGON	TANDY	DRAGON	TANDY
ABS	ABS	EXEC	TAB(NEW	CLOAD	RESTORE	RESTORE
ACS	MIDS	EXP	LEN	ON	ON	RETURN	RETURN
ATN	CHRS	FIX	ATN	OPEN	LLIST	RIGHTS	RIGHTS
AUDIO	SKIPF	FOR	FOR	PAINT	>	RND	RND
CHRS	POINT	GET	=	PCLEAR	↑	RUN	RUN
CIRCLE	OR	GOSUB	GOPSET	PCLS	+	SCREEN	SCREEN
CLEAR	NEW	GOTO	GOPCLS	PCOPY	EDIT	SET	SET
CLOAD	OPEN	HEXS	COS	PEEK	EDF	SGN	SGN
CLOADM	OPENM	IF	IF	PLAY	TROFF	SKIPF	SKIPF
CLOSE	SET	THEN	SCREEN	PMODE	TRON	SIN	SIN
CLS	SOUND	INKEY\$	POS	POINT	LOG	SOUND	SOUND
COLOR	AND	INPUT	INPUT	POKE	CONT	STOP	STOP
CONT	LIST	INSTR	VARPTR	POS	USR	STRINGS	PPOINT
COS	VAL	INT	INT	PPOINT	TIMER	STR\$	LEFT\$
CSAVE	CLOSE	JOYSTK	JOYSK	PRESET	★	SQR	SIN
CSAVEM	CLOSEM	LEFT\$	TAN	PRINT	PRINT	TAN	ASC
DATA	DATA	LEN	JOYSTK	PRINT TAB	PRINT TAB	TIMER	INSTR
DEF FN	CSAVE PRESET	LET	RUN	PRINT USING	PRINT USING	TROFF	STEP
DEFUSR	CSAVE STRINGS	LIST	CLEAR	PRINT @	PRINT @	TRON	NOT
DEL	SUB	LLIST	RESET	PSET	—	USR	STRINGS
DIM	DIM	LINE	OFF	PUT	<	VAL	RIGHT\$
DLOAD	DEF	LINE INPUT	OFF INPUT	READ	READ	VARTR	HEXS
DRAW	DEL	LOG	PEEK	REM	REM	>	DLOAD
EDIT	THEN	MEM	SQR	RENUM	RENUM	<	FN
END	END	MIDS	FIX	RESET	RESET	=	RENUM
EOF	INKEY\$	MOTOR	AUDIO			↑	PCOPY

This table shows you how to convert the Tandy's vocabulary to the Dragon.

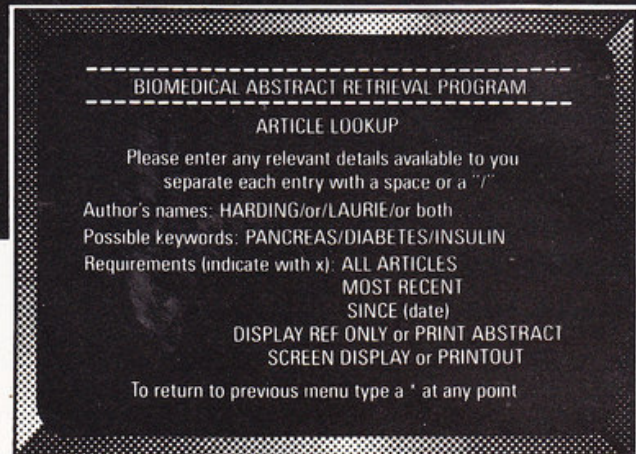
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The biochemistry department of a major Scottish university had a need for a filing system which could store details of abstracts of biochemical articles and which would allow retrieval of relevant material through entry of key words alone. A massive database had to be implemented on an Apple II computer and retrieval times needed to be measured in seconds not hours. TLO did it and the solution has since been widely published for use on other machines.

Using a computer to solve a complex problem is not always as easy as it sounds.

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A glance through the three examples on this page will give you some idea just how versatile TLO is.

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Bob Maunder continues his orchestration of your micro's sound and music commands.

Music-making Oric

Last week's Oric feature looked at toggling sound channels on and off as well as use of the envelope command. This week we use the PLAY, SOUND and WAIT commands to continue the pursuit of musiccomputer excellence.

The PLAY command on its own is not much use. But when combined with SOUND, it can give both musical and non-musical noises, from whistles to footsteps.

The sound command takes the form:

SOUND CH,P,V

Where CH is the channel (1 to 3 are the tone channels, and 4 to 6 the noise channels), P is the pitch (or period of the vibration of the note) of the sound produced, and V is the volume, which varies from 1 (the lowest) to 15 (the loudest).

If V is set to zero, then PLAY determines the volume.

The following program gives a footsteps sound by alternating between a pitch of 10 and 15.

```
5 REM FOOTSTEPS
10 FOR N=1 TO 20
20 PLAY 0,1,1,300
30 P=(N AND 1)*5 + 10
40 SOUND 4,P,5
50 PLAY 0,0,0,0
60 WAIT 60
70 NEXT N
```

It is more convincing with pictures:

```
5 GOSUB 100:GOSUB 300
10 FOR N=1 TO 37
20 PLAY 0,1,1,300
30 P=(N AND 1)*5 + 10
35 GOSUB 200
40 SOUND 4,P,5
50 PLAY 0,0,0,0
60 WAIT 60
70 NEXT N
80 WAIT 1000:CLS:PAPER 7:INK 0
90 PRINT CHR$(20):POKE
#26A,3:STOP
99 REM Set up walking figure
100 FOR J=0 TO 15
110 READ B:POKE 46080+8
*ASC("a")+J,B
120 NEXT J
130 DATA 28,28,28,8,28,62,62,
61,61,60,28,20,50,34,34,51
140 RETURN
199 REM Draw figure at position N
200 PLOT N,10,"a":PLOT N,11,".b"
210 RETURN
299 REM Draw scene
300 CLS:PAPER 3:INK 0:POKE
#26A,10:PRINT CHR$(20)
310 POKE 48520,18:POKE 48480,18
320 FOR L=0 TO 3
330 POKE 48040+L*40,20
340 NEXT L
350 POKE 48200,17:POKE
48201,4:POKE 48240,17
360 PLOT 1,4,CHR$(9) +
"012345678901234567890123456789
012345"
370 RETURN
```

Although SOUND can be used to produce musical notes, the Oric has been supplied with a command especially for this purpose — MUSIC:

MUSIC CH,OCT,N,V

CH is the tone channel (1 to 3), V is the volume (1 to 15, or 0 for PLAY to determine the volume), OCT is the octave number from 0 (low) to 6 (high), and finally, N is the note number.

N ranges from 1 (note C) going up one digit per semitone to 12 (note B). The command is very flexible and has an excellent range, as shown in the program here:

```
10 PLAY 1,0,1,200
20 FOR OCT=0 TO 6
30 FOR N=1 TO 12
40 MUSIC 1,OCT,N,2
50 WAIT 20
60 NEXT N
70 NEXT OCT
80 PLAY 0,0,0,0
```

Chords are easily obtained: all three tone channels can be opened, using PLAY, and then a different note of the chord can be set on each channel by separate MUSIC commands.

It is simple to get the Oric to play a tune. Because of the flexibility of the instructions, you can vary volume and tempo to your taste as shown:

```
10 CLS:PAPER 6:INK 0
20 INPUT "Enter volume (1-15)";V
30 V=V AND 15
40 INPUT "Enter delay (1-7)";D
50 D=D AND 7
100 POKE #26A,11:PLAY 2,0,1,2000
110 FOR J=1 TO 18
120 READ N,W
130 MUSIC 2,3,N,V
140 WAIT W*D*10
150 NEXT J
160 MUSIC 2,2,10,V
170 WAIT 240
180 PLAY 0,0,0,0
190 STOP
1000 DATA 3,2,6,4,8,2,10,3,11,1,10,2,
8,4,5,2,1,3,3,1,5,2
1010 DATA 6,4,3,2,3,3,2,1,3,2,5,4,2,2
```

Notes are held in the DATA statements as two-digit pairs, the first specifying the note number, and the second specifying its length (in eighths).

If all the notes are the same length (as in a little jingle), then the note numbers may be put in a string:

```
5 PLAY 1,0,2,1000
10 TS="13243546571324354657666798:9;
:<<<<:987654321111"
20 FOR J=1 TO LEN(TS)
30 N=ASC (MID$(TS,J,1))-48
40 MUSIC 1,3,N,3
50 WAIT 20
60 NEXT
70 PLAY 0,0,0,0
```



Arthur Brown

S O U N D

Suddenly the Colour Genie can run the programs available for the Genie I. Marc Leduc explains.

Colour Genie's thought transference



Many people still own and buy the Genie I micro-computer because of its reliability and vast amount of available software. Unfortunately, the Genie I has a black and white display, and sound can only be produced by software generating square waves from the cassette port into an external amplifier.

It is possible to purchase a colour board, a high resolution board and a sound board for the machine, but that would bring the computer cost high above other machines with similar features.

The Colour Genie, on the other hand, is comparatively inexpensive. It also supports 98 per cent of the Basic commands available on the Genie I, the exceptions being SET, RESET and POINT.

These commands were used for the very low resolution graphics on the Genie I, but remarkably, the first 12K of the Colour Genie ROM is almost identical to the Genie I ROM. The Colour Genie has a 4K ROM extension to support the Colour and Sound enhancement commands.

The Colour Genie has two types of screen displays: a text screen and a high resolution screen. The high resolution screen allows 160x96 pixels with four colours — and this takes up 4K of user RAM.

But here's the funny part. In the text screen, you can program the individual pixels in 128 characters, or you can use 128 pre-defined characters. With simple programming, you could produce a display of

FIG 1

16K - 32000
32K - 48384
48K - 64768

FIG 2

```
10 DEFINT A - Z
20 FOR I = 128 TO 255
30 PRINT CHR$(I);
40 NEXT I
50 GOTO 20
```

FIG 3

P
r A
o r
b e
l a
e
m

Keyboard Map

Video Map
(text mode)

Figure 1. Memory reservations for the different versions of CSAVERS.

Figure 2. A sample program to transfer to the Colour Genie which requires no modification.

Figure 3. Addresses of potential problem areas when converting programs from the Genie I and II to the Colour Genie.

ADDRESSES

Genie I and II Colour Genie

3801H - 3880H	F801H - F880H
3C00H - 3FFFH	4400H - 47FFH

320x192 pixels in 16 colours (eight colours, eight tints and hues), and take up only 1K of user memory!

As the Colour Genie and the Genie I are so much alike, you would think any software sold for the Genie I should run on the Colour Genie. Well, not entirely.

The Genie I supports a 64x16 character screen, while the Colour Genie has a 40x24 character text screen. This isn't a great problem, as anyone who gets the hang of programming on the Colour Genie will soon be able to make the slight alteration that is necessary to change Genie I programs.

The other snag is that the Genie I tapes are 500 Baud, while the Colour Genie tapes are 1,200 Baud. Also, the format of the tapes is slightly different.

So you could conclude that the only

method of transferring Basic programs is to type in the program by hand. Not so.

Machine language

CSAVER is a utility which allows you to take a Basic Program LOADED into the Genie I or II, and then make a copy of that program onto a tape which will LOAD into the Colour Genie. Instead of spending the next two weeks retyping and debugging a 16K Genie I Basic program, you now only need a few minutes to make a good copy. Suddenly, the Colour Genie has access to the large set of programs available for the Genie I.

CSAVER is a machine language program, and must be entered using an editor/assembler. The program is very short, and you should be able to get it working within a couple of hours.

Once you've assembled the program, you will end up with an object tape. For the sake of convenience, we'll name the tape CSAVER. By the way, you must alter the assembly code as appropriate for the memory size of your machine, and if you have a Genie I you must change the program to use the second cassette port.

Now that you have the object tape, try it out. Reset your Genie I or II. You must then reserve a memory size. Refer to figure 1 for the memory reservation required for your machine. Enter this number and press NEWLINE. Now, type in SYSTEM followed by NEWLINE. This tells the Basic interpreter that you wish to load or execute a machine code program. The system should reply with a *?.

Now type CSAVER followed by NEWLINE. This tells the Basic interpreter that you wish to LOAD in a machine language program named CSAVER. Enter the machine language program into your tape recorder (on the Genie I or Genie II, not the Colour Genie!) and press the play button. The program should now LOAD. If not, refer to your owner's manual for instructions about LOADING problems. Once the tape is LOADED, the system will reply with another *?.

Simply type / followed by NEWLINE to activate CSAVER. The screen should clear and the program credits will be displayed. CSAVER is now active in your system. If you wish to SAVE a program in Colour Genie format, simply type SAVE "filename" instead of CSAVER "filename".

Try typing in the program in figure 2. Now, prepare the cassette recorder with a blank tape as you would using the CSAVER command. Type in SAVE "A" followed by NEWLINE. The tape will be SAVED in Colour Genie format and, when complete, the message "save complete" appears followed by the usual READY statement. Now, you can CLOAD the program into the Colour Genie as normal.

Most of the straightforward, ordinary Basic programs should run without any change, but you may have trouble with the sophisticated ones. Some of the potential problem areas may occur with POKEing the video display and PEEKing the keyboard and programs which contain machine code subroutines. Refer to figure 3 for the common address differences between the Colour Genie and the Genie I and II.

With some obvious modification, it should be possible to get a version of CSAVER which will transfer machine language programs, since the only difference in tape formats (besides the baud rate) is the program leader. The format of the machine code leader and the Basic leader on the Colour Genie are the same.

Mark J Leduc is chairman of the National Colour Genie Users' Group. A cassette version of the machine code program in this article is available from the group. Write to: Mark Leduc, Chairman, National Colour Genie Users' Group, 46 Highbury Avenue, Bulwell, Nottingham.

Genie I or II Basic program utility

ORIGIN	EQU	OFD00H	; Origin -- 48K version
			; Change to BD00H for 32K version
			; or 7D00H for 16K version
SAVEADR	ORG	ORIGIN	
INIT	EQU	41A1H	; "SAVE" command vector
	LD	HL,PROGST	; CSAVER code start address
	LD	(SAVEADR),HL	; Insert CSAVER code in SAVE vector
	CALL	01C9H	; Clear screen -- ROM routine
	CALL	PMESS	; Display credits
	DEFB	'CSAVERS -- Genie I or II to Colour Genie'	
	DEFB	13	
	DEFB	'	
	DEFB	13	BASIC program transfer utility'
	DEFB	13	
	DEFB	13	
	DEFB	0	
	JP	06CCH	; Jump to BASIC READY
PROGST	LD	A,1	; Change to 16 for Genie I
			; second cassette port
	LD	A,5	; Cassette Mask
			; Change to 33 for Genie I
	LD	(BITFF),A	; Save Mask
	CALL	0212H	; Turn on cassette motor
	CALL	PSYNC	; Write tape leader
	CALL	2337H	; ROM Routine -- place string in
			; command line into temporary
			; string space
	PUSH	HL	; Save HL
	CALL	2A13H	; ROM Routine -- Place address of
			; temporary string into DE
	LD	A,(DE)	; Store file name in Accumulator
	CALL	COUT	; Write Byte to cassette
	LD	HL,(40A4H)	; Start address of BASIC program
	EX	DE,HL	; Swap registers
	LD	HL,(40F9H)	; End address of BASIC program
OPROGB	LD	A,(DE)	; Get byte of BASIC program
	INC	DE	; Point to next byte
	CALL	COUT	; Write Byte to Cassette
	RST	18H	; Compare HL and DE
			; Z flag set if HL = DE
	JR	NZ,OPROGB	; Jump if not all done
	CALL	01F8H	; Turn off cassette motor
	CALL	PMESS	; Tell User I'm Done
DMESS	DEFB	13	
	DEFB	'Save complete'	
	DEFB	13	
	DEFB	0	
	POP	HL	; Restore HL
	RET		; Back to BASIC
PSYNC	DI		; Disable interrupts
	LD	B,255	; Length of leader
	LD	A,0AAH	; Leader byte
LOOP3	CALL	COUT	; Write byte to cassette
	DJNZ	LOOP3	; Loop 255 times
	LD	A,66H	; Sync byte
COUT	EXX		; Use alternate registers
	EX	AF,AF'	; " " "
	LD	C,8	; No. of bits in a byte
	LD	D,A	; Save Byte to send to cassette
G4LOOP	CALL	OBIT	; Output bit -- Time sync
	LD	B,38H	; Timing delay
WAIT1	DJNZ	WAIT1	; Loop for time delay
	LD	A,D	; Restore byte to send
	RLCA		; Shift right -- LSB into carry
	LD	D,A	; Save byte state
	CALL	C,BITOUT	; Output bit if it is in carry
	LD	B,3AH	; Time delay
WAIT2	DJNZ	WAIT2	; Loop for time delay
	DEC	C	; Decrement bit count
	JR	NZ,G4LOOP	; Loop till all eight bits done
	EX	AF,AF'	; Restore old registers
	EXX		; " " "
	RET		; Return to caller
OBIT	LD	A,(BITFF)	; Get mask
	XOR	3	; Swap bottom two bits
	OUT	(OFFH),A	; Output to cassette
	LD	(BITFF),A	; Save new mask
	RET		; Return to caller
PMESS	POP	HL	; Pop message address off stack
PMESS3	LD	A,(HL)	; Get byte from message
	INC	HL	; Point to next byte
	OR	A	; Is it zero?
	JR	NZ,PMESS2	; Jump, if so
	JP	(HL)	; Else, return to caller
PMESS2	PUSH	HL	; save HL
	CALL	33H	; ROM Routine -- display character
	POP	HL	; Restore HL
	JR	PMESS3	; Try next byte of string
BITFF	DEFB	5	; 33 for Genie I second cassette

Mike Gerrard passes sentence on a cassette-based word processing package for the Dragon.

Microdeal has been importing good quality arcade games from the US and successfully converting them from the Tandy to the Dragon, and with Telewriter it has introduced what seems to be the first word processing package for the Welsh machine.

It is also the first word processor I've used, and as a novice I was surprised how easy it was to master.

Features

Telewriter converts the Dragon's rather large and boring-looking 32 x 16 text screen into a 51 x 24 display of clear characters, in both upper and lower case, enabling you to manipulate text easily and quickly. Four versions of the program are on the cassette.

Some word processing packages try to incorporate every printer into one program, thereby sacrificing facilities, but the first version here will work with most standard printers, the second is for the Epson Grafftrax, the third is a Centronics version and the fourth will link with Terminus, Teletype and some daisywheel printers not covered by the other three.

Presentation

The cassette comes with a smart cream ring-binder, A4 size, which contains both a 33-page reference manual for the experienced user and a 27-page tutorial for the newcomer. The manual is indexed and contains a useful appendix of commands. I only wish the manual that came with the Dragon was this helpful and logical.

Getting started

When loaded (and the programs are duplicated in case of problems) a menu allows you, on a single key command, to create a new file, edit an existing one, save a file or part of a file to tape, read in a file from tape, add a file from tape to what's already held in memory, verify a file that has been loaded, move to the printer format or have a word and line count of the text currently held, there being room for up to 18,500 characters.

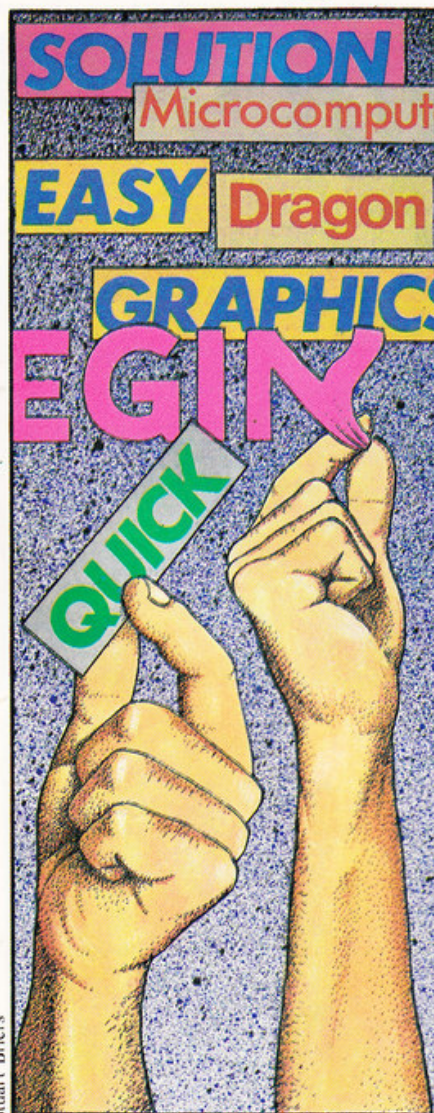
In use

The tutorial begins by showing you how to create a new file, and then leads you through the control commands available, showing you how to move the cursor around, delete and insert text, align paragraphs, move blocks of text from one place to another, and scroll quickly back and forwards through the pages on file.

Just a few hours with the instructions familiarised me fairly well with the commands, as most of them are logical entries, such as B for Begin, P for Paging and so on. There was little confusion with the Dragon's own editing commands.

The program also provides a search facility, enabling you to skip through the text and locate every instance of a word. You can then delete it, ignore it, or replace it with another pre-chosen word. What it doesn't have, though, are two different areas of text memory which would allow

Big-screen writing on the Dragon



Stuart Briers

you, for example, to keep a standard letter in file and send different copies to each of a series of names and addresses held elsewhere. But in a program costing only £50 and aimed at a home micro you can't expect all the facilities business executives demand from more expensive systems.

There is an automatic wordwrap; any word which would be left unfinished at the end of a line is transferred to the next line. This facility can be disabled if you want your words broken, though this is the nearest the program comes to offering automatic justification of the right-hand margin. If you want that without broken words, you'll have to wait for a more expensive package.

The printing commands allow you to set the line spacing, left margin, characters per line, upper and lower margins, lines per page and pagination. You can also have

direct access from file tape to printer or from keyboard to printer.

One extremely useful feature is %Print, allowing you to run off a few lines for inspection before going ahead with the whole printing. This % facility also applies to saving files from tape, so you can easily confirm that saving is actually happening. There is also an auto-retry feature when searching for files, so you don't have to type in CLOAD continually. The machine just keeps on looking for the file you want.

Reliability

There is a certain amount of precaution against error, with a prompt of 'Sure???' when attempting to type in something which would wipe out an existing file, and although most of the commands are only double-key entries (such as CLEAR-X), I think the worst you could do inadvertently would be to wipe out a line of text by hitting K for kill instead of M for menu. It seems to be a small risk when set against the simplicity of use.

The commands for setting the printer are also fool-proofed, and if in error you make your 4-space margins 44, or even 444444 as I tried, they are instantly resettable.

In two days of working on the package, the program crashed just twice. While scrolling backwards through several pages of text that I had entered from the demo programs provided on the tape, I found myself looking at a page full of what appeared to be Chinese characters, and there was nothing for it but to reload.

This unfortunate incident was no great disaster with a demo program, but losing several pages of incomparable and irreplaceable prose would have taught the virtue of saving as you go.

Verdict

I was impressed by Telewriter. It was easy to master, even for someone with no direct experience of word processors.

Similar packages for other machines seem to cost at least half as much again as Telewriter, and Microdeal hasn't skimped on documentation.

Comparing it to a full-blown package is like comparing the Pocket Oxford Dictionary to the full 13-volume edition, and while it might be nice to have the full set, the pocket version will satisfy your needs about 90 per cent of the time.

RATING

Features
Documentation
Performance
Useability
Reliability
Overall value



Name Telewriter Application Word processor
System Dragon 32 Price £49.95 Publisher
Microdeal (0726-67676) Format Cassette
Language Machine code Other versions Tandy
Color Computer Outlets Mail order, John
Menziess, selected Boots, other dealers.

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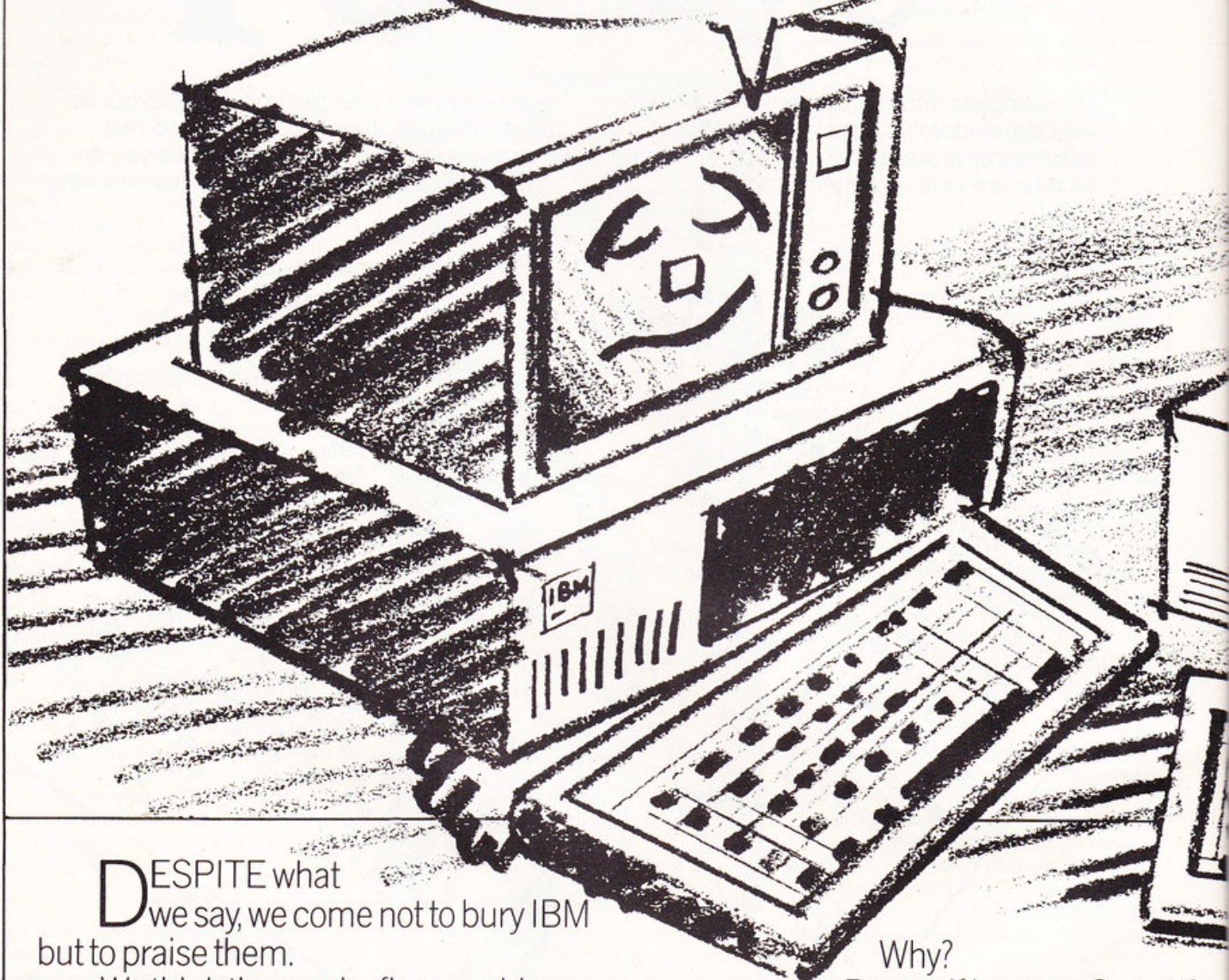
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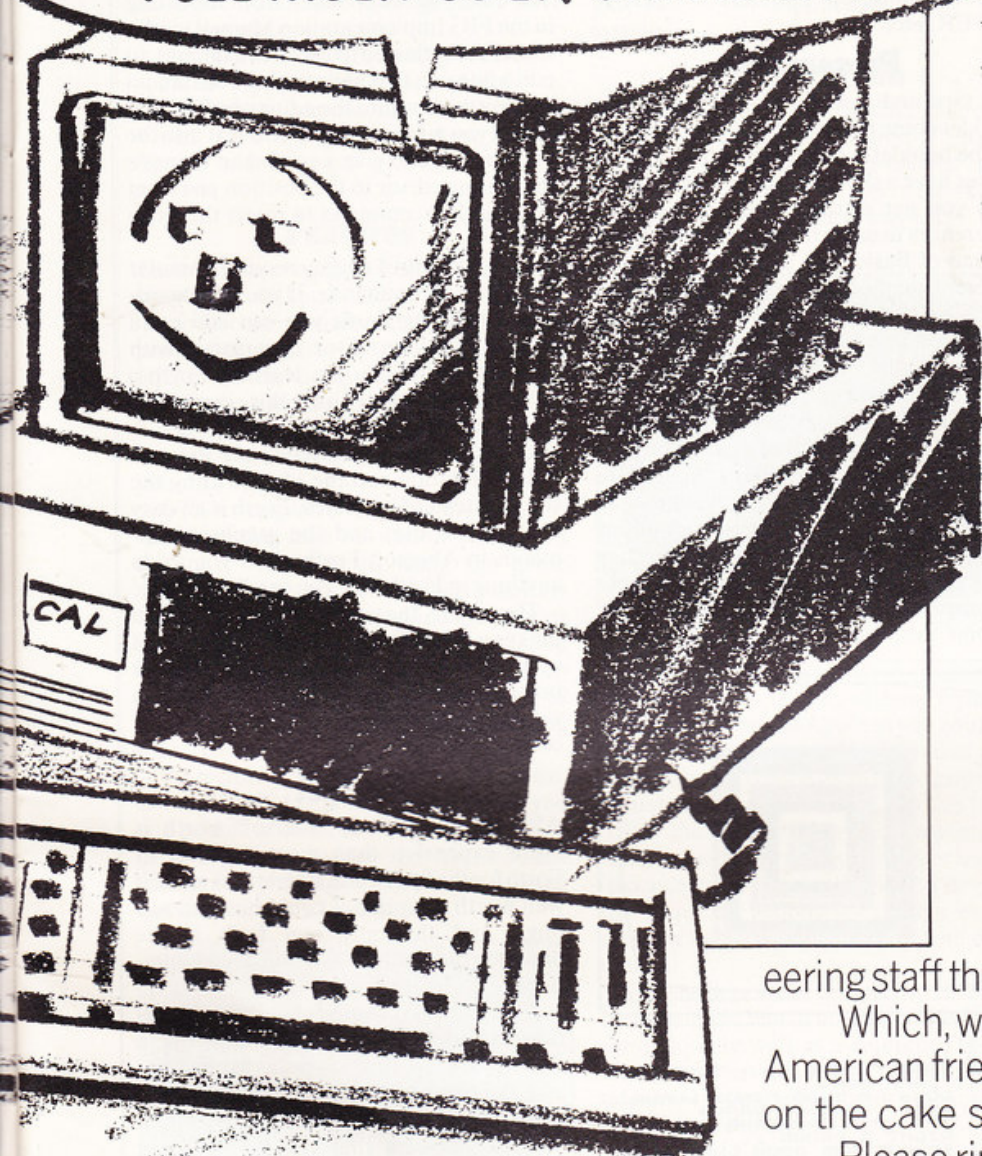
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Looking for a speedier Spectrum? Ted Ball reviews a Forth-coming attraction from Abersoft.

A Forth first for the Spectrum

Forth is becoming a very popular programming language on small microcomputers because it's almost as easy to use as Basic and almost as fast as machine code. Abersoft Forth is an implementation of FIG-Forth, with disk simulation in RAM, and a number of extensions which are mostly to allow you to use the special features of the Spectrum.

Features

Being an implementation of FIG-Forth, Abersoft Forth includes the complete standard FIG-Forth vocabulary, and with the disk simulation in RAM you can enter and run published program listings without having to make changes.

The disk simulation uses 11K of memory to represent a disk, and the disk handling words treat this block of memory as if it were a disk. There is an editor which allows you to type programs into the 'disk' area, in the usual FIG format where each 1K of disk is treated as a 'screen' with 16 lines of 64 characters. Although this is not really suitable for the Spectrum's 22 x 32 screen, Abersoft has kept it for the sake of compatibility.

Abersoft's extensions to FIG-Forth include sound, colour, graphics, tape, keyboard and printer commands. Where possible it has the same names as the corresponding commands in Basic, but you have to use them in Forth's normal Reverse Polish form.

All the colour and graphics commands from Spectrum Basic have equivalents in Abersoft Forth, except CIRCLE, presumably because of the difficulty of implementing and using this command in an integer-only language.

DRAW is rather different from the Basic DRAW command. In Abersoft Forth, xy DRAW draws a line from the current position to the point (x, y), while the Basic command DRAW x,y draws a line from the current position to a point at a distance x horizontally and y vertically from the current position.

For sound, Abersoft Forth has the word BLEEP, which allows you to set values of duration and pitch related to the processor clock cycles. With the extra speed of Forth you can produce more varied sounds with BLEEP than with the BEEP command in Basic, where you have to give duration in seconds and pitch in semitones.

As well as the extensions that allow you to use the special hardware features of the Spectrum there are some miscellaneous non-standard words. These include CASE, ENDCASE, OF, ENDOF, which together give a case statement of the type

found in Pascal and other structured languages. There are also some words that operate on 32-bit numbers — 2DUP, 2OVER, etc.

Presentation

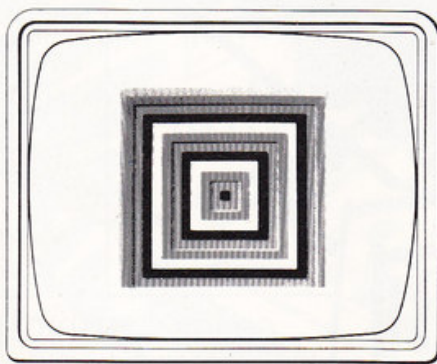
The tape and a neatly printed instruction booklet come in a clearly labelled box.

The booklet is mostly for reference, but it does have a short introductory section to help you get started. It describes some differences in using the computer in Forth instead of Basic. For example, there is a different method for getting the symbols which are printed in red below the keys.

There is a short explanation of some of the extensions, mainly the graphics and input/output words. The section on the editor defines the editor commands, and gives some explanation of their use.

More than half the booklet's 28 pages are a glossary listing words available in Abersoft Forth, giving precise definitions of what the words do, the inputs they expect and the outputs they give. But there are misprints and omissions in this section.

Some misprints could give you a lot of



```
1 LIST
SCR # 1
0 : DRAP 23678 CB + SWAP 2367
7 C : + SWAP DRAP
1 : DOWN @ SWAP MINUS DRAW ;
2 : LEFT MINUS @ DRAW ;
3 : UP @ SWAP DRAW ;
4 : RIGHT @ DRAW ;
5 : SQUARE DUP DOWN DUP LEFT
DUP UP RIGHT ;
6 : MOVESTART 1 1 DRAW ;
7 : DEMO CLS 124 54 PLOT
8 : 22 @ DO I 8 MOD INK
9 : 1 DO J 8 * I + SQUARE
10 :
11 : 2 +LOOP MOVESTART
12 : LOOP ;
```

All you need is Abersoft's implementation of Forth, a Spectrum and this program and you can produce the above demonstration.

trouble, particularly if you've just started learning Forth. For example > appears as < at the heading of its definition, and the words R0 and S0 (with the digit '0') appear as RO and SO (with the letter 'O').

Most of the omissions are words that Abersoft has added. The introduction mentions UDG, which allows you to set up user defined graphics characters, but UDG

is missing from the glossary. There are also words which come up in the vocabulary when you use VLIST, but are not in the glossary, for example, INCX, INCY, X1, and Y1.

The glossary doesn't tell you which words are in the FIG-Forth standard and which have been added. If you want to write portable programs you need to get the FIG Implementation Manual to find this out.

In use

The editor has been taken from the listing in the FIG Implementation Manual, and is rather complicated to use. For example, to edit a line you first have to give a command to copy the line into the editing buffer, and then if you want to insert extra text into the line you have to give a command to move the editing cursor to the position you want and another command to insert the extra text.

Other forms of editing require a similar sequence of commands. If you are experienced in using Forth you can add extra commands to the editor, or replace it with another, but if you are learning Forth a complicated editor like this can make things difficult.

Once you have got used to the Reverse Polish Notation and the idea of using the stack instead of variables, Forth is an easy language to use, and the graphics commands in Abersoft Forth allow you to do anything in Forth that you can do in Basic.

However, the extra speed of Forth makes a big difference. You can get speed improvements of ten to 50 times, making it possible to produce moving graphics you would otherwise have to write in machine code.

Verdict

Although at £14.95, Abersoft Forth is more expensive than most versions of Forth for the Spectrum, its features make it well worth the price. I could not find any bugs, and the only real fault is the omissions and misprints in the documentation.

Abersoft also promises low-priced additions including Microdrive file handling, a Z80 assembler, floating-point arithmetic, and a more expensive compiler to allow you to compile Forth programs into a stand-alone form that can be sold in a self-contained form.

These additions will make Abersoft Forth a very useful programming system.

RATING

Features
Documentation
Performance
Usability
Reliability
Overall Value



Name Abersoft Forth. **Application** Programming language. **System** 48K ZX Spectrum. **Price** £14.95. **Publisher** Abersoft, (0970) 828851. **Format** Cassette. **Language** machine code. **Outlets** Mailorder

It's paddle your own graphics on the Apple II+. But Mike Whitney has that sinking feeling...

Up the creek with a paddle

The Apple II is the granddaddy of all microcomputers. As 'venerable' is the description it most often attracts these days, it's all the more surprising how well its high-resolution colour graphics have stood the test of time.

But the problem with all high-resolution — for the Apple or any other machine — is how to get the picture you want onto the screen. GPS is a graphics editor for the Apple, and attempts a solution to this problem.

Features

The hardware required is an Apple II+, at least one diskette drive, a colour or monochrome monitor and the Apple game paddles or some form of joystick. A 16K RAMcard and additional diskette drives can also be used if available, and an Apple Silentyper or other graphics printer is needed if you will be wanting hard copy of your drawings.

GPS is designed to give you the power to draw on the high-resolution screen, in colour if you have it, using the game paddles or a joystick. The objects you draw can be manipulated either individually or in groups, the manipulations available including moving the object or group around in the picture, duplicating it as often as desired, changing its size, rotating it and changing its colour.

A picture can be saved on diskette, either in GPS format — in which case you will be able to do more work on it later — or as a binary image of the hi-resolution screen for printing or for use as a fixed background for a later picture.



GPS ready to roll

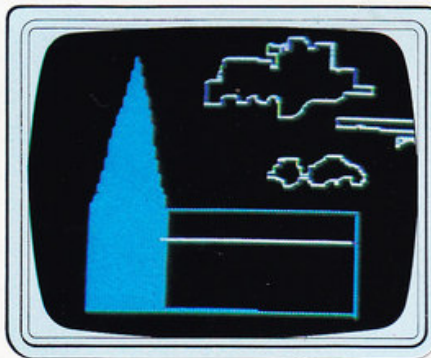
A powerful feature is that individual objects or groups can also be saved in GPS format on the diskette. Objects saved in this way can be used as standard items, loadable into any picture, and fully capable of being manipulated in all the ways described above.

The package is claimed to be capable of printing your picture, directly onto a Silentyper printer, but this feature was not

tested. The alternative method, required for other graphics printers, is to use the binary dump of the screen. But you will need suitable software for this purpose, and this is not supplied with the GPS system.

Presentation

The packaging of this product cannot be faulted. The manual, of about 70 pages, comes in a padded stiff-backed ring-binder, with packets for the two diskettes containing the programs and other software.



An example of GPS' work

One thing to beware of is reading the manual cold — that is, without trying all the examples on the Apple as you go along. This package, because of the kind of job it is trying to do, is not easy to get to grips with at first, and the manual reflects this fact.

But the subject matter is presented in easily swallowed pieces, and a standardised system of phrases is used to describe the required actions — there's even a glossary of these phrases at the end of the manual.

The authors seem to have achieved the not-so-simple feat of making a tutorial text serve equally well as a reference for the more experienced user. All things considered, I would class the documentation as well above average.

Getting started

One of the key features of the program is that almost everything, including menu-selection, is done with the paddle or joystick and the paddle button. Once you've got the hang of this it's very good, but it can land you in some pretty pickles before that happy moment arrives.

But this kind of difficulty has to be seen in perspective. Software can be easy for the beginner to use, or fast and efficient for the more experienced, but rarely both at the same time. The manipulation of graphic images is an awkward business at best, and it was probably right in this case to give the advantage to experience.

In use

GPS is not for doodlers — you need to plan your approach to drawing your picture very carefully. Start with the background, and work forwards. Treat every surface as a separate object. Don't start colouring in your picture until everything has been done in outline. Save work-in-progress to diskette at regular and frequent intervals. Learn the package thoroughly before trying anything too ambitious, so that you know all the time-saving dodges!

One problem I found was that it was difficult to control the graphics cursor. This is a little spot of light on the screen, which is your 'pencil point', and which you move with the game paddles — one for left-right, and one for up-down. I have tried this before, and find it next to impossible. On this occasion I used the Apple joystick: this is a little better, but not much.

The software could have helped out more here by providing some useful standard shapes automatically; the only automatic drawing feature actually present is the ability to draw straight lines from point to point. The addition of such features would add considerably to the value of the package.

Reliability

Program 'hang' is a phenomenon all micro users have met at one time or another. For no apparent reason your program seizes up solid, and won't respond to anything you do. The only remedy is to turn the machine off completely, so losing whatever work has been done since you last saved it.

GPS did this three times in a four-hour session. What gets me is that the manual even warns you about this possibility. It seems totally pointless to test a program, find a bug and then, instead of curing it, just document it in the manual. As far as I'm concerned, programs with this sort of fault score very low on reliability.

Verdict

This package will do the job it is designed for, provided you are prepared to put in the necessary effort. The reliability problem is irritating, but you can keep its effects to a minimum by regular saving of your work. It could be improved, but in its present form is perfectly usable, and could be a great boon to, for example, writers of games programs.

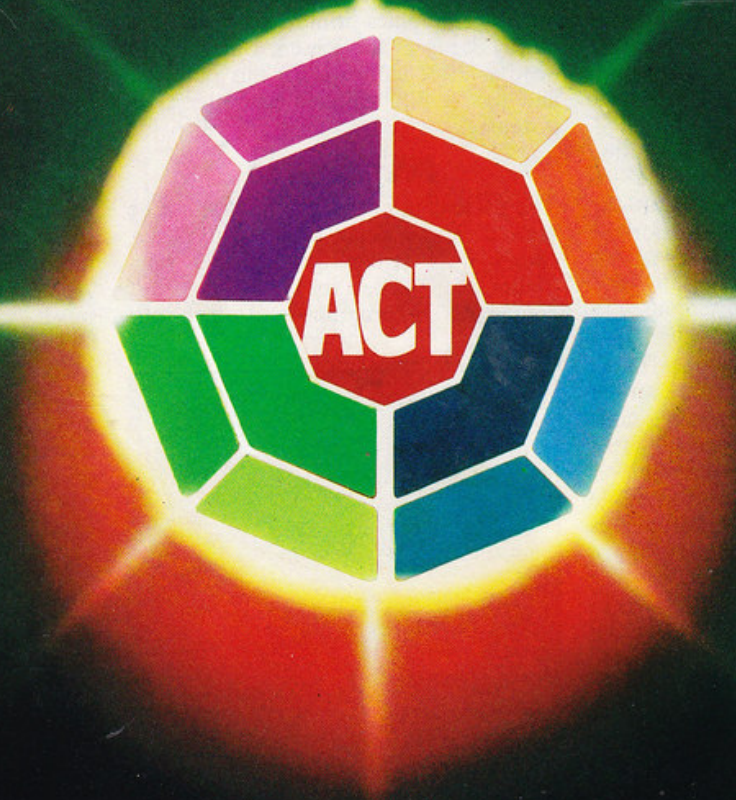
RATING

Features
Documentation
Performance
Usability
Reliability
Overall value



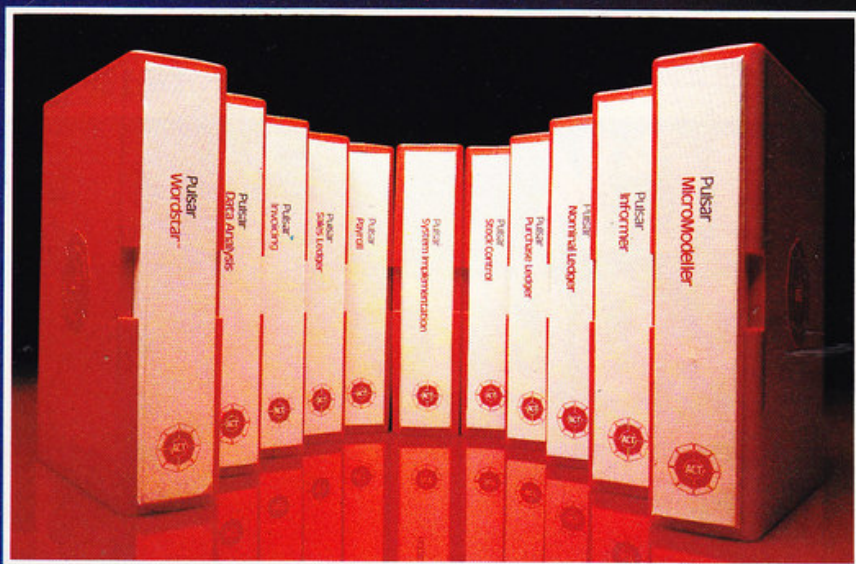
Name GPS graphics processing system
Application Apple hi-res graphics **System** Apple II+ **Price** £57.45 inc VAT **Publisher** Stoneware Inc, San Rafael, California, USA **Format** Diskette **Language** N/A **Other versions** Professional **Outlets** SBD Software, 01-870 9275, and Apple dealers

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SC1

Which joystick should you buy for your micro? Ian Scales gets to grips with the problem.

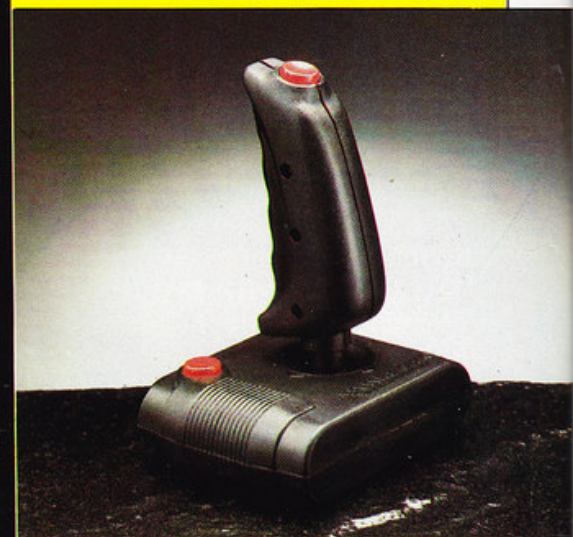
JOYSTICK SHOOT-OUT

These days games players are becoming choosier about their joysticks, so devices for manipulating screen-objects are appearing in great variety. All of them claim to provide the ultimate 'user interface', giving you more accurate control and delivering better scores.

Over the coming months *PCN* will run several joystick roundups, and we'll look at selected joysticks as and when they appear.



Kempston's Competition Pro is a solidly constructed unit and comes with an interface for the ZX Spectrum.



The Spectravision Quickshot features a helicopter-style grip. It works with the Atari and the Vic 20.



The standard Atari joysticks may not be particularly high in quality, but they are a good buy.

Helmets by Lewis Leathers, photographs by Nartu

Interfacing with the Spectrum

Kempston's Competition-Pro joystick for the Spectrum represents one way around the perennial problem of getting a joystick to manipulate a game designed for a keyboard. The Pickard joystick controller (PCN May 20-26) is an ingenious, if primitive solution to the problem of the portless Spectrum.

The Kempston joystick approaches the problem on two flanks. First, the company has managed to get several software companies to include joystick routines in their commercial games. These are compatible with Kempston's joystick interface.

The interface plugs onto the edge connector on the Spectrum, and the joystick is configured through a standard joystick port. This means it is possible to configure other joysticks to the interface. This is no mean feat, and indicates a certain amount of clout and respect for Kempston among the micro-software industry.

There are currently 14 action games with Kempston joystick compatibility, including products from Artic, Silversoft and Quicksilver.

The other method of configuration is a little more complex. It is possible to dig into Basic programs and modify them to accept the joystick commands, which are mapped to address 31 in the Spectrum.

Kempston claims the joysticks are selling like hot cakes.

Joysticks tend to be packaged rather like something you'd expect to find in Woolworth's. Kempston's joystick is no exception. The packaging is slick, but the documentation tends to let it down.

It never ceases to amaze me how much effort many companies put into a product, only to shove a scrappy bit of paper in as a last thought. I suspect that the instructions may also be a little obscure for many people.

The joystick itself is another matter — it looks as though it has been ripped out of an Italian sports car. The good thing about it is its low profile and short throw (motoring correspondent jargon for how far the stick moves at its handle).

With longer sticks there is a tendency for the long travel to topple the thing when you're after a particularly devious alien on the other side of the screen. The only solution here is to keep a firm grip of the thing with the other hand.

With the Kempston joystick, I found that as long as I kept enough weight bearing down on the stick, I could keep my other hand completely free for the firing button.

The joystick is extremely accurate, and is very responsive to small movements. Construction is also very rugged. Kempston boasts of the nylon-covered steel shaft on the stick, and the unit has a very droppable feel about it.

The firing buttons, by the way, could be described as 'hair trigger'. It takes only the slightest depression to zap. The joystick is connected to a special interface, which is plugged into the Spectrum edge connector.

The only grumble I can find about the hardware is that the lead dangles down across the Spectrum keyboard, making it difficult to enter the loading commands.

Item Kempston Competition-Pro Joystick and Spectrum interface **Machine** Sinclair Spectrum **Price** Spectrum Joystick and interface £25, Vic 20/Atari joystick £16, Spectrum joystick interface £15. **Outlets** Kempston 0234 852997

Chopper-style fire control

The Spectravision Quickshot features more of a helicopter-style grip. This is to be encouraged, as extended playing with a stick tends to wear holes in the palm of your hand.

The Quickshot has a full pistol-grip, with its trigger button on the top of the handle. There is another button on the base, so you can adapt it to your own playing style.

The base also features a 'contour groove' for better grip, although the advantages of this are hard to gauge.

The Quickshot uses a standard joystick plug compatible with Atari, Commodore Vic 20 and the NEC 6001. It also features suction cups on the corners of the base. These aren't really the ultimate answer to the stability problem, but they can be a help as long as your playing style isn't too aggressive.

Accuracy and feel are very good — there is none of that 'loose tooth' feel in the playing action. The Quickshot is heavily constructed, and this is a very important factor in choosing a joystick. Its cord is a comfortable four feet.

Distributor Vulcan Electronics is promising to release an interface for the Spectrum soon and this will apparently cost around £10.

Item Spectravision Quickshot **Interface** Atari 400/800, Commodore 64, Vic, NEC C-6001 **Price** £11.95 **Distributor** Vulcan Electronics **Outlets** Most Commodore and Atari dealers

The Atari plays its best shot

Atari's own joystick for the Atari 400 and 800 is worth using as a yardstick for the others. It's probably fair to say that some other computer manufacturers have never really had their hearts in producing fiddly little peripheral items like joysticks.

Atari's joystick controllers consist of what looks like a scale model of Nelson's column without Nelson. This doesn't really endear it to the palm of your hand

— the thing can get rather uncomfortable during an intensely 'gripping' phase of play.

The casing isn't as flimsy as some, and it looks as though it could take a reasonable pounding without problems. The lead is a short three feet. The accuracy is good, although the mechanism seems over-sprung, needing a good deal of effort to move it.

The single firing button is not as responsive as it could be, needing a good strong push to get it firing.

Item Atari Joystick controllers **Machine** Atari 400 and 800 **Price** £13.99 **Outlets** Most Atari dealers

Acorn's portable pistol-grip

Acorn has approached joysticks from yet another angle. The BBC joystick controllers we tested came as pairs, sharing the joystick plug at the back of the BBC micro — both cables go into the same plug.

Instead of the controllers resting on a table, they are the pistol-grip type, with the fire button occupying the trigger position.

You aren't tied to a flat surface while playing — instead the controller is held and fired with one hand and the joystick is manipulated with the other. This gives you more flexibility in your playing position.

Two people playing an action game can easily adjust positions to take turns in front of the screen, and it also makes it much easier to play in front of the domestic telly, which usually doesn't rest on a table. But this hand-held design has disadvantages too. It is often difficult to maintain your bearings when you are controlling a screen object over two dimensions. It pays to try and keep the trigger pointed at the screen, so you can

	QUICKSHOT	ATARI	PRO+ INTERFACE	BBC
CONTROL ACCURACY	3	3	3	4
BUTTON RESPONSE	3	2	5	1
GRIP	5	1	4	1
CONSTRUCTION	4	2	5	2
PRICE	£11.95	£13.99 per pair	£25.00	£13.00 per pair
5 EXCELLENT 4 V. GOOD 3 GOOD 2 FAIR 1 POOR	This panel rates what we consider the most important joystick capabilities of the joysticks featured in this round-up. The products actually varied quite markedly. Some, as can be seen, were good in one area and bad in another.			

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Spectrum Software

- | | | |
|---|-------------------|--------|
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| <input type="checkbox"/> Cosmic Guerilla | 16K Crystal | £5.95 |
| <input type="checkbox"/> Cosmos | 16K Abbox | £5.95 |
| <input type="checkbox"/> Cyber Rats | 16K Silversoft | £5.95 |
| <input type="checkbox"/> ETX | 16K Abbox | £5.95 |
| <input type="checkbox"/> Frenzy | 16K Quicksilva | £4.95 |
| <input type="checkbox"/> Frogger | 16K DJL | £5.95 |
| <input type="checkbox"/> Galaxians | 16K Artic | £4.95 |
| <input type="checkbox"/> Gulpman | 16K Campbell Sys. | £4.95 |
| <input type="checkbox"/> Jet Pac | 16K Ultimate | £5.95 |
| <input type="checkbox"/> Joust | 16K Softtek | £5.95 |
| <input type="checkbox"/> Knot in 3D | 48K New Gen | £5.95 |
| <input type="checkbox"/> Mazeman | 16K Abersoft | £5.95 |
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WORK TO RULE



The BBC joysticks are hand-held and offer good on-screen control, but the pistol grip is uncomfortable.

◀ 39

keep your stick movements oriented to what you expect to happen in the game.

Because these joysticks are hand-held, they use a different method to send information to the computer. Instead of the normal spring-loaded stick, which centres itself in a vertical position when left to its own devices, the BBC controller uses a pair of potentiometers to send information to the computer.

The computer interprets the signals from the potentiometers as directions for movement across an X-Y axis. To the user all this means is that the joystick moves evenly through about 90 degrees in two dimensions — there is no spring loading and this is eminently suitable for a hand-held controller.

It also gives the user more accurate control over the screen object. So much for the theory. In practice, we found that the joystick was fairly accurate, but comfort was another matter.

The pistol-grip area is a rectangular plastic moulding with little compromise for the shape of the hand. It is uncomfortable to use for any length of time, and the trigger mechanism is difficult to get to, unless you have the finger-reach of a concert pianist. The unit's construction can only be described as flimsy.

Although the BBC joystick is reasonably priced at £13, we would recommend 'hanging fire'. PCN will bring you other joysticks for the BBCs as they come to hand.

Item BBC Joystick Controller **Interface** BBC model A or B **Price** £13 per pair including VAT **Outlets** Mail order from Acorn or through BBC micro dealers

At first sight, the subject of rulers seems an unpromising one for readers of PCN. But strange though it may seem, the humble ruler can be a valuable aid for many of the more mundane tasks users can find themselves up against.

Inmac is an American company which has been around long enough to concentrate on aids for programmers, and budding programmers, as well as on such things as disks and cables.

Perhaps the most obvious use for a ruler is during the study of program printout. The Data Hi-Lite Ruler is the simplest Inmac ruler, but is nonetheless a real help.

The Hi-Lite is 15 inches long, and is calibrated in sixteenths and tenths of an inch.

Read it right

Its main use, however, is the 'line window' which enables you to concentrate on one line at a time, when reading printout. This gives you an easy way of not misreading lines.

If you use a micro as a word processor, you may want to design a special format for your text. You will need to work out a way of getting the printer to follow it, and this can be a very tricky business.

The first time round, the tendency is to try the 'hit or miss' method — setting up the printer's parameters on screen and hoping that everything is going to come out the way you want it.

There is another way. The second of Inmac's aids, the Word Processing Ruler, enables you to work out the characters per inch, and see how they are going to come out on paper.

The Word Processing Ruler has seven scales in all. This is achieved by using both the front and back of the ruler, and by

leaving a transparent space along the middle.

Anyone who wants to design formats to set up documents on a word processor will save time with this ruler.

The scales include six, 12, and 15 characters to the inch, and each of the scales is numbered from 1 up, over a 14 inch length, and this gives 210 columns on 15 pitch as a maximum.

The third ruler, the Forms Design Ruler, is intended for systems analysts, programmers, and anyone who uses or designs computer printout for any purpose.

It is made of steel, and is 18 inches long, and considerable ingenuity has been used in its design. It has more facilities than the others which we have examined so far.

The Forms Design Ruler is calibrated in sixteenths and tenths, and holes have been made in the ruler which replicate exactly the 22 locations you must avoid if you are using standard 11 inch, 66 line paper.

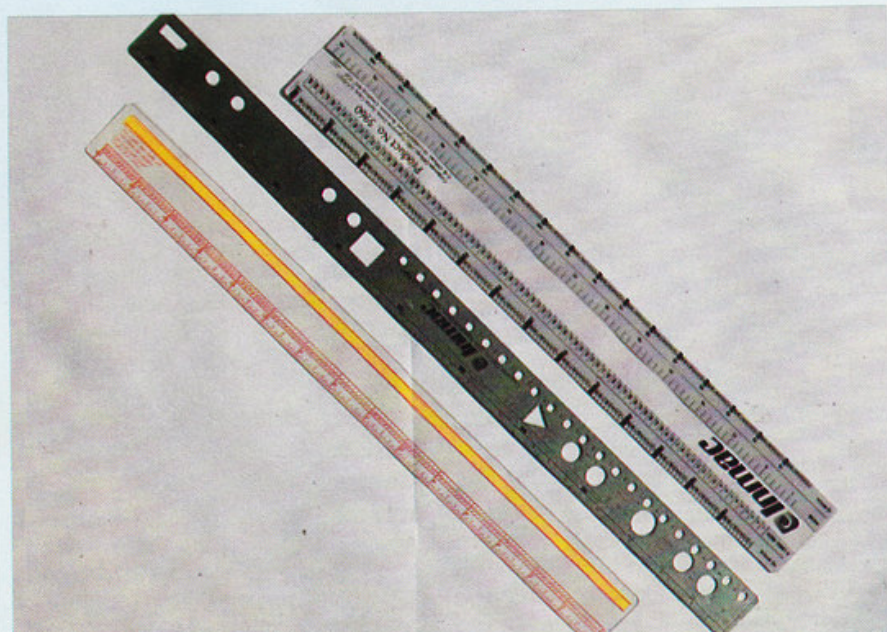
A punched card scale tells you how many cards there are in a set, to within five.

Handwriting scales are provided at 5, 4, and 3 characters to the inch. This makes it easier to design forms which are better human-engineered.

Various paper thicknesses are engraved on the ruler, so that you may adjust your printer more exactly. Metric scales are also provided, should you need them.

A square, circles, a triangle, and a punched card shape are all provided, to assist in minor flowcharting tasks, and standard (American) file hole spacing is also given, by perforation.

Items Data Hi-Lite Ruler, Word Processing Ruler, Forms Design Ruler **Prices** £2.50, £4, and £6 respectively **Contact** Inmac (UK) 09285-67551.



Inmac's rulers from right to left: the Data Hi-Lite, Forms Design ruler and Word Processing ruler.

Max Phillips picks up an IBM-compatible that approaches perfection — but then . . .

AJILE: PORTABLE STATE OF THE ART



The diminutive and sophisticated Ajile.
21lbs of IBM compatible computer that
won't take up your desk.



The Ajile is state of the art personified. Anderson Jacobson's new machine is a superb IBM configuration in a sports bag that weighs less than an Osborne. An 8088, 246K RAM, twin 320K floppies, MS DOS, bundled software . . . this could just be the portable productivity tool.

First, a little background. The Ajile isn't really an Ajile. It's designed and built by the Canadian Dynalogic Infotech under the equally silly name of Hyperion. The established and much admired AJ became an OEM and was sole UK distributor. For three days.

Following a precedent set by DRG-Sirius and ACT business machines, who recently merged in order to sell a green and white striped machine called the Virius, Dynalogic, through Gulfstream (a subsidiary of its parent Bytec) is also selling the Hyperion here.

This explains at least half of the Hyperion name. And also why AJ is selling a machine with an 'Ajile' sticker on the front and the 'Hyperion' name throughout its documentation and software.

Presentation

The review Ajile arrived in its sporty carrying case plus a plastic bag full of manuals. The drawings therein tell of a well made shipping carton, complete with leads and so on.

One bright idea is the inclusion of a writeable master disk as well as the usual notchless copy. So the novice can get on with the tutorial without having to plough through formatting and copying masters.

Documentation

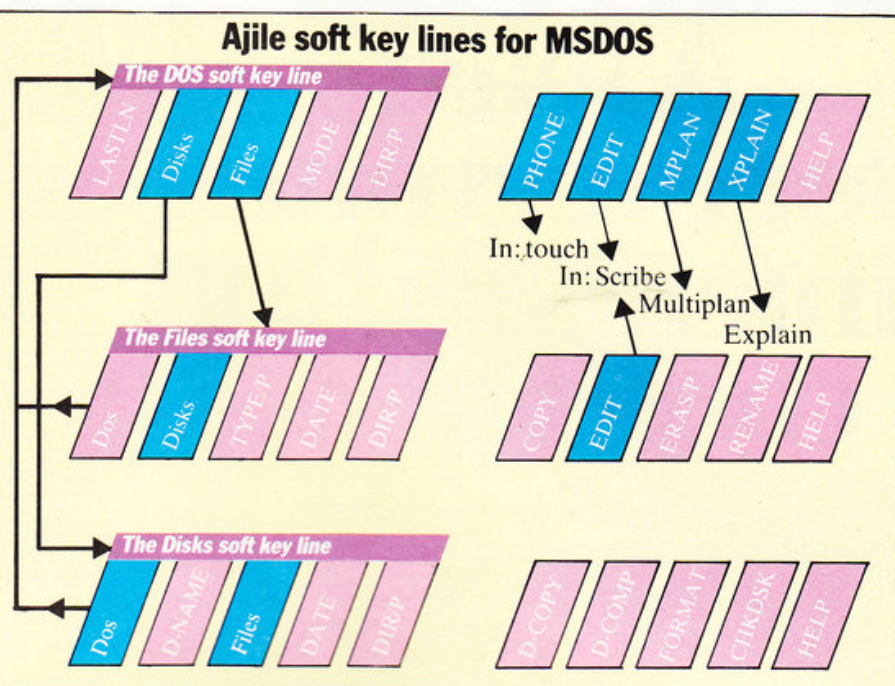
The documentation is the first big letdown of the system, particularly if you read the manuals before using the machine. There are three big ring binders full — these are IBM-like in design, but not content. They're too big to carry round with the computer, so you also get a spiral bound pocket guide to stuff in the sports bag with the machine.

The whole lot looked as if it had been printed by a clapped out daisywheel running, I suspect, under Wordstar. It reads as if too little time was spent writing it. Artwork is limited to simple but helpful line drawings.

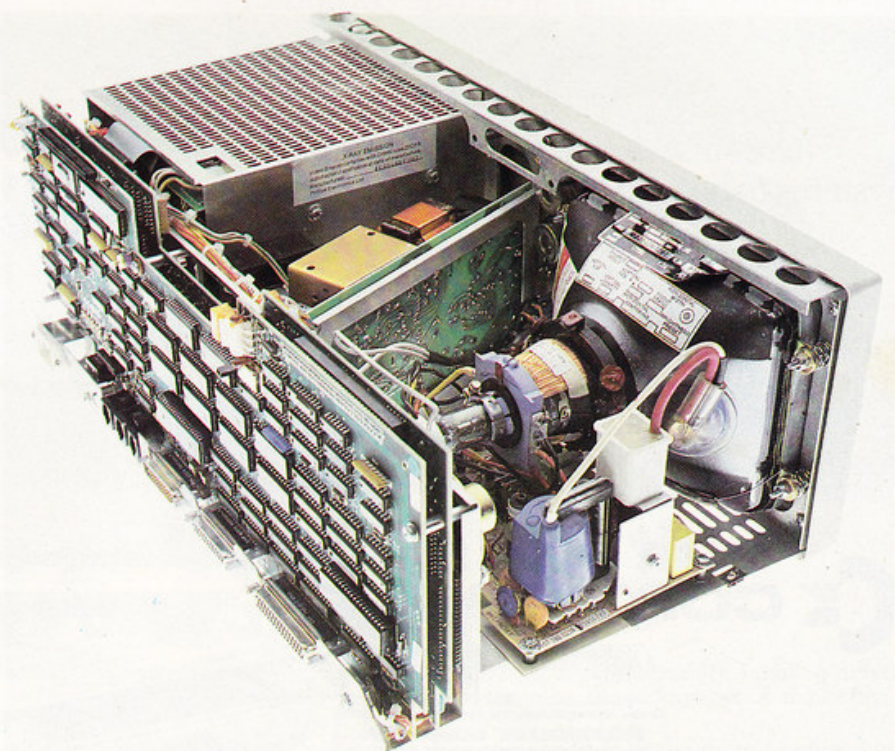
The manuals are aimed totally at the novice. There are some superb introductory pieces — at least three for each aspect of the machine — but they don't go on to give more helpful and advanced information.

Thankfully, little has been done to the Basic and Multiplan manuals. The rest seem to run round in circles, and there are some lovely curiosities.

There's the inconsistent — a power light that changes from amber to red during the tutorial. There's the archaic — an octothorpe appears on the screen (prizes for the best drawing of an octothorpe on a postcard to . . .). Even the tragic — a page or two on Microsoft's inability to deliver GWBasic on time. It turned out to be on the disks! There's even a filler — 11 sides devoted to a table of the ASCII set.



A map of the Ajile's soft key lines for MSDOS



The Ajile's beautifully built and designed internals. It's awkward to open but it is built like a tank.

Nice computer, shame about the documentation. AJ and Gulfstream will do themselves a big favour if they sort out this mess.

Construction

But Dynalogic has produced a superbly designed and engineered portable. The Ajile is a single tiny unit incorporating screen, computer and disks. The detached keyboard slides underneath when not in use, and its tiny footprint is a real pleasure. The Ajile doesn't steal your desk and can easily be shifted on to the floor if you need the space.

AJ is proud that the design work was done by the team that did Lisa, and it certainly has the same ugliness. It's also a silly colour. Next time I change a printer ribbon I'll show you why.

Opening the Ajile proved to be something of a battle, involving at least six screws and two screwdrivers. But it is a portable, and needs to be well put together. Inside is quite a surprise — the monitor and disk drives take up most of the room, and the computer is tipped sideways on two boards at the back. There's plenty of air in the middle, complete with a small but not so silent fan.

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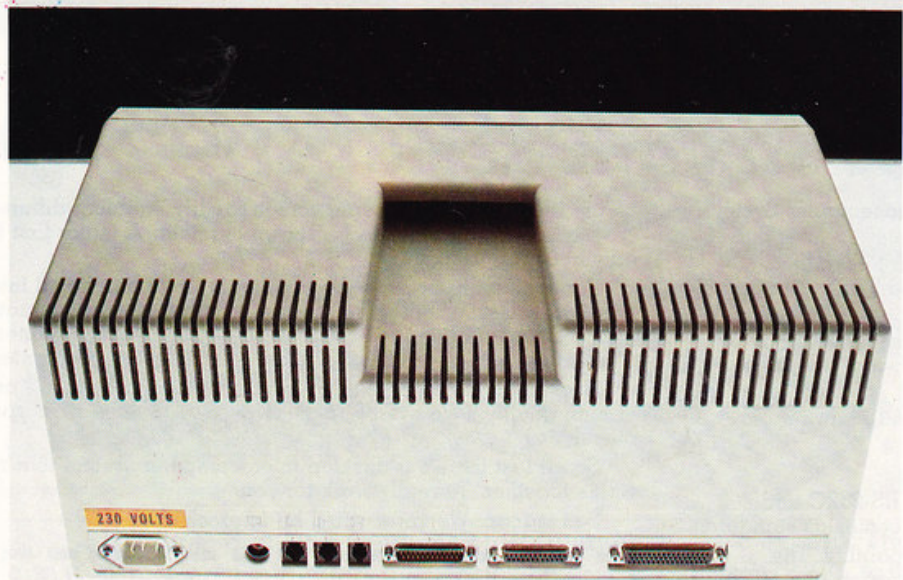
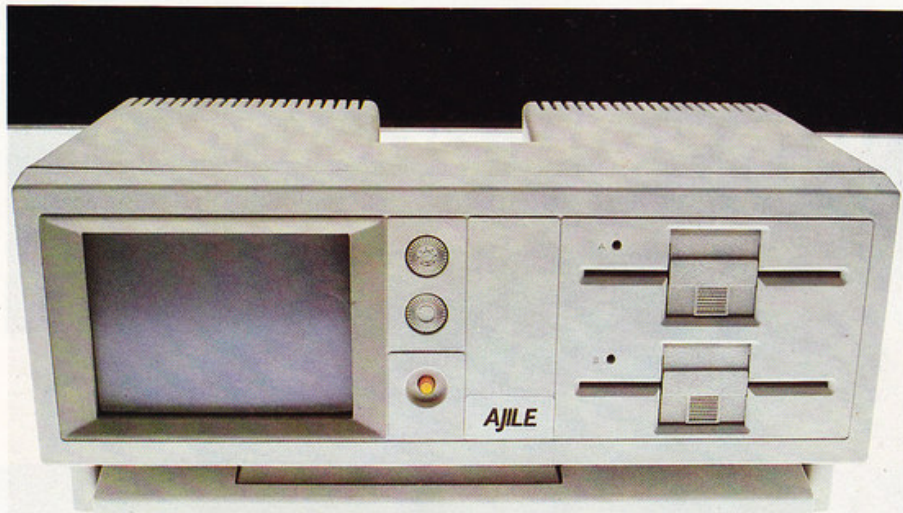
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All around the Ajile. Top: the 7-inch screen, power light and twin disk drives. Middle: The PC-like keyboard with the vital ten function keys. Bottom: The curiously labelled interface ports. The slot in the top of the case is a convenient carrying handle for short trips.

Keyboard

The keyboard plugs into a little socket, which is at the back of a tiny hole, hidden in a dark recess in a slot underneath the machine. There's an access hole, apparently smashed in the case by an irate designer, but it still looks like something your dealer should fit. The manual hedges the issue, and says the keyboard should come plugged in.

It's one of those ghastly imitation PC keyboards that doesn't click and sags in the middle. It's like typing in a bowl of mushy peas. This is £3,000 worth of gear, but the keyboard makes it feel cheap and nasty.

The thing is nearly PC layout. There's two blocks of five function keys across the top, and these invariably correspond to the key labels displayed on the bottom line of the screen. In the gap in the label display there's a real time clock. An upwards arrow and octothorpe appear here to show when the keyboard is CAPS and NUM locked.

Screen

The screen is a 7in amber monitor, offering a fully featured 80 or 40 column screen and up to 640 x 250 high resolution graphics. There are brightness and contrast controls on the Ajile's fascia, and the display was perfectly workable, although the focus seemed a little off, with some characters a little blotchy and the left margin a little curved.

But it seems like heaven to an Osborne user. The screen times-out after three minutes without anyone touching the keyboard, and the Ajile goes into power down state, only to reawaken when you hit a key. This is presumably a safeguard against a bright image becoming a permanent feature of the monitor, and not an attempt to panic the user. You never see it when you are actually using the machine, but I hope that Dynalogic has remembered that mice don't use the keyboard!

Storage

The Ajile has two IBM compatible 320K floppies. In addition, Dynalogic has had a fiddle in the Bios to create a RAM drive configured as C:. This isn't as much fun as it sounds.

C: is normally 90K in size. A standard Autoexec batch file usually fills it on power on with standard MSDOS utilities. If you knock its size up to the maximum 160K, you run out of system RAM to run such trivia as the communications package and text processor. You also get around 13.5K free for Basic.

MSDOS 1 doesn't really understand RAM drives. So C: comes out only about ten times faster than floppies. If you had a one drive system, C: would be a great help. On a two drive machine, it's not that special.

Expansion

Round the back of the Ajile are seven numbered sockets. They are labelled like a washing machine, with ridiculous little drawings. Take your average new Ajile

owner and ask him to show you the parallel printer port. Is it two vertical lines next to each other? Or two vertical lines on top of each other? It's not that obvious, even if you do understand the difference between serial and parallel transmission.

There are three American phone jacks. Hyperions in the US sport built in modems, and once the relevant blood sacrifices and daughters have been sent to you-know-who, AJ may be able to sort something similar out here.

Apart from an external monitor jack, the only other socket is the mysteriously labelled heap of dominoes. Yes! It's the expansion port. You'll be able to plug in a non-portable expansion bus, complete with IBM compatible slots, hard disks and so on.

Operation

The Ajile works, and works well. Switch on and it runs through 30 seconds of diagnostics and then boots MSDOS. This isn't your average common-or-Sirius MSDOS, but one that Dynalogic has done a fair amount of fiddling with.

Everybody else seems to be waiting for MSDOS 2 and its fabled — sorry, fabulous — user shell to give them a user-friendly computer. Dynalogic has put in a lot of work trying to make MSDOS 1 more presentable.

After C:, the most obvious tweak is the Ajile's reliance on soft key lines. The label line on the screen and the ten function keys are used to do most of the work, though the command line can be used normally. There's a mixture of MSDOS commands and keys that move to other soft key lines. CTRL and F10 (invariably the Help key) produces a complete map of all the current soft key lines.

Dynalogic has taken the soft keys right into the bundled packages, even throwing a label line across the bottom of Multiplan. Provided your hand to eye co-ordination is good enough, and you don't let your brain interfere, the soft keys work well.

It's not the world's friendliest system, but it does make life easier for the novice without destroying MSDOS's usual imitation CP/M command line. Dynalogic's version of the MODE command even lets you switch off the keys. It's certainly interesting to use a computer that goes the whole hog on soft keys — everyone else gave them up at least two weeks ago.

The Ajile is also rather good at Help. There's lots of it available, usually by pressing F10. Besides being able to get soft key and keyboard explanations, there's a full Explain command which will document most of the Ajile's features. Anyone who is reasonably confident can get away with Help and Explain and leave the manuals at home.

There have been other modifications to MSDOS: DISKNAME titles disks and ERASE replaces the usual DEL. ERASE has a /P switch that prompts the user before deleting individual files. All in all, it's a competent and thoughtful implementation of MSDOS.

You get a complete set of development

tools, including the Macro Assembler that often gets lost somewhere between Micro-soft and the end user, and if it does turn up, usually does so with a price tag. As well as MASM, there's LINK, CREF, DEBUG, EXE2BIN and last and definitely least EDLIN.

There's a version of GWBasic, renamed BasicA to indicate that it's closer to IBM Basic than most GWs. The manual apologises for there being no BasicA, but an interim GWBasic instead. But it's nice to see that Dynalogic has kept its promise to supply BasicA when it becomes available.

There will never be an IBM compatible Basic, but Dynalogic BasicA is pretty close. No matter what its compatibility status, BasicA is one of the most powerful and useable interpreted Basics you can get your hands on.

Bundled applications packages include Multiplan, a communications package called In:Touch, and In:Scribe, ominously billed as a text processor.

Multiplan is very safe ground. Until 1,2,2 1/2 makes it to the UK in big numbers, Multiplan is as good a spreadsheet as you'll get both in ability and ease of use.

It's a bit strange to have the ten function keys thrown in as well — using Multiplan becomes a bit like flying the flight simulator. Thank heavens for mice.

In:Touch would be a lot more fun if I had a modem to try it out with. It combines the role of a phone book cum auto-dialler as well as more normal data communication facilities. When AJ sorts out a modem for the Ajile, I hope it throws in a Prestel/feletext emulator as well.

But the big mistake is In:Scribe. People who've copied the Osborne 'bundled software' tradition have frequently missed a vital point — Osborne doesn't bundle just software. It bundles good software, and In:Scribe just isn't what you'd expect it to be.

It's a superb on-screen text editor. It does amazing things like on-screen bold-face, underline, sub- and super-scripting. It's fast, and provided you can work the soft keys, a relative doddle. But it's not a word processor. It can't print finished documents onto that old fashioned paper stuff.

I finally found out how you are supposed to print the documents. Drop back into MSDOS, stick CTRL-P on and TYPE the file! You can say goodbye to minor things like underlining, sub's'n'supers, headings, page breaks and so on. You've also got to

be fast with the On-line/Off-line button on the printer, unless you want to finish your love letters with the note 'Press any key to continue'.

Very 2001 this. I want to take it into the street and hit it with a piece of bone. Why isn't In:Scribe a word processor? Maybe the print formatter isn't ready. Perhaps you are supposed to buy an Ajile for your friend and send him the file with In:Touch.

Whoever heard of a portable without a word processor? Come to think of it, whoever heard of a system text editor that could do on screen sub- and super-scripting? Buy an Osborne, it comes with Wordstar. Or at least add the price of Wordstar to the price of an Ajile.

One fish and many days of joy/prosperity for the first distributor, Gulfstream or AJ, to do something about this laughable mistake.

Support

This is the key to the Ajile's success. Its high price is only justifiable because it leaves margins for proper support. And proper support is what Anderson Jacobson is all about.

The Ajile will be supported by the same established nationwide network that handles AJ terminals. Contracts will include on-site repair and replacement. The Ajile can be bought outright, or leased.

Software is, of course, no problem. MSDOS and heavy IBM ability put it right where all the best software is, and is going to be. Not all IBM packages will run first time, but modifications should not be so major that they stop everything from being available.

Verdict

The Ajile is the real state of the art. It's not a revolution that's 'coming soon to a dealer near you'. It's flesh and blood, 8088-based, IBM-compatible reality. It's a shame that mistakes like the cheapo keyboard, 24 hour documentation and In:Describable have to be made.

And the Ajile does need to be without mistakes. Its high price can be explained away, since it's roughly equivalent to a similar IBM set-up. But you don't compete with IBM, you undercut it. Machines like the Compaq and Corona are going to grab mass market status first... provided IBM itself doesn't beat them to it.

The Ajile will have to move, and move fast — on performance if not price. Simply to survive.

SPECIFICATIONS

Price: £4,100 inc VAT

Processor: 8088, 4.7MHz

RAM memory: 256K

ROM memory: 2K

Text screen: 80 x 25

Graphics screen: IBM resolutions, 320 x 250 and 640 x 250

Keyboard: 95 keys, detached, 10 functions keys, numeric keypad cum cursor cluster

Storage: Twin 320K IBM format floppy drives

OS/Language: MSDOS

Distributor: Anderson Jacobson, Slough 25172. Hyperion from Gulfstream, 04026-4926

Software supplied: Macro-Assembler, Basic, Communications package, non-printing word processor, Multiplan



GAMEPLAY

Each week in this section PCN tests the latest games for you to play.

ADVENTURE

SPECTRUM

Uphill struggle

Name Everest Ascent **System** 48K
Spectrum Price £6.50 **Publisher**
Richard Shepherd Software,
0628-21107 **Format** Cassette
Language Machine Code **Outlets**
Mail order from Richard
Shepherd Software, Freepost,
Maidenhead, Berks SL6 5BY.

Everest Ascent is described as an adventure-type game, but this is perhaps an overstatement. It lacks the complexities of a true dungeons and dragons adventure, and is relatively easy to crack. But it will still provide hours of entertainment and frustration.

Objectives

The object of the game is to climb Everest. You have an initial £1,000 to finance your expedition, and you can buy equipment and supplies, hire sherpas to carry it and build up to three base camps.

First impressions

It takes 20 days to scale the mountain, and play takes the form of two moves a day. There are numerous hazards to overcome, such as crevasses, rock-falls, thin ice, avalanches, and an abominable snowman. Different equipment is needed to deal with the hazards and you will find that above certain heights you need oxygen and heat pads.

As play progresses, your expedition gains international

recognition and donations come flooding in. The snag is that you have to return to the sherpas' village to collect the cash. But this does give you the chance to recruit more sherpas and buy more supplies.

Your strength rating is the key to the game. Too low and you could find a message flashing up telling you that the expedition is exhausted because of your dynamic leadership. You can increase your strength rating by hiring additional sherpas — some have higher ratings, but they expect to be paid more.

As seems typical for low cost games software, the cassette comes with the minimum of explanation. One irritating problem was the LOADING instructions, which were inadequate.

In play

Once LOADED, the program draws an animated picture of Everest with snow falling. I don't know what falling snow should sound like, but I'm sure it's nothing like the clicking coming out of the Spectrum's speaker.

Pressing any key takes you through a couple of pages of brief instructions. There then follow three pages that allow you to hire sherpas, buy equipment and buy supplies.

This takes you to the morning of the first day. Throughout the rest of the game, any response to a question leads to a graphic superimposed with text offering four options of what to do next.

My first expedition came to a grinding halt at the end of the



first day. I forgot to buy a tent. Returning to the village I tried to buy a tent only to be told that I had no money left! End of the first game, and a dawning realisation that careful planning was essential to success.

The next expedition fared a little better. At the start of the second day I ran into the first hazard. Needless to say I didn't have the required piece of equipment. Returning to the village I bought it and had carefully calculated that I should have £86 left. As I left the village, a message flashed up on the screen to say that I had run out of money.

In fact this problem was to happen again — on several occasions. This was no fault of mine, and I can only conclude that there was a fault in the program.

The other annoying problem I came across also lay with the way the program was written. I found that it was possible to get trapped by a hazard that appears where it should not be.

To give an example, I discovered that above a certain height, heat pads were required. In a subsequent game, I planned to build a base camp immediately below this height, and carry the heat pads up to it before returning to the village.

Everything went well. I reached the predetermined overnight point, and went through the procedure for setting up a base camp. The following morning I attempted to retrace my steps back down the mountain only to be confronted by a message 'heat pads required above this height'.

The aforementioned heat pads had of course been left at the base camp, so I tried going back, only to be told 'heat pads

required above this point'. No matter whether I tried going up or down the mountain, the same message flashed up on the screen. In the end that expedition collapsed exhausted 'because of my dynamic leadership'.

Further expeditions suggested alternative strategies, and eventually I stormed up the mountain accompanied by virtually all the sherpas available and carrying all the equipment I could buy. Incidentally, because of the international recognition, the expedition ended up with a nice £7,000 profit!

Having done it once I tried different permutations to do it quicker and more cheaply. It absorbed many happy hours of frustration as I tried to unravel the logic of the programmers. My only lasting disappointment was that no matter how hard I tried, I couldn't find a way of climbing the mountain single-handed without oxygen!

Verdict

The game is based on the challenge of climbing Everest using a big support team. It's easy to master the basic technique of playing the game while you're thinking out the winning strategy. Having found a solution the game could, for some people, lose its appeal, but you may enjoy trying to find different ways to reach the top.

A lot of thought has gone into the game, so it's a shame it's partially spoiled by some quirky features.

Ralph Bancroft



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Use of machine
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Genie uncorked

The Colour Genie is just starting to roll off the production lines and into the living rooms of the nation. By a remarkable coincidence PCN suddenly finds itself with, if not a flood, at least a large trickle of software for the machine.

So, here's a round-up of what's on offer.

PONTOON

A



This is a strong contender for the Worst Pontoon title — anytime, any-

where, for any computer. It is supposed to be the classic game dressed in science fiction trappings — a battle between the computer and a humanoid (that's you).

Even at the LOADING stage this game is on shaky ground. The first part of the programme LOADs under Basic control, but then the player must turn off the computer, turn it back on while holding down the MOD SEL key and LOAD the remainder.

Not a good technique.

Once it's running, the game starts by displaying a dreadful title and shuffling the cards. To see your hand you press T for 'twist' then, if you wish, twist again, or S for 'stick'.

The computer then makes its selections until you are either beaten or you win. Unfortunately the program logic does not follow the standard rules of pontoon (as claimed). During play, I landed a Royal Pontoon — ace and queen — but the computer contemptuously claimed a win with a pair of eights and a five.

A game that would benefit from a total rewrite. A risky purchase until it's had one.

EXTERMINATOR



Definitely not one for the ornithologists among you.

The object is to kill a flock of hawkish birds in the first part, and then to destroy their eggs in the second.

Written in machine code, this game is fast, graphically good

and with sound in the arcade manner.

You move your laser about the screen, firing as you go, but control is a bit difficult because the authors chose some awkward keys for the operation. As if that were not enough, these unearthly birds unleash a rain of indestructible missiles.

Assuming you manage to get through this part, the second phase requires even greater skill. You must nip out of a safe area, grab an egg, dash back, destroy it, then repeat this performance.

Sound easy? It isn't — the eggs are protected by a variety of defences too numerous to mention.

Even though I didn't become too skilful at this game, I found it enjoyable and worth a go.

BLITZ



This is yet another version of the arcade and pub standard in which you must land your crippled plane safely by bombing to smithereens an innocent city.

One, if not the only, good feature of this game is the chance to set your own skill level by varying the height of the city buildings and the number of planes with which to attempt your landing.

Essentially, it's all boringly repetitive and I am lost as to why a gravestone should greet your success.

It's a shame that what was such a hit in the arcades should be reduced to the mundane by sluggish operation and limited graphics.

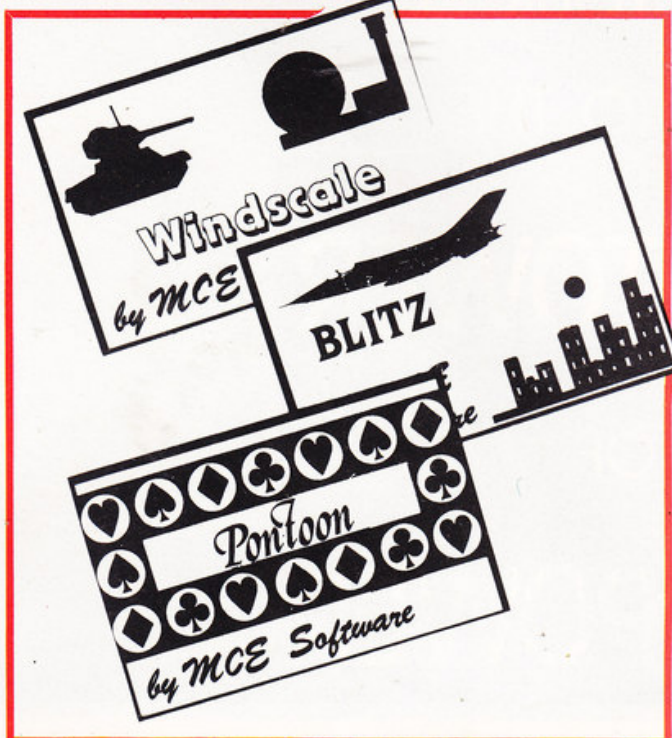
It would have been much better written in machine code instead of Basic.

GALACTIC



As you might expect, this turns out to be a better Space Invaders type game with wave after wave of intergalactic meanies dropping out of the sky.

What they are dropping on is you — the last surviving human in your Starfighter (fortunately



not the German version).

A comprehensive instruction page tells you all you need to know to play the game and the position of the operating keys is sensible, making it easy to play.

The aliens appear in the now obligatory wave formation at the top of the screen, dropping bombs all the while. However, not content with the old sideways shuffle, individuals in this bunch peel off and whizz about, adding to the hazards.

Things get increasingly difficult, the graphics and sound are excellent but games of this type have all but had their day.

WINDSCALE



A simple game, this is a maze with a difference. You have to drive radio-active tanks around the screen and crash them into nuclear reactors without colliding with the trail they leave behind them on screen.

Skill levels can be set between 1 (hard) and 9 (easy) and you can choose the number of tanks and reactors. Although the game is simplicity itself, the variations make it quite challenging.

As the tanks move about, a

nicely realistic geiger-counter sound is emitted, but eventually it becomes a bit wearing.

A good starter game with all the right features, graphics, sound and variation and at about the right price.

KONG



I'm sure everyone has seen the arcade versions of this game which features a mad gorilla hurling barrels at the unfortunate, lovestruck wretch trying to rescue the damsel in distress at the top of the building.

To all intents and purposes this is identical to the arcade version with excellent graphics and sound and the whole gamut of ridiculous situations from which you must extract yourself and the Fay Wray caricature.

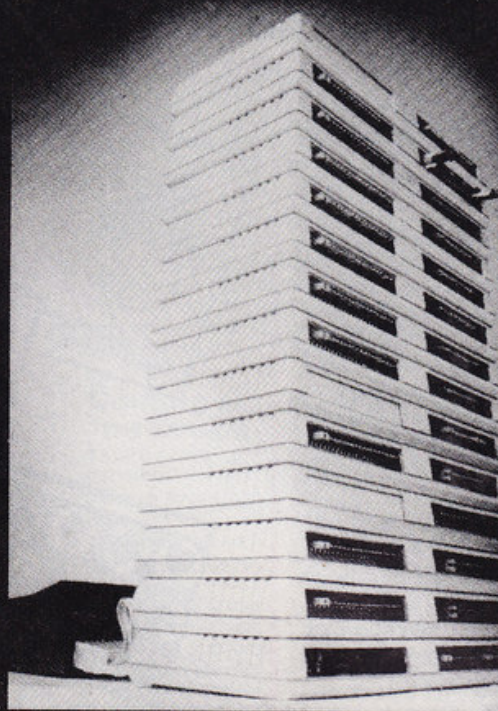
Nuff said?

Algray Software Algray House, 33 Bradbury Street, Barnsley, S Yorks. Exterminator Part I — The Birds, £7.95; Kong, £8.95.
MCE 79 Ratcliffe Gate, Mansfield, Notts NG18 2JB, 0623-31202. Pontoon, £3.95; Blitz, £5.95; Windscale, £6.95.

Microbyte Software 18 Hilgrove Road, Newquay, Cornwall, 06373-6886. Galactic Attack, £7.95.

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GRID STRATEGY

JUPITER ACE

Tightly Packed

Name Micro Maze **System** Jupiter Ace **3K Price** £6.50 **Publisher** Hi-tech Computer Software **Format** Cassette **Language** Forth **Other versions** None **Outlets** Mail order from Hi-tech, 42 Cranleigh Drive, Whitfield, Dover, and dealers

It's a real challenge to produce a reasonable game for a 3K Ace. But Micro Maze from Hi-tech isn't just reasonable. It's something of a challenge. For £6.50, you get a good fraction of Pacman on your very own Ace.

Packaging is neat, complete with cover illustration. The cassette bears the name 'Micro-soft' as well as Hi-tech. Surely not the Microsoft? Instructions are complete enough to get you over the rather devious LOAD-ing procedure.

One slight hitch, though. 'LOAD GRAPHICS' should be in lower case. Beyond that, Micro Maze loaded and ran first time.

Objectives

Your sole aim in Micro Maze is to gobble as many radioactive dots as possible. Why radioactive I don't know. They look like perfectly ordinary dots to me. You're pursued, accurately if not relentlessly, by a couple of alien-looking aliens.

There's no power/pep pills and no chasing baddies. That's the bit that got sacrificed to the Ace memory shortage. But there are four levels of play.

If you're tough enough, clearing a whole screen of dots produces another, each with ever smarter aliens. And Hi-tech has been kind enough to include a couple of extra mazes on the tape once you've eaten the first.

In play

Micro Maze does play well, considering the space it's playing in. Typing 'RUN' starts you off in the top left hand corner and you rush round under the slightly chaotic control of the four arrow keys.

Graphics are fast and smooth, though sound is limited to a regular unchanging *bleep* for every square moved, plus an unglamorous raspberry when you lose. This could do with the odd pep pill.

There is a running score in the corner of the screen so a test for dots being eaten must be being made.

Even though it is an utterly simple game, it is fun and challenging. The only letdown was my ability to jam the terrible twins in the tight corners of maze 2. I could clean up before being forced to go close enough to coax them back.

Verdict

Micro Maze is a fun 3K. If you can't afford a RAMpack, it's worth more than a five-minute novelty. Hopefully, when you get a RAMpack, Hi-tech will put as much care into some 16K programs.

Max Phillips

RATING

Lasting appeal

Playability

Use of machine

Overall value



ATARI

Lines of defence

Name Qix **System** Atari 400 and 800 **Price** 29.99 **Format** Cassette **Language** machine code **Other versions** None **Outlets** All Atari dealers.

Qix is the latest in a long line of Atari releases based on popular arcade games. Its appearance as a cartridge for the Atari 400 and 800 computers comes after the traditional year or two of bench-testing in the country's arcades.

Objectives

You control an Etch-a-Sketch type line on the screen and must manoeuvre it to capture territory. You do this by drawing rectangles at either fast or slow speeds, and the territory you capture is 'painted' in red or blue on the screen.

Opposing this voracious video imperialism are the Qix and the Sparx. The Qix are spikey balls which roll around the screen and the Sparx are little sparks which travel along the lines you have drawn. If the Qix 'hits' you while you're trying to fill in a square of territory, you lose a life.

If you hang back from capturing territory to avoid the Qix, the Sparx will travel along your video trail and again end your on-screen dynasty.

When you capture 75 per cent or more of the screen, you get bonus points and a new screen. After two such screens you have to combat two Qix at once and the pace of the game quickens. The closer you get to capturing

100 per cent of the territory before the screen changes the more bonus points you get.

First impressions

Although it's a marketing gimmick the company uses on many of its packages, I still object to having a 3in x 2½in game cartridge enclosed in a box three times that size.

In play

I experimented with a number of the wilder playing possibilities to begin with. I tried drawing slowly a line straight across the screen to capture territory in the higher-scoring red colour. I was battered by the Qix and lost a life.

I then reverted to the conservative incremental strategy where you build up small blocks of territory before making a big sweep to one of the screen walls and capturing a big chunk.

It didn't take more than an hour or so before I hit on a guaranteed, rock-solid way of getting high scores. I simply drew a short vertical line, and then a long horizontal line—an 'L' turned 90 degrees to the left.

I then trapped the Qix in the 'L' and completed the capture of the territory at the top and right of the screen.

Verdict

Qix gets boring pretty quickly once you have the time to figure it out at home. This is one of those rare beasts that makes a great arcade attraction because it holds your interest for the short periods but fails when you play it at length in the home.

Geof Wheelwright

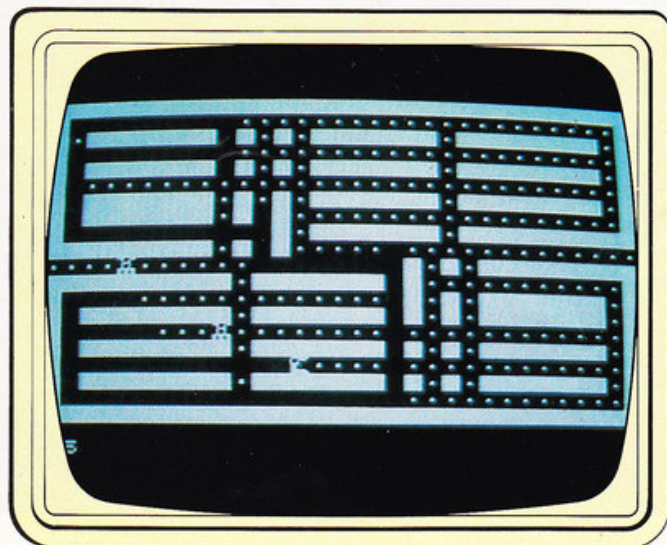
RATING

Lasting appeal

Playability

Use of machine

Overall value



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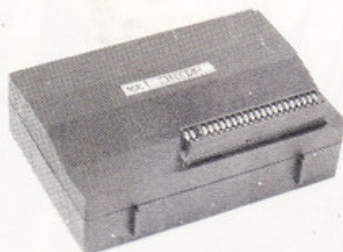
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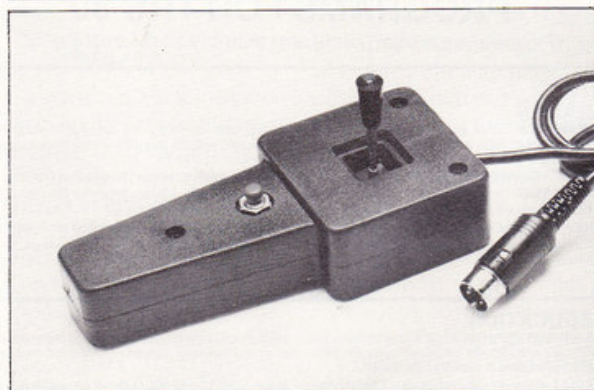
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PCN ProgramCards

A bumper bundle of PCN ProgramCards this week — 11 cards for you to cut out and keep.

It's nice to see that you've taken us up on our request for more diverse programs for a wider range of machines. This is reflected in the first Atari program to find its way into this section.

This week

From a far-flung outpost of the computer world — well, Wiltshire really — comes an entertaining program for the 48K Oric-1. Tim Green, aged 16, of Trowbridge, will no doubt manage to tug at the heartstrings of most of you with his all-action game Cupid.

This will set all you sentimentalists and romantics pounding away at your keyboards, and you'll be glad to know that the Programs Editor, a somewhat less than romantic character, was none too clever at this one.

In stark contrast is the Dragon 32 game from MP Croucher, of Havant, Hants,

called Alien. This program is primarily designed for joystick use, but for those without this facility the modifications necessary to convert it to keyboard operation are included in the program notes at the end of the last card.

The program requires the player to negotiate his/her way through randomly generated stars to destroy half-a-dozen aliens. The variable skill levels in the program make life somewhat difficult with the creation of up to a hundred stars to avoid.

How many of you, we wonder, got caught up in the tension of the television programme *Danger — UXB* — all about defusing bombs? If you enjoyed that and feel that you have the 'right stuff' then Time-Bomb from the deft fingers and furtive mind of P Lister, Bradford, is just for you.

Written for the Atari 400/800 range of machines it combines both joystick and keyboard controls for the player to produce an exciting arcade-type game.

The first two ProgramCards of this game are included this week and it will be completed next week. Something to look forward to, eh?

There's money in them programs

Are we to assume that most of you are not interested in receiving financial rewards for the fruits of your computerised labours? Surely not!

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PCN ProgramCards

Cupid

Card 1 of 5

8313C1/5

An entertaining game for romantics

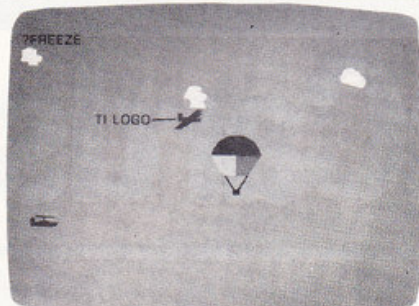
```
1 CLS:DIM NN(11):DIM LL(11):GOSUB 4000
2 GOSUB 5000
3 GOSUB 5090
4 PRINTCHR$(17)
5 S=0:L=3
6 IF A$="N" THEN LET W=10
7 IF A$<>"N" THEN CLS:W=3
9 PLOT 9,W,"WHAT SKILL LEVEL (2-9)"
10 PLOT 12,W+2,"2=EASY 9=HARD"
11 GET A$:H=VAL(A$)
12 IF H<2 OR H>9 OR H-INT(H)<>0 THEN 1000
15 CLS:PAPER0:INK3
16 XX=0:YY=1:G=13:P=0:W=0
20 FOR U=1 TO 24
30 PLOT U+1,1,"!"
40 PLOT 1,U,"!":PLOT 25,U,"!"
50 PLOT 0,1,4
55 IF U<>1 THEN PLOT 0,U,4:PLOT3,U,23:PLOT24,U,16
60 NEXT U
65 U=93
70 FOR E=1 TO 10+H:GOSUB 2000:B=INT(RND(1)*4)+1
80 FOR J=1 TO INT(RND(1)*8)+1
81 LET Y=Y+(B=2)-(B=1):LET X=X+(B=4)-(B=3)
85 IF SCRN(X,Y+1)<>32 AND B<3 THEN Y=Y+2
86 IF SCRN(X+1,Y)<>32 AND B>2 THEN X=X+2
87 IF X>23 THEN X=4
88 IF X<4 THEN X=23
89 IF Y<3 THEN Y=23
90 IF Y>24 THEN Y=3
99 PLOT X,Y,"E"
110 NEXT J:NEXT E
170 FOR A=1 TO H
175 GOSUB 2000
180 PLOT X,Y,"@"
185 SOUND 1,130-(Y*5),15:PLAY 1,0,5,2500:WAIT 10
190 NEXT A
191 PLAY 0,0,0,0
```

Oric-1 48K Oric Basic

Application: Game

Author: Tim Green

- | | |
|---------|--|
| 1-3 | Dimension arrays for notes, lengths; define characters, display title and instructions |
| 4 | Turn off cursor |
| 5-7 | Set score and lives, work out print position |
| 9-12 | Get skill level |
| 15 | Clear screen |
| 16 | Initialise variables |
| 20-60 | Print border in blue, background black |
| 65 | Code of down arrow |
| 70-86 | Loop to print trees up/down/left/right, not in same place |
| 87-90 | Keep tree on screen |
| 99-100 | Finish loops |
| 170-191 | Loop displays men at random positions, random sound |



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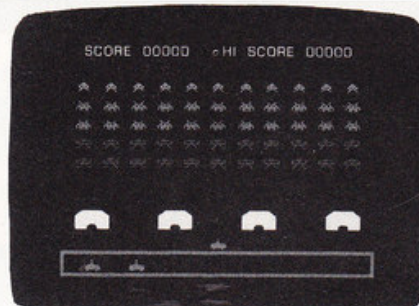
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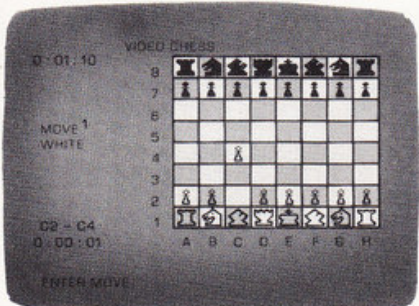
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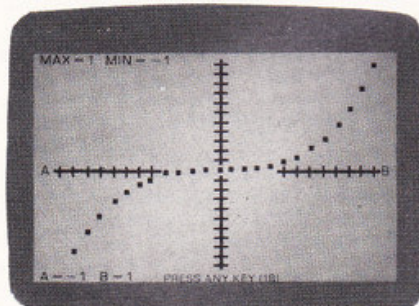
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PCNProgramCards**Cupid****Card 2 of 5**

8313C2/5

```

192 FOR D=2 TO 24:B=INT(RND(1)*4)+1
193 IF B=1 THEN G$="["
194 IF B=2 THEN G$="]"
195 IF B=3 THEN G$="{"
196 IF B=4 THEN G$="}"
197 PLOT D,25,G$:NEXT D
199 PLOT 13,26,"["
200 PLOT 1,0,"SCORE:      TIME= 100 [["
205 PLOT 23+L,0," "
206 PLOT 7,0,STR$(S):PLOT 7,0,3
210 GOSUB 2050
220 FOR T=100 TO 0 STEP-1
223 IF R=1 THEN 340
225 P$=STR$(T)+" "
230 PLOT 18,0,P$:PLOT 18,0,3
240 FOR CC=1 TO 9-INT(H/2)
250 GOSUB 400
260 FOR DEL=1 TO 5-INT(H/3):NEXT DEL
270 NEXT CC
280 PLOT X,Y," ":X=X+XX:Y=Y+YY
290 IF X>23 THEN X=4
293 IF X<4 THEN X=23
296 IF Y<2 THEN Y=24
300 IF Y>24 THEN Y=2
310 IF SCRN(X,Y)=35 THEN GOSUB 940
320 IF SCRN(X,Y)=64 THEN GOSUB 1100
325 IF P=H THEN R=1:E=T
330 PLOT X,Y,CHR$(U)
340 NEXT T

350 IF R=1 THEN 6000
360 GOTO 6200
400 K$=KEY$
410 IF K$="" THEN 480
420 PLOT G,26," "
430 IF K$=" " THEN 510
440 IF K$="V" THEN G=G-1
450 IF K$="M" THEN G=G+1
460 IF G<2 THEN G=24
465 IF G>24 THEN G=2
470 PLOT G,26,"["
480 RETURN

```

192-199 Loop displays arrows at bottom of screen

200-206 Display score, time, lives left

210 Start game
 220 Time loop
 223 All men shot? Loop again
 225-230 Display time left

240 Start delay loop
 250 Check for key pressed
 260-270 End previous delay, start new loop

280 Erase arrow, calculate new position
 290-300 Keep arrow on screen

310 Hit tree? Execute explosion routine
 320 Got him! Execute bonus routine
 325 If all men shot, set variables
 330 Print appropriate arrow
 340 Decrease time and loop again if not finished
 350 All men shot? Execute cleared sheet routine
 400-420 Get key pressed, erase arrow at bottom

430 Change direction
 440-450 Move arrow at bottom left or right

460-480 Keep on screen, print arrow and end routine

PCNProgramCards**Cupid****Card 3 of 5**

8313C3/5

```

510 IF W=23 THEN 6200
520 JJ=SCRN(G,25)
530 IF JJ=93 THEN XX=0:YY=1
540 IF JJ=91 THEN XX=0:YY=-1
550 IF JJ=125 THEN XX=-1:YY=0
560 IF JJ=123 THEN XX=1:YY=0
570 IF JJ>33 THEN W=W+1
575 IF JJ>33 THEN U=JJ
580 PLOT G,25,"!"
590 GOTO 470
940 EXPLODE:FOR DEL=1 TO 50:PLOT X,Y,"X":PLOT X,Y,"_":NEXT DEL
950 PLOT X,Y," ":L=L-1:PLOT 23+L,0," "
960 IF L=0 THEN 6200
970 GOSUB 2050
980 RETURN
1000 MUSIC 1,2,1,15:PLAY 3,0,5,2500:WAIT 5:PLAY 0,0,0,0
1010 GOTO 9
1100 FOR I=1 TO 50:PLOT X,Y,"\\":PLOT X,Y," ":NEXT I:PLOT X,Y,CHR$(U)
1110 P=P+1:SS=P*H:S=S+SS:PLOT 29,2,"BONUS OF":PLOT 31,4,STR$(SS)
1120 PLOT 31,4,3:PLOT 28,2,3
1130 FOR I=0 TO 3
1140 FOR K=I*7 TO 30
1150 SOUND 1,K,15:PLAY 1,0,5,2500
1160 NEXT K
1170 NEXT I
1175 FOR K=50 TO 1 STEP-1:SOUND 1,K,15:PLAY 1,0,5,2500:NEXT K
1178 PLAY 0,0,0,0
1180 WAIT 100:PLOT 29,2," ":PLOT 31,4," ":PLOT 7,0,STR$(S)
1185 PLOT 7,0,3
1190 RETURN
2000 X=INT(RND(1)*22)+3:Y=INT(RND(1)*22)+3
2010 IF SCRN(X,Y)<>32 THEN 2000
2020 RETURN
2050 GOSUB 2000:IF SCRN(X,Y)<>32 THEN 2050
2060 PLOT X,Y,"J":XX=0:YY=1:U=93
2070 PLOT 28,2,"PRESS 'F'":PLOT 29,4,"TO FIRE"
2075 PLOT 27,2,7:PLOT 28,4,7
2080 GET A$
2090 IF A$="F" THEN PLOT 28,2," ":PLOT 28,4," "
2097 IF A$<>"F" THEN 2080
2098 RETURN

```

510 All arrows used? End game

530-575 Change direction and arrow

580-590 Erase direction arrow and end routine
 940-950 Explosion, lose life

960 As 510
 970 Fire new arrow

1000-1010 Make rude noise if bad input

1100-1120 Print flashing heart and bonus. Update score

1130-1178 Bonus noise

1180 Erase words and continue game

2000-2020 Select random empty position

2050-2098 Select new arrow position and fire arrow

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A traditional adventure game in which the player has to find the 12 cunningly hidden signs of the Zodiac which lead him to greater treasures. The player manipulates objects through simple sentences which the program can understand and can ask for his score at any time. A save game feature is also included. Requires a 48k machine.
Price: £9.99 including VAT and 40p postage and packing.

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PCNProgramCards

Cupid

Card 4 of 5

8313C4/5

```
4000 FOR Y=1 TO 10
4001 READ A:FOR I=A TO A+7
4005 READ F:POKE I,F
4010 NEXT I:NEXT Y
4015 DATA 46344,63,63,63,63,63,63,63
4020 DATA 46360,4,14,4,31,4,63,4,4
4030 DATA 46592,31,21,31,4,31,4,10,17
4040 DATA 46808,0,4,14,21,4,4,4,0
4050 DATA 46824,0,4,4,4,21,14,4,0
4060 DATA 47064,0,4,2,31,2,4,0,0
4070 DATA 47080,0,4,8,31,8,4,0,0
4080 DATA 46816,0,10,31,31,31,14,4,0
4085 DATA 46376,33,18,8,35,8,18,33,12
4090 DATA 46840,9,42,24,2,49,4,18,33
4100 FOR Y=1 TO 8:READ NT(Y):READ TS(Y):READ LT(Y)
4110 NEXT Y
4120 DATA 10,4,15,10,4,15,8,4,12,5,4,12,3,4,12,1,4,12,10,3,18,10,5,
15
4130 FOR Y=1 TO 11:READ NN(Y):READ LL(Y)
4140 NEXT Y
4150 DATA 8,15,5,5,10,6,8,8,5,8,5,8,5,5,4,10,4,8,10,5,11
4160 RETURN
5000 CLS:PAPER0:INK3
5005 PLOT 13,10,"CUPID'S ARROW":PLOT 13,9,"CUPID'S ARROW"
5010 PLOT 12,10,10:PLOT 12,9,10
5011 WAIT 300
5015 RETURN
5090 CLS:PAPER1:INK3
5100 PLOT 9,1,"DO YOU WANT INSTRUCTIONS":PLOT 15,3,"Y' OR 'N'"
5110 GET A$:IF A$="Y" THEN 5130
5120 RETURN
5130 FOR DEL=1 TO 20:READ SI:READ I$
5140 FOR IN=0 TO LEN(I$)-1:PLOT IN+SI,DEL+4,MID$(I$,IN+1,1)
5150 FOR NN=1 TO 10:NEXT NN:NEXT IN:NEXT DEL
5160 DATA 1,In this game you are Cupid the famous,2
5170 DATA god of love.You have come down from,1
5180 DATA the heavens on a mission to shoot your,2
5190 DATA arrow through the hearts of many men,3
5200 DATA turning them into romantic Romeos.,1
5210 DATA You are equipped with three arrows for,1
5220 DATA the complete game.You lose 1 each time,2
5230 DATA it hits a tree.But beware because if,1
5240 DATA you don't convert all of the men into,1
5250 DATA Romeos within the the time limit then,1
5255 DATA you will be sent back up to heaven.If,3
```

4000-4090 Routine to define characters

4100-4160 Read notes and lengths fortunes

5000-5015 Routine for title page

5090-5250 Print instructions if required

5255-5310 Remainder of instructions

PCNProgramCards

Cupid

Card 5 of 5

8313C5/5

```
5260 DATA you do then you will stay down on,1
5270 DATA Earth a bit longer so as to reconvert,1
5275 DATA even more men.You can change direction,1
5280 DATA by putting the arrow at the bottom of,3
5285 DATA the screen behind any arrow that is,1
5290 DATA pointing in the required direction and,7
5291 DATA then press the space bar.,4
5295 DATA Key V.....Moves cursor left.,4
5297 DATA Key M.....Moves cursor right.
5300 PLOT 8,25,"PRESS ANY KEY TO CONTINUE":GET K$
5310 RETURN
6000 SS=INT((E/2)*H)
6020 S=S+SS
6025 PLOT 27,1,"*****":PLOT 27,5,"*****"
6030 PLOT 27,2,"* MISSION *":PLOT 27,4,"*COMPLETED*"
6033 PLOT 27,3,"* *":PLOT 26,3,3
6035 PLOT 26,2,3:PLOT 26,4,3:PLOT 26,1,3:PLOT 26,5,3
6040 PLOT 27,8,"SUPER-BONUS":PLOT 32,9,"OF"
6045 PLOT 26,8,6:PLOT 31,9,6
6046 IF SS>99 THEN LET R=30
6047 IF SS<100 THEN LET R=31
6050 PLOT R,11,STR$(SS):PLOT R,11,7
6055 R=0:H=H+1
6060 FOR TT=190 TO 140 STEP-1:SOUND 1,TT,15:PLAY 1,0,5,2500:NEXT TT
6070 FOR M=1 TO 8
6080 MUSIC 1,TS(M),NT(M),15:MUSIC 2,TS(M)-1,NT(M),15:PLAY 3,0,5,250
0
6090 WAIT LT(M)/2:PLAY 0,0,0,0
6100 IF M=2 THEN WAIT 12
6110 IF M=7 THEN WAIT 25
6120 NEXT M
6140 WAIT 500:CLS:GOTO 15
6200 PLOT 23,0," ":PLOT 28,2,"GAME OVER":PLOT 27,4,"AGAIN (Y/N)"
6205 PLOT 27,2,6:PLOT 26,4,2
6206 WAIT 15
6210 FOR M=1 TO 11
6220 MUSIC 1,4,NN(M),15:MUSIC 2,3,NN(M),15:PLAY 3,0,5,2500
6230 WAIT LL(M)*2:PLAY 0,0,0,0
6235 IF M=6 OR M=7 THEN WAIT 2
6240 NEXT M
6245 PLOT 26,6,7
6250 GET A$
6260 IF A$="Y" THEN 5
6270 IF A$<>"N" THEN 6250
6280 PLOT 27,6,"OK GOODBYE."
6290 PLOT 26,6,7
6300 END
```

6000-6055 Display 'Mission Completed' and bonus. Update score

6060-6120 Playtune for sheet cleared

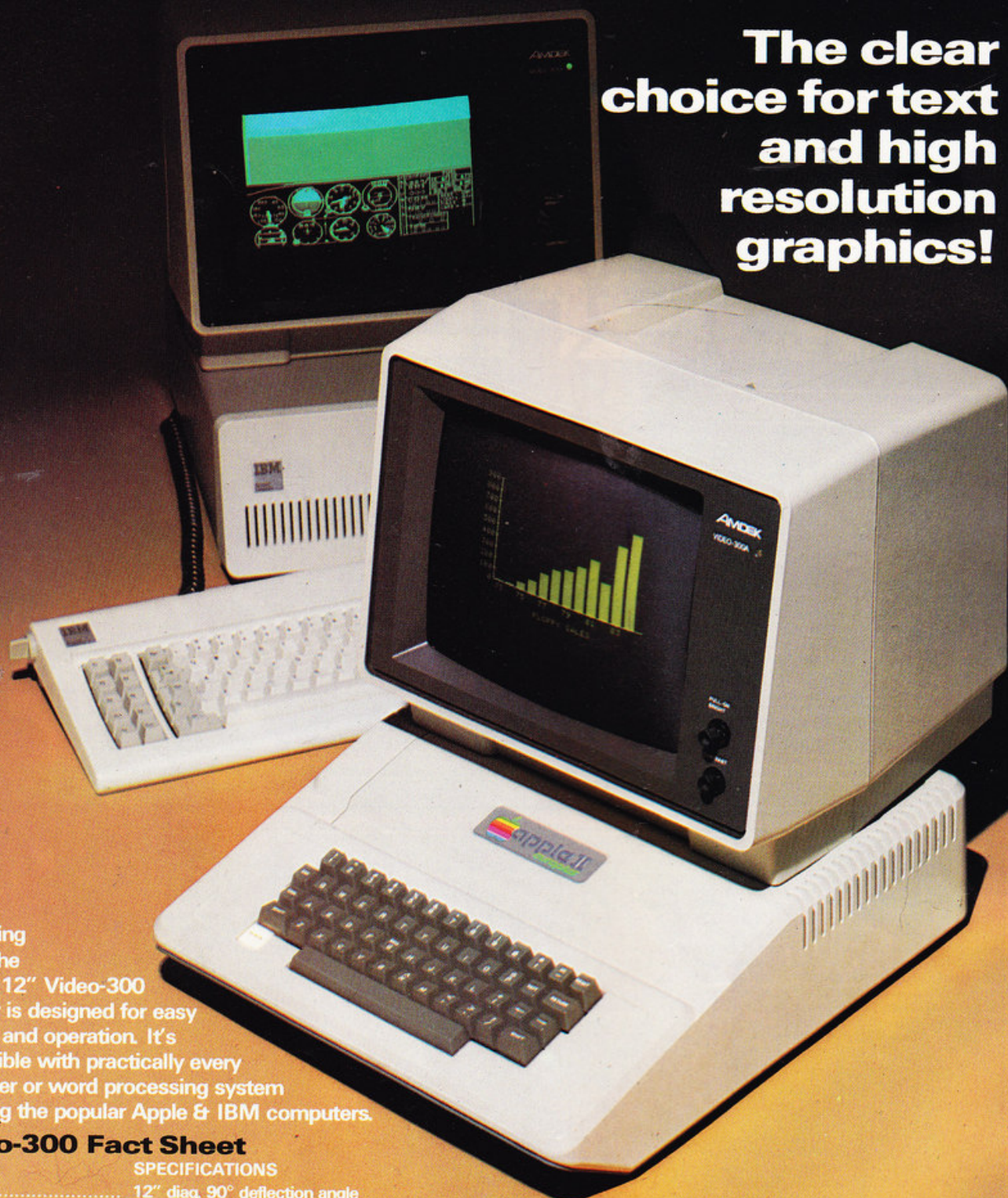
6140 Wait, then start newsheet
6200-6206 End of game

6210-6240 Playtune for game over

6245-6300 Play new game or finish

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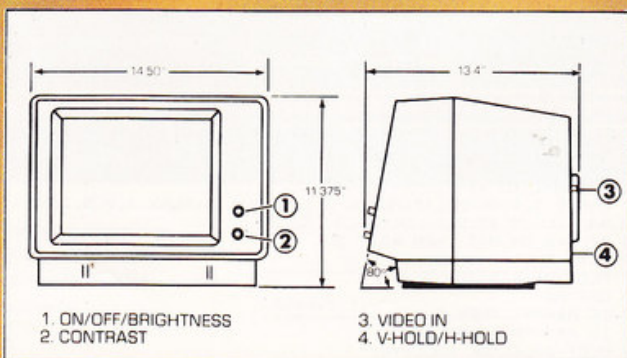
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CTR.....	Etched non-glare, green or amber
Signal.....	Composite video input
Input Signal.....	1.0 Vp-p, sync negative
Input Impedance.....	75 ohms
Scan Frequencies.....	Horizontal: 15.75 KHz. Vertical: 50/60 Hz
Display Size.....	210 (W) x 158 (H) mm
Deflection Linearity.....	Horizontal: 10% Max. (refer to EIA ball chart and dot pattern). Vertical: 8%
Video Response.....	18 MHz (±3dB)
Resolution.....	Centre: 900 lines. Corners: 800 lines
Power Source.....	120/220 V Convertible 50/60 Hz
Controls.....	See diagram (focus, sub-brightness, H-size V-linearity and +B adjustment are on PCB)



Alien

8313A1/4

Card 1 of 4

A full arcade-type game with joystick use. For keyboard operation see end of card 4. These instructions allow cursor controls and space bar for "torp" firing. NB: SAVE this program before running.

```

10 REM %%%%%%%%%%%
20 REM %   ALIEN   %
30 REM %   FOR    %
40 REM % DRAGON 32 %
50 REM %%%%%%%%%%%
60 CLS
90 PRINT @ 237,"ALIEN"
100 SCREEN0,1
110 FOR T= 255 TO 1 STEP -10
120 SOUND T, 1
130 NEXT T
140 CLS
150 PRINT:PRINT" THE OBJECT OF THE GAME IS"
160 PRINT:PRINT" TO DESTROY ALL SIX ALIENS."
170 PRINT:PRINT" THE ALIENS ARE IN THE ";CHR$(239); " SHIPS"
180 PRINT:PRINT" YOU CONTROL THE ";CHR$(207); " SHIP"
190 PRINT:PRINT" YOU HAVE 300 GALLONS OF FUEL &"
200 PRINT:PRINT" 10TORPS TO COMPLETE THE MISSION"
210 GOSUB 1550
220 PRINT:PRINT"YOU SCORE TEN POINTS FOR EACH"
230 PRINT:PRINT"ALIEN DESTROYED.A BONUS IS"
240 PRINT:PRINT"GIVEN IF ALL THE ALIENS ARE"
250 PRINT:PRINT"DESTROYED"
260 PRINT:PRINT"THE MORE TORPS AND FUEL LEFT"
270 PRINT:PRINT"AFTER DESTROYING THE ALIENS"
280 PRINT:PRINT"THE HIGHER THE BONUS"
290 GOSUB 1550
300 PRINT:PRINT TAB(12);"BEWARE"
310 PRINT:PRINT " HITTING A STAR WITH A TORP"
320 PRINT:PRINT " OR COLLIDING WITH A STAR OR"
330 PRINT:PRINT " ALIEN WILL DESTROY YOU"
340 GOSUB 1550
350 PRINT:PRINT" THERE ARE TEN LEVELS OF PLAY"
360 PRINT:PRINT" LEVEL ONE IS THE EASIEST"
370 PRINT:PRINT" TO START GAME PRESS ANY KEY"
380 PRINT:PRINT" AFTER ENTERING SKILL LEVEL"
390 GOSUB1550

```

Dragon 32
Dragon Basic

Author: M P Croucher

80	Clear screen prior to start
90	Initial heading
100	Set screen initial attribute
110-130	Noise!
140	Clear screen again
150-390	Display instructions for game and start

Alien

8313A2/4

Card 2 of 4

```

400 CLS:PRINT:PRINT:PRINT:PRINT:PRINT
410 GOTO 1480
420 POKE65495,255
430 DEF FNA(C)=&H3FF+A(C)
440 DEF FNB(C)=PEEK(FNA(C))
450 DEF FNC(C)=PEEK(FNB(C))
460 LET B=6:LET F= 10: G=1
470 A$="CDEFGAB":B$="T25501V31"
480 FORT=1T010
490 B$=B$+A$
500 NEXT T
510 CLS0
520 FORT=1T0 (SL*10)
530 S= RND(470)
540 IF PEEK(1056+S)<>128 THEN 530 ELSE POKE1056+S,42
550 NEXT T
560 FOR T=0 TO 6
570 ACT)=(RND(400)+60)
580 IFT=0 THEN S=&HC2 ELSE S=&HE2
590 POKE 1023+ACT),S
600 NEXT T
610 PRINT @ 0,"FUEL      TORPS      ALIENS"
620 TI=TIMER
630 IF G=1 THEN TI=0
640 IF F=0 OR TI>3000 THEN 1260
650 TI=300-INT(TI/10)
660 S=INT(TI/100):POKE1023+6,112+S
670 S=INT(TI/10):S=(S/10-INT(S/10))*10
680 POKE1023+7,112+S:S=(TI/10-INT(TI/10))*10:POKE1023+8,112+S
690 IF F=10 THEN S=1 ELSE S=0
700 POKE1023+16,112+S
710 IF F=10 THEN S=0 ELSE S=F
720 POKE1023+17,112+S
730 POKE1023+28,112+B
740 IF G=0 THEN 780
750 IF INKEY$="" THEN 750
760 G=0
770 TIMER=0
780 C=RND(B)
790 POKE&H7D00,RND(4)
800 POKE FNA(C),&H80
810 LET A(7)=A(C)
820 GOSUB 970

```

400	Clear screen and move cursor down 5 lines
410	Perform "skill level" input routine
420-500	Define functions and assign variable initial values
510	Clear screen and set background colour
520-550	Place stars (by skill level) randomly
560-600	Place Alien ships
610	Heading line
620-730	Sets initial values and displays them
740-770	Routine to start game after parameters set up
780-810	Select alien ship to move and move it
820	Perform routine to move ship

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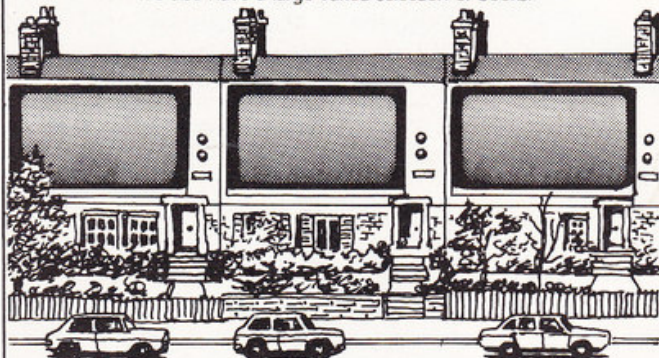
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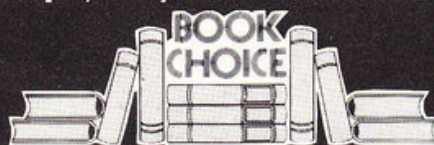
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PCNProgramCards

Alien

Card 3 of 4

8313A3/4

```

830 IF FNB(C)=&H2A THEN A(C)=A(7)
840 IF FNB(C)=&HC2 THEN 1260
850 POKE FNA(C),&HE2
860 LET C=0
870 IF JOYSTK(0)=&H3F THEN POKE&H7D00,1
880 IF JOYSTK(0)=0 THEN POKE&H7D00,2
890 IF JOYSTK(1)=&H3F THEN POKE&H7D00,3
900 IF JOYSTK(1)=0 THEN POKE&H7D00,4
910 IF PEEK(65280)=126 OR PEEK(65280)=254 THEN 1060
920 POKE FNA(C),&H80
930 GOSUB 970
940 IF FNB(C)<>&H80 THEN 1260
950 POKE FNA(C),&HC2
960 GOTO 620
970 ON PEEK(&H7D00)GOTO 980,1000,1020,1040
980 A(C)=A(C)+1: IF INT(A(C)/32)-(A(C)/32)=0 THEN A(C)=A(C)-31
990 RETURN
1000 A(C)=A(C)-1: IF INT(A(C)/32)-(A(C)/32)=0 THEN A(C)=A(C)+32
1010 RETURN
1020 A(C)=A(C)+32: IF A(C)>&H1E0 THEN A(C)=A(C)-&H1C0
1030 RETURN
1040 A(C)=A(C)-32: IF A(C)<&H40 THEN A(C)=A(C)+&H1C0
1050 RETURN
1060 LET A(7)=A(0):LET C=7:LET F=F-1
1070 FOR U=1 TO 5
1080 IF FNB(C)<>&HC2 THEN POKE FNA(C),&H80
1090 GOSUB970
1100 SOUND100,1
1110 IF FNB(C)=&HE2 THEN 1170
1120 IF FNB(C)=&H2A THEN 1260
1130 POKE FNA(C),&H2E
1140 NEXT U
1150 POKE FNA(C),&H80
1160 GOTO 620
1170 POKE1023+A(C),128
1180 IF B=1 THEN 1340
1190 FOR X=1 TO B
1200 IF A(7)=A(X) THEN Y=X
1210 NEXT X
1220 IF A(Y)<>A(B) THEN A(Y)=A(B)
1230 B=B-1
1240 PLAY B#
1250 GOTO 620

```

830-850 Print new ship position

860-920 Move player's ship and fire options by joystick. See end of card 4 for keyboard replacement lines

930-940-960 Perform routine to move ship
Print ship in new position

970-1050 Routine to work out new positions of all ships and torps

1060-1160 Routine to fire torp and check for hit

1170-1250 Routine to remove Alien from array to suppress print

PCNProgramCards

Alien

Card 4 of 4

8313A4/4

```

1260 FOR T=50 TO 1 STEP -4
1270 SOUND T,2:NEXT T
1280 CLS
1290 PRINTTAB(7);" YOU WERE DESTROYED"
1300 PRINT:PRINT"YOU MANAGED TO DESTROY";6-B;"ALIENS"
1310 PRINT:PRINTTAB(7);" YOUR SCORE WAS";(6-B)*10
1320 IF (6-B)*10>HS THEN HS=(6-B)*10
1330 GOTO 1430
1340 FOR S=1 TO 5
1350 FOR T=1 TO 50 STEP 4
1360 SOUND T,1
1370 NEXT T:NEXT S
1380 CLS
1390 PRINT TAB(4);"WELL DONE YOU DESTROYED": PRINT:PRINT TAB(8);"ALL THE ALIENS"
1400 S1=(TI*F)+60+TI+F
1410 PRINT:PRINT TAB(7);" YOUR SCORE WAS"S1
1420 IF S1>HS THEN HS=S1
1430 PRINT:PRINT TAB(8);"HIGH SCORE IS ";HS
1440 PRINT:PRINT TAB(11);"PLAY AGAIN"
1450 SCREEN0,1
1460 TT$=INKEY$:IF TT$="" THEN 1460
1470 IF TT$="N" THEN END
1480 PRINT:PRINT TAB(2);"ENTER SKILL LEVEL NOW (--)"
1490 SCREEN0,1
1500 S1$=INKEY$:IF S1$="" THEN 1500
1510 SL$=INKEY$:IF SL$="" THEN 1510
1520 SL$=S1$+SL$
1530 SL=VAL(SL$):IF SL<1 OR SL>10 THEN 1480
1540 SCREEN0,0:GOTO 420
1550 PRINT @ 482;"PRESS ANY KEY TO CONTINUE"
1560 SCREEN0,1
1570 IF INKEY$="" THEN 1570
1580 CLS
1590 RETURN

```

1260-1330 Routine to play sound and display message plus score when player's ship is destroyed

1340-1420 Routine to play sound and display message plus score when "mission" complete

1430-1470 Display highest score, option to play again or end

1480-1540 Routine to allow the input of skill level. NB must be input as 2 digits

1550-1590 Routine to allow key-stroke for continuation of game

The succeeding lines of program are only to be used for keyboard operation. Cursor controls move ship, space fires torp

```

865 S1$ = INKEY$: IF S1$ <> "" AND S1$ <> CHR$(32) THEN S2$ = S1$
870 IF S2$ = CHR$(9) THEN POKE &H7D00,1
880 IF S2$ = CHR$(8) THEN POKE &H7D00,2
890 IF S2$ = CHR$(10) THEN POKE &H7D00,3
900 IF S2$ = CHR$(94) THEN POKE &H7D00,4
910 IF S1$ = CHR$(32) THEN 1060

```


TELEWRITER™ the DRAGON 32 Word Processor

TELEWRITER

Telewriter is the powerful word processor designed specifically for the DRAGON 32 Computer. It can handle almost any serious writing job and is extremely easy to use. It has all the advanced features you need to create, edit, store, format and print any kind of text. With Telewriter you can quickly produce perfect, finished copy for letters, reports, term papers, articles, technical documentation, stories, novels, screenplays, newsletters. It is also a flexible and efficient way to take notes or organize ideas and plans.

51 x 24 DISPLAY

The DRAGON 32 is an incredibly powerful and versatile computer, but for text editing it has some major drawbacks. The small 32 character by 16 line screen format shows you too little of the text and, combined with its lack of lower case letters, bears little resemblance to the way text really looks on the page. Reverse video in place of lower case just adds confusion. Telewriter eliminates these shortcomings with no hardware modifications required. By using software alone, Telewriter creates a new character set that has real lower case letters, and puts 24 lines of 51 characters on the screen. That's more on-screen characters than Apple II, Atari or TRS-80 Model III. That's more than double the DRAGON 32's standard display.

FULL SCREEN EDITOR

The Telewriter editor is designed for maximum ease of use. The commands are single keys for single key plus control keys, fast, and easy to remember. There is no need to switch between insert modes and delete modes and cursor movement modes. You simply type. What you type is inserted into the text at the cursor, on the screen. What you see on the screen is always the current state of your text. You can move quickly through the text with one key cursor movement in all 4 directions, or press the shift key simultaneously for fast, auto repeat. You can jump to the top or bottom of the text, and beginning or end of a line, move forward or backward a page at a time, or scroll quickly up or down. When you type past the end of the line, the wordwrap feature moves you cleanly to the next line. You can copy, move or delete any size block of text, search repeatedly for any pattern of characters, then instantly delete it or replace it with another. Telewriter gives you a tab

into a state of the art word processor - outstanding in every respect. DRAGON 32, Jan 1987

The only one with all these features for your DRAGON 32

- 51 column x 24 line screen display
- Sophisticated full screen editor
- Real lower case characters
- Powerful text formatter
- Works with any printer
- Special MX-80 driver
- Requires absolutely no hardware modifications
- Tandy colour version also available

Keys tell you how much space you have left in memory, and warn you when the buffer is full.

FORMAT FEATURES

When it comes time to print out the finished manuscript, Telewriter lets you specify left, right, top, and bottom margins, line spacing and lines per page. These parameters can be set before printing or they can be dynamically modified during printing with simple format codes in text. Telewriter will automatically number 54 pages (if you want) and centre lines. It can chain print any number of text files from cassette without user intervention. You can tell it to start a new page anywhere in the text or pause at the bottom of the page. You can print all or any part of the text buffer, abort the printing at any point, and there is a "Typewriter" feature which allows you to type straight to your printer. Because Telewriter lets you output numeric control codes directly (either from the menu or during printing), it works with any printer (Tandy, Sokosha, MX-80, Okidata, NEC 8021, C. Itoh 8110, Centronics, GE Temmer, Smith Corona TP-1, etc.). There's even a special driver for the Epson MX-80 that lets you simply select any of its 12 fonts and do underlining with a single underline character.

CASSETTE INPUT/OUTPUT

Because the Telewriter makes using cassette almost painless, you can still have a powerful word processor without the major additional cost of a disk. The advanced cassette handler will search in the forward direction till it finds the first valid file, so there's no need to keep retyping a load command when you are lost in your tape. The Verif command checks your cassette save to make sure they're good. You can save all or any part of the text buffer to cassette and you can append pre-existing files from those you have in the buffer already.

ASCII COMPATIBLE

Telewriter turns your DRAGON 32 into the most powerful, lowest cost, word processor in the world today. But that's not all. The simple ASCII conversion program provided with Telewriter means you can use the full power of the Telewriter editor for creating and editing BASIC and assembly language programs. It means you can use Telewriter to prepare or edit text files used with any data communications program.

Telewriter costs £49.95 on cassette and is

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The R2 mains controller give you two 13 Amp mains sockets under the control of your home micro. You don't need any special knowledge to get the system working - and appliances are easily switched using simple BASIC statements. The controllers are supplied with full, easy to follow, instructions and example programs.

R2 is ideal for disco and theatre lighting rigs, heating control - and for deterring potential burglars!

Adaptors are available for all popular micros: BBC; Sinclair ZX80, ZX81 and Spectrum; and many others - just contact us at the address below.

	Code	Price
Two-channel relay with 13 Amp sockets, indicator LEDs, control connection and instruction manual:	R2	£29.95
Connectors for four units (8 channels):		
for BBC model A:	R2A	£14.75
for BBC model B:	R2B	£9.95
adaptor for the Sinclair range (ZX80, ZX81 or Spectrum):	R2C	£19.50
Please add postage and packing to all orders		£1.50

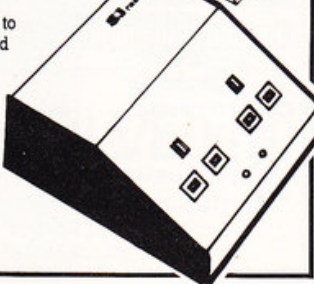
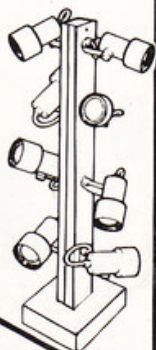
(All prices include VAT)

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As featured in BBC's
"Making the
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Printers, drives etc Please phone for quote

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PCNProgramCards

Time Bomb Card 1 of 5

8313TB1/5

An entertaining game using full graphics capability with sound. Where "£" is printed type "#".

```

100 GRAPHICS 18:POSITION 5,0:£ £6;"TIME BOMB":POSITION 4,2:£ £6;"":G
OSUB 9300:SOUND 1,80,0,11
130 FOR A=0 TO 15:FOR B=15 TO 0 STEP -1:SETCOLOR 0,A,B:SETCOLOR 2,B,A:NEXT B:NEX
T A
140 FOR A=0 TO 15:SETCOLOR 4,0,A:NEXT A:GOSUB 9100:GOSUB 7200:GOSUB 7300:GOSUB 8
000:DIM Z(20),X(20)
340 GOSUB 9300:SCORE=0:ROUND=0:LIFE=3:LP=11
350 GRAPHICS 18:SETCOLOR 0,3,8:SETCOLOR 1,0,12:SETCOLOR 2,15,8:SETCOLOR 3,10,10:
SETCOLOR 4,0,0:TIME=99:F1=0:F2=0:F3=0
360 CAT=0:GOSUB 6000:POKE 756,56
370 FOR A=0 TO 19:FOR B=0 TO 8:POSITION A,B:PRINT £6;"Z":NEXT B:NEXT A
390 GOSUB 7000:BX=Z(7):BY=X(7)
410 POSITION Z(1),X(1):£ £6;"v":POSITION Z(2),X(2):£ £6;"v":POSITION Z(3),X(3):£
£6;"v"
450 FOR A=1 TO 5:POSITION Z(0),X(0):£ £6;" ":GOSUB 9200:POSITION Z(0),X(0):£ £6;
"t":GOSUB 9510:NEXT A
500 IF LIFE=3 THEN POSITION 7,9:£ £6;"t":POSITION 9,9:£ £6;"t":POSITION 11,9:£ £
6;"t"
510 IF LIFE=2 THEN POSITION 7,9:£ £6;"t":POSITION 9,9:£ £6;"t":POSITION 11,9:£ £
6;"x"
520 IF LIFE=1 THEN POSITION 7,9:£ £6;"t":POSITION 9,9:£ £6;"x":POSITION 11,9:£ £
6;"x"
1000 S=STICK(0):TICK=BOMB:TIME=TIME-1:BOMB=INT(TIME/10):POSITION BX,BY:£ £6:BOMB
:IF BOMB=0 THEN 3000
1010 IF TICK<>BOMB THEN SOUND 0,20,10,15
1020 IF Z(0)>19 THEN Z(0)=0
1030 IF Z(0)<0 THEN Z(0)=19
1040 IF X(0)>8 THEN X(0)=0
1050 IF X(0)<0 THEN X(0)=8
1060 HUM=TIME+30:SOUND 0,0,0,0:SOUND 2,HUM,10,3:SOUND 3,HUM+7,10,3
1100 SK=INT((12-ROUND)*RND(1)+1)
1125 IF SK=1 THEN SX=Z(4):SY=X(4):GOSUB 1500:POSITION SX,SY:£ £6;"U":Z(4)=SX:X(4
)=SY
1130 IF SK=2 THEN SX=Z(5):SY=X(5):GOSUB 1500:POSITION SX,SY:£ £6;"U":Z(5)=SX:X(5
)=SY

```

Atari 400/800

Atari Basic

Requirements: 16K, Joystick.

Author: P Lister

100-140	Set initial display and DIMension arrays and variables
340	Game start point. Score and other values set to zero
350	Start of new round. Set flags and new bomb
360	Set catches to zero, print score and set alternative characters
370	Print pathways
390-410	Set random positions of bomb and flags
450	Flash robot on screen
500-520	Display robot lives at base of screen
1000-1050	Adjust bomb timer etc and print new value or explode. If OK then check screen wrap-around and enact
1060	A bit of background music (?)
1100-1130	Allow for movement of first and second "skulls" randomly

PCNProgramCards

Time Bomb Card 2 of 5

8313TB2/5

```

1140 IF SK=3 THEN SX=Z(6):SY=X(6):GOSUB 1500:POSITION SX,SY:£ £6;"U":Z(6)=SX:X(6
)=SY
1170 IF SX=Z(0) AND SY=X(0) THEN 4000
1309 POSITION Z(0),X(0):PRINT £6;"t"
1310 IF S=7 THEN GOSUB 2000
1320 IF S=11 THEN GOSUB 2050
1330 IF S=13 THEN GOSUB 2100
1340 IF S=14 THEN GOSUB 2150
1360 IF PEEK(764)=6 THEN GOSUB 2200
1370 IF PEEK(764)=7 THEN GOSUB 2300
1380 POSITION Z(4),X(4):£ £6;"U":POSITION Z(5),X(5):£ £6;"U":POSITION Z(6),X(6):
£ £6;"U"
1400 IF F1=0 AND Z(0)=Z(1) AND X(0)=X(1) THEN GOSUB 5000
1405 IF F2=0 AND Z(0)=Z(2) AND X(0)=X(2) THEN GOSUB 5050
1410 IF F3=0 AND Z(0)=Z(3) AND X(0)=X(3) THEN GOSUB 5100
1450 IF Z(0)=BX AND X(0)=BY THEN 2400
1460 IF Z(0)=Z(4) AND X(0)=X(4) THEN 4000
1470 IF Z(0)=Z(5) AND X(0)=X(5) THEN 4000
1480 IF Z(0)=Z(6) AND X(0)=X(6) THEN 4000
1490 SOUND 2,0,0,0:SOUND 3,0,0,0:GOTO 1000
1500 POSITION SX,SY:£ £6;"Z"
1514 IF SX=Z(0) THEN 1517
1515 IF SX>Z(0) THEN 1530
1516 IF SX<Z(0) THEN 1520
1517 IF SY>X(0) THEN 1550
1518 IF SY<X(0) THEN 1540
1520 SX=SX+1:IF SX>19 THEN SX=0
1522 LOCATE SX,SY,C:IF C<>218 AND C<>116 THEN 1530
1529 RETURN
1530 SX=SX-1:IF SX<0 THEN SX=19
1532 LOCATE SX,SY,C:IF C<>218 AND C<>116 THEN 1520
1539 RETURN
1540 SY=SY+1:IF SY>8 THEN SY=0
1542 LOCATE SX,SY,C:IF C<>218 AND C<>116 THEN 1550
1549 RETURN
1550 SY=SY-1:IF SY<0 THEN SY=8
1552 LOCATE SX,SY,C:IF C<>218 AND C<>116 THEN 1540
1559 RETURN
2000 POSITION Z(0),X(0):£ £6;" "
2020 Z(0)=Z(0)+1:IF Z(0)>19 THEN Z(0)=0
2030 LOCATE Z(0),X(0),C:IF C=32 THEN Z(0)=Z(0)-1:RETURN
2040 POSITION Z(0),X(0):£ £6;"t":RETURN
2050 POSITION Z(0),X(0):£ £6;" "
2060 Z(0)=Z(0)-1:IF Z(0)<0 THEN Z(0)=19
2070 LOCATE Z(0),X(0),C:IF C=32 THEN Z(0)=Z(0)+1:RETURN

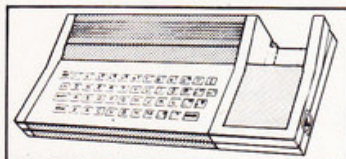
```

1140	Third "skull" movement
1170	OOPS! Robot deaded!
1309-1340	Scan joystick for action and enact
1360-1370	Scan keyboard for action and enact
1380	Display "skulls"
1400-1490	Check for flags collected and robot/"skull" hits
1500-1559	Move the "skulls" about screen chasing the robot
2000-2070	First part of routine to move the robot about screen

Continued next week

HOME COMPUTERS

AQUARIUS



AQUARIUS: The brand new Aquarius Personal Computer is part of Mattel Electronics latest developments in advanced technology and offers full home computing facilities, as well as extensive game play, using a very wide range of plug in cartridges. Since Aquarius is a Mattel Electronics product, it benefits by the company's wide experience of producing high

technology equipment, as well as their game programming expertise which is evident from the advanced games which have been produced for the Intellivision. Aquarius costs £79 and comes with microsoft basic built in. It is so simple to use that you'll be writing your first programs within minutes of taking the machine out of its box. You can even record the programs on your own cassette recorder at home, so you can use them again at a later date. Most available domestic tape recorders are compatible with the Aquarius.

A POWERFUL MACHINE: For all its simplicity, it is also very sophisticated. It has a Z80A processor and 8K of built in ROM as well as 4K of RAM, which is user expandable to 52K. It has a display of 40x24 characters, and a graphic resolution of 320x192 with a total character set of 256 (including the complete ASCII set with upper and lower case letters, numbers and additional graphic symbols). The keyboard has 49 full stroke moving keys, unlike some of the cheaper machines which have membrane keyboards. The size of the machine (excluding any of the additional peripherals), is 13" x 6" x 2".

PERIPHERALS: It is very easy to increase the capabilities of your Aquarius as all the peripherals plug straight into one another. You can add a Printer, a Modem, a Data Recorder, Mini Expander and other items. All of the peripherals are very easy to install and what is more, they're easy to use. But the best news of all is, they're easy to afford.

CPM OPERATING CAPABILITY: The Aquarius is capable of being expanded to 52K RAM and later in 1983 a disk drive will be available for it, with the commercial CPM business operating system. This will allow you access to one of the largest software libraries in the world, with literally hundreds of programs available for you to use.

CARTRIDGES: Various sophisticated programs will be launched on plug in cartridges such as a Visicalc type spreadsheet and a word processor. In addition there will be dozens of games and utilities and alternative languages such as Logo, which combined with the built in microsoft basic gives an unbeatable combination of high quality programming ability.

MATTEL AQUARIUS - £68.70 + VAT = £79

ATARI 400/800



NEW LOW PRICES

ATARI 400/800: With the Atari Personal Computers, you can play the ultimate in T.V. games, teach yourself new subjects or skills, balance budgets, and even write your own computer programs in Basic.

SPECIFICATIONS: Both the Atari 400 and 800 can display in up to 16 colours, each with 16 intensities. They have four independent sound synthesizers for music tunes/game sounds, giving four octaves with variable volume and tone control on your T.V.'s speaker. The display graphics

are of amazing quality, having a detailed resolution of 320 x 192, comprising 24 lines of 40 characters. Atari personal computers have a standard 10K ROM operating system. In addition the standard Atari 400 (£149) comes with 16K of RAM, and the expanded version with 48K (£198). The Atari 800 (£299) comes with 48K as standard. Both the 400 and 800 are now supplied with a FREE £40 Basic Programming Kit, which includes the Basic Programming Cartridge, as well as a 120 page Basic Reference Manual and the 184 page Self Teaching Manual by Bill Carris called 'Inside Atari Basic', so you can begin programming straight away, without buying any 'extras'. Even a mains plug is supplied!

OVER 500 PROGRAMS AVAILABLE: The Atari computers are supported by well over 500 programs available for your use, a larger selection than you will find on any other television game or home computer! The wide selection puts Atari way ahead of the competition. Just fill in the coupon and we will be pleased to send you a full price list which gives details of our range of software available for entertainment, home education, programming and home office use. We think you'll agree when we say it's quite impressive.

100 FREE PROGRAMS FROM SILICA SHOP: If you buy your Atari Home Computer from Silica Shop, you will receive a FREE presentation pack of 6 cassettes, containing 100 programs including games, utilities and demonstrations. A 16 page booklet giving full details of all of these programs is available on request. If you have already purchased your computer elsewhere you can buy the set of 6 cassettes for £30. What's more, Silica Shop offer a two year guarantee on all computers as well as a FREE joystick. This adds up to a great offer that we believe can't be beaten or matched by any of our competitors.

ATARI 400 16K - £129.57 + VAT = £149
ATARI 400 48K - £172.17 + VAT = £198
ATARI 800 48K - £260.00 + VAT = £299

VIDEO GAMES

COLECOVISION



THE SYSTEM: The CBS Colecovision offers new standards in video game play. The excellent graphics are well implemented with arcade titles such as Zaxxon, Lady Bug, Gorf, Wizard of Wor, Carnival, Mouse Trap and the lovable Smurfs. The console comes supplied with a three screen arcade quality version of DONKEY KONG. Parker and other companies have also announced ranges of cartridges for Colecovision, to further enhance the wide range of quality titles available for this new television games machine.

THE CONSOLE: The CBS Colecovision video games system has advanced technology which produces superlative graphics resolution and excellent sound effects. The styling of the console and hand controllers has been carefully researched; the console is designed to complement modern hi-tech equipment, and has clear features for easy operation. The hand controllers allow fingertip control via the 8 direction joystick, and feature 2 independent fire buttons. The push button keyboard is used for game selection and for game control with some cartridges. The hand controllers are detachable and are connected to six feet of telephone cord cable, storing neatly away in the console when not in use.

ATARI EXPANSION MODULE: The Atari converter module allows Atari VCS software cartridges to be played on the Colecovision console, allowing owners the freedom to purchase from the extensive range of Atari compatible cartridges. It also means that existing Atari owners can buy the CBS Colecovision games system without discarding their software library. Silica Shop offer part exchange facilities if you wish to upgrade.

TURBO EXPANSION MODULE: The Turbo Driver Expansion Module allows you to actually drive the vehicle that appears on your T.V. screen. The module consists of a steering wheel, dashboard and accelerator pedal. One hand controller is mounted on the dashboard to provide a gear change unit. The module comes complete with a Turbo Driver cartridge, the first of several cartridges to make use of the module, which provides all the action of sitting in the driving seat. This facility is unique to CBS Colecovision.

HOME COMPUTER EXPANSION MODULE: The Home Computer Module scheduled for late 1983, allows conversion of the games unit into a sophisticated Home Computer. This flexibility of design is an important feature of the CBS Colecovision System.

COLECOVISION - £127.82 + VAT = £147



THE SYSTEM: Vectrex is a totally unique Home Arcade System, which has been exclusively designed and engineered to duplicate real arcade game play. Complete with its own monitor display, Vectrex won't cause any arguments over the use of the family's television because it has its own built in screen.

THE SCREEN: Vectrex does not use ordinary display techniques, instead it uses vector scanning to control the images on the screen. With this scanning method, the gun only updates the area of the screen that has changed, whereas a normal T.V. re-transmits the ENTIRE screen 50 times a minute. It is this that gives Vectrex its speed, and means that very little computer power is required for screen control, and the results provide very fast responding and clear images. These 'Vector Graphics' are used in several arcade games such as Asteroids and Battlezone, to give you incredibly high resolution and quality. Vectrex brings all of this from the arcade right into your living room. The Vectrex screen is capable of displaying 80 columns by 40 lines, which is significant to the extensive developments planned for the system.

EXCITING SOUNDS AND ELECTRONICS: Vectrex has an advanced microprocessor with more speed and power and exciting effects than many home video games systems.

REAL ARCADE CONTROLS: Vectrex has a unique control panel, similar to those used in many real arcade games, with 4 concave action buttons and a full 360° self centering joystick. This control panel has a 4 foot detachable cord for maximum player freedom.

REAL ARCADE GRAPHICS: Vectrex has its own 9 inch vertical screen and unlike a conventional T.V. screen, uses advanced display technology to achieve brilliant, high resolution imagery and superb game play never before possible. The Vectrex display provides special effects too, such as 3-D rotation and zooming in and out, which a regular T.V. cannot match. Using a black and white monitor, each Vectrex game comes supplied with its own coloured plastic screen overlay to add to the excitement of game play. The range of Vectrex cartridges (£21.95 each), gives a good selection of arcade games such as Berzerk, Scramble, Rip-Off and Bomber Attack. Vectrex comes complete with a fast paced 'Minestorm' game built into memory.

VECTREX: Vectrex has an advanced state-of-the-art microprocessor with more speed than other T.V. games.

VECTREX - £129.57 + VAT = £149.00

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Silica Shop are one of the leading specialist suppliers of Video Games & Personal Computers. We consider that our service, to those who already own or to those who are interested in any products in our range, cannot be matched by any other supplier. Just look at what we have to offer:

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- SECONDHAND GOODS** - we sell secondhand Mattel & Atari consoles (cartridges tested) at a full 1 year guarantee, at two thirds of our normal retail price.
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- 2 YEAR GUARANTEE** - we offer a 2 year extension on some manufacturers 12 month warranties, including Atari Personal Computers.
- VIDEO GAMES AND COMPUTER CLUBS** - we offer a full information service on all video games and computers in our range. Advanced information on many new developments is often included, so you are always kept informed. We now have regular newsletters on software releases to make sure that you join our club.
- OVERSEAS ORDERS** - we regularly send goods overseas and use various dispatch services. Please let us know your requirements and we will give you a quotation.
- PAYMENT** - we accept Access/Bankcard/VISA American Express/Diners Club credit cards, as well as cash, cheques, postal orders, C.O.D. or Post Office Transfers.
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ATARI

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ATARI

ATARI VCS (2600) - THE NO 1 BRAND LEADER IN THE U.K.

ATARI: The Atari Video Computer System known as the Atari VCS or the 2600 has now become the T.V. game brand leader. In the U.K., there are over 700,000 owners of the VCS with access to a range of over 200 different plug-in cartridges, each having a multitude of different variations and difficulty levels. Every system comes complete with the main console, two individual joystick controllers, a pair of paddle controllers, aerial splitter, mains adaptor and a 27 game Combat cartridge. It gives you bright crisp graphics, realistic sound effects and even specially designed circuits for the protection of your Television Set.

SECONDHAND GAMES: We currently have several secondhand Atari VCS units in stock which we are selling for only £49 (inc VAT). This price includes the Console, with Combat Cartridge and all the accessories, as well as a 12 month guarantee. We also have stocks of several secondhand cartridges many at half price (all with 12 months guarantee). We will normally buy back secondhand units and cartridges at one third of our standard price.

EXTENSIVE CARTRIDGE RANGE: The Atari VCS is so popular that in addition to Atari's own cartridges, there are over 150 compatible cartridges, produced by at least a dozen different third party manufacturers. Silica Shop has one of the largest cartridge selections available in the U.K. Our range of over 200 titles (printed either side of this column), includes items in stock now, as well as many of the new releases for later in 1983.

SILICA ATARI CLUB: Silica Shop has over 20,000 Atari VCS club members registered on our computer. As a specialist company we are able to obtain advance information about new developments and send detailed catalogues to all of our club members, enabling them to evaluate new products before they buy. This is a totally FREE service, to receive your copies complete the coupon below.

SERVICE CENTRE: Atari International (UK) Inc has recently appointed Silica Shop as an authorised Atari Service Centre. This means that we can now service your Atari VCS or 400/800 (under guarantee if applicable), whether or not you purchased it from us.

VCS COMPUTER KEYBOARD: A keyboard will soon be launched to convert the VCS into a fully programmable home computer. For further details, join our club by completing the coupon below. We will then let you know when further information is available.

STARPATH SUPERCHARGER: The supercharger plugs into the cartridge socket of your VCS and expands its RAM almost 50 fold, from 128 to 6,272 bytes. This increased memory adds vivid high resolution graphics capabilities and significantly lengthens the game playing time. Supercharger has a range of multi-load games (at £19.45 each), these offer the facility to play a game in several distinct parts (great for adventures), the next section being loaded when you have completed the previous one, thus enhancing the game play. For further information please complete the coupon below.

ATARI VCS CONSOLE - With Combat Cart & Accessories £68.70+VAT = £79.00

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Mousetrap
Smurf
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Turbo
Venture
Wings
Wizard of Wor
Zaxxon

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Cosmic Ark
Demon Attack
Dem. Attack II
Dragonfire
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No Escape
Riddle of Spk
Scuba
Star Voyager
Trick Shot
Zoon

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Burger Time
Congo Revenge
Frog & Flies
Int'l Soccer
Lock 'n Chase
Space Attack
Tron Dvly Dec
Winter Olymp

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Action Force
Amidar

PARKER/Con
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Incredible Hulk
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Pizza Chef
Quest for Gold
The Ho
Tanks no Tanks

ACCESSORIES

We stock a wide range of accessories for the Atari VCS and 400/800 personal computers. The same accessories can be used on the Commodore VIC range of computers. The Wico range can also be used with the Texas Instruments computers on purchasing a special adaptor. To give you an idea of the range available, just take a look at the following list:



Trackball by Wico

LE STICK: A mercury filled joystick specially made for one handed operation, with thumb fire button.

QUICK - SHOT: This joystick features a contoured handle grip, thumb trigger and optional base fire button. It is supplied with 4 sure foot suction grips.

STARFIGHTER: Neat and compact with a small direction stick. Metal interior for added strength.

VIDEO COMMAND: With a tapered handle, this joystick is for one handed use. It has a directional control which is similar to a jet fighter joystick.

WICO RED-BALL: An arcade type joystick with a red ball handle, it features 2 fire button locations, one at the base and one on the stick. It comes supplied with 4 grip pads for easier table top use.

WICO STRAIGHT - STICK: The main feature of this joystick is its arcade style, bat handle grip. It also has 2 fire buttons. Four grip pads included for table top use.

WICO TRACKBALL: A true arcade style trackball for use with your Atari or Commodore VIC. This product is designed to give arcade control in your living room.

12" EXTENSION LEAD: A 12" extension for Atari and Atari compatible joysticks for greater player freedom.



Wico Straight Stick with Stick Fire Button

MATTEL INTELLIVISION



MATTEL INTELLIVISION: The Mattel games unit is a most versatile T.V. game which offers 3-D graphics quality for only £98. Each cartridge comes with 2 overlays which fit over the unique hand controller giving easy directions for game play. Using the handset's control disc, objects

can be moved accurately in 16 directions giving a realistic simulation of lifelike movement.

VOICE SYNTHESIS: The Intellivision unit, price £49, is used with special cartridges where high quality synthesised male and female voices feature as part of the game play.

NEW MATTEL CARTRIDGE RELEASES: Why not complete the coupon below and join the Silica Mattel Owners Club and receive our FREE news bulletins and 16 page catalogues detailing new Mattel releases. There will soon be over ninety cartridges available for the Mattel, and a small selection from these is listed below:

MATTEL: Arctic Squares, Burger Time, Buzz Bombers, Chess, Cloudy Mountain, Loco Motion, Mission X, Mystic Castle, Sharp Shot, Solar Sailor, Space Shuttle, Vectron, Winter Olympics.

ACTIVISION: Happy Trails, Pitfall, Stampede.

CBS: Blue Print, Carnival, Donkey Kong, Golf, Mousetrap, Smurf, Solar Fox, Turbo, Venture, Wizard of Wor, Zaxxon.

IMAGIC: Beezer, Dracula, Ice Trek, Nova Blast, Safecracker, Swords & Serpents, Tropical Trouble, White Water.

PARKER: James Bond 007, Lord of the Rings, Popeye, Q-Bert, Spiderman, Star Wars, Super Cobra, Tutankham.

COMPUTER KEYBOARD: In July/August 1983, Mattel will be launching their new £89, 49-key computer keyboard attachment called 'Lucky' which is fully programmable and has microsoft basic built in. It will transform your Master Component into a home computer. The adaptor also accepts a 6 note polyphonic music synthesiser and full size 49-key piano keyboard that will make learning music as easy as playing games.

MATTEL CONSOLE £85.22 + VAT = £98.00

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VIDEO GAME CLUB

In a fast moving market like video games, it is difficult to keep up to date with all the developments that take place. With new programmes and accessories being introduced at a fast rate by several different manufacturers, it is impossible to get all the information you require from one manufacturer alone. It is for this reason, that we have set up owners clubs for the more popular video games and home computers, to keep you fully up to date with what is going on with your particular machine. As far as we know, Silica Shop are the only company to offer such clubs, but that is not surprising since we are the specialists. We currently have FREE clubs for the Atari VCS, Atari 400/800 home computers, and Mattel Intellivision. Soon we will have clubs for Colecovision, Aquarius and Vectrex. So if you own one of these machines, fill in the coupon opposite, and we will enrol you FREE OF CHARGE in the club relevant to your computer or video game.

01-309 1111
SILICA SHOP

SILICA SHOP LIMITED, Dept ZPCN 0683,
1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX
Telephone: 01-309 1111 or 01-301 1111

FREE LITERATURE

FREE LITERATURE - Please send me your FREE LITERATURE and catalogues on the following items:

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FREE LITERATURE

Clubnet keeps you in touch with the microcosm of personal computer enthusiasts throughout the UK. It is divided into two sections — clubs and user groups.

We publish a list of these two groups on alternate weeks. This week it is the turn of user groups, which are listed alphabetically by machine and special interest.

What's in a Namebug?

The North and Mid-Essex BBC Micro Users Group (Namebug for short) held its first meeting last October. Originally the regional Microelectronics Education Programme set up the group specifically for teachers, but now anyone can join.

On the night I visited the group, 30 members gathered in two rooms of a comprehensive school in Witham, for its monthly meeting.

They looked at printers in operation and listened to a Microvoc sound system (see *Monitor*, May 20-May 26) set up by local dealers. In addition, members had the chance to get hands-on a bunch of Beebs on display.

Among the membership, which included husband-and-wife teams, schoolchildren and professionals, several projects were brewing — such as development of a toolkit program, building a modem

and various types of interfacing.

Andy Purkiss, Namebug's general secretary, said: 'We always intended our meetings should be more than just sessions for people to play Snapper. So far we've had a number of guest speakers on topics such as Basic program structure and the

Hands on the Beeb at Namebug



development of the micro, Wordwise and disk operating.'

Recently group members lent their expertise to the Chelmer Mini-Marathon race organisers and they'll be writing a program for next year's race to keep track of performances. In the meantime, they plan to evaluate a Hobbit floppy tape from Ikon Computer Products.

Namebug is another group with community awareness. Dave Watts, the chairman, said: 'We're very anxious to give assistance to disabled people in the area who have an interest in micros. We're prepared to arrange transport to and from meetings or even visit housebound people.'

Name: Namebug **Venue:** Sixth Form Centre, Spinks Lane, Witham, Essex. **Meetings:** Second Thursday every month at 7.30pm **Contact:** Dave Watts, 0245 358127.

Sandra Grandison

USER GROUPS

Acorn

Coventry Acorn Atom User Group. Subs: £4. No meetings but quarterly newsletter. Contact Peter Frost, 18 Frankwell Drive, Coventry, 0203 613156.

Essex Acorn Atom User Group. Program magazine. Contact Alan Carr, 105 Fairhole Avenue, Gidea Park, Romford, Essex.

Kent Medway Acorn User Group. Meets at St John Fisher School on last Monday of month at 7pm. Session at 9pm Thursday at the Fox and Hound, Chatham. Contact Clem Rutler, c/o St John's Fisher School, Ordance Street, Chatham, Kent, 0634 42811 (day), 0634 373459 (eve).

Manchester Acorn User Group. Meets at AMC, Crescent Road, Crussall, Manchester 8 on Tuesday except school holidays, fees: £1. Contact John Ashurst, 192 Vendure Close, Failsworth, Manchester, 061-681 4962.

Apple

Bristol Apple Users and Dabblers. Meets at 10 Waring House, Redcliffe Hill, Bristol BS1 6TB, once a month. Newsletter. Contact Ewa Dabkowski, c/o Datalink, 10 Waring House, Redcliffe Hill, Bristol BS1 6TB, 0272 213427.

Buckinghamshire Apple User Group. Contact Steve Proffitt, The Granary, Hill Farm Road, Marlow Bottom, Buckinghamshire, 0628 473074.

Croydon Apple User Group. Meets at Sidda House, 350 Lower Addiscombe Road, Croydon, on second Monday of month. Subs: £5, £10 commercial members. Contact Paul Vernon, 60 Flawkhurst Way, West Wickham, Kent, 01-777 5478.

Hertfordshire British Apple Systems User Group. Meets at Old School, Branch Road, Park Street, St Albans, Hertfordshire, on first Tuesday and third Sunday each month. Tuesday and third Sunday each month. Annual subs: £12.50, joining fee: £2.50. Publishes magazine. Contact John Sharp, 09273 75093.

London Apple Music Synthesis Group. Contact Dr Davis Ellis, 22 Lennox Gardens, London SW1.

Milton Keynes Microcomputer User Group. Meets every Tuesday, 7.30pm. Contact Brian Pain, Sir Frank Markham School, Woughton Centre, Chaffron Way, Milton Keynes.

Atari

Birmingham Users Group. Meets at the Malaga Grill, Matador Public House, Bull Ring shopping centre, Birmingham, on second and fourth Thursday every month at 7.30pm. Subs: £5. Meetings: 25p members, 50p non-members. Contact Mike Aston, 42 Short Street, Wednesbury, West Midlands.

Carshalton Atari User Club. Contact Paul Deegan on 01-642 5232.

Hull Atari Users Local Group. Proposed new user group. Contact Harvey Kong Til, 546 Holderness Road, Hull HU9 3ES. Hull 7911094. **London Silica Atari 400/800 User Club.** New club, library planned, newsletter. Contact Richard Hawes on 01-301 1111.

Preston Atari Computer Enthusiasts. Meets at KSC Club, Merriion House, Beach Grove, Ashton, Preston, on third Thursday of month at 7.30pm. Subs: £5. Contact Roger Taylor, 0253 738192.

Atom

Liverpool BBC and Atom User Group. Meets at Old Swan Technical College, Room C33 on first Wednesday of month at 7.30pm and at Birkenhead Technical College on third Thursday of month at 7.30pm. Contact Nick Kelly, 051-525 2934 (evenings).

BBC

Laserbug is an international user group for the BBC micro. Produce monthly magazine. Subs: £12 for one year, £6 for six months. Contact Paul Barbour, 10 Dawley Ride, Colnbrook, Slough, Berks. 02812 30614.

Beebug. Ten magazines with programs. Discount deals, library and query service. Contact Sheridan Williams or David Graham at PO Box 50, St Albans, Hertfordshire AL1 2AR.

Bournemouth BBC User Group. Meets at Lansdowne Computer Centre, 5 Holdenhurst Road, Bournemouth on first and fourth Wednesday of month at

7.30pm. Contact Norman Carey on 0202 749612.

Brent/Barnet User Group. Meets on last Sunday of month. Subs £3. Newsletter. Contact Joseph Fox, 4 Harman Close, London NW2 2EA.

North London BBC Micro Users Group. Meets at The Prince of Wales, 37 Fortune Green Road, on Tuesdays at 7pm. Wide range of skills and expertise. Contact Dr Leo McLaughlin, Department of Chemistry, Westfield College, University of London, Kidderpore Avenue, London NW3 7ST, 01-405 0109.

Preston Area BBC Micro User Group. Meets at Boatmans Arms, Marsh Lane, Preston, on last Thursday of month. Subs: £5. Contact Duncan Coulter, Membership Secretary, 8 Briar Grove, Ingol, Preston, Lancashire, 0772 725793.

Witham BBC Micro User Group meets at comprehensive school, Witham on second Thursday each month at 7.30pm. Contact Dave Watts after 7pm, 0245 358127.

Comal

London Comal User Group. Meets at Polytechnic of North London, Holloway, second Wednesday of month, term time. Subs: £7.50. Contact John Collins, 75 74111.

Commodore ICPUG

Barnsley. Subs: £7.50. Contact Bob Wool, 13 Word Green, Barnsley, South Yorkshire, 0226 85084.

Blackpool. Meets at Arnold School, Blackpool, on third Thursday of month. Contact David Jarrett, 197 Victoria Road, Thornton Cleveleys, Blackpool FY5 3ST.

Canterbury SE. Meets at The Physics Lab, Canterbury University, on first Tuesday and Wednesday of month. Subs: £7 adults, £3.50 juniors. Contact R Moseley, Rosemount, Romney Hill, Maidstone, 0622 37643.

Carrickfergus. Contact David Bolton, 19 Carrickburn Road, Carrickfergus, Antrim BT38 7ND, 09603 63788.

Cheltenham. Meets at The Cheltenham Ladies College on last Thursday of month at 7.30. Contact Alison Schofield, 78 Hesters Way Road, Cheltenham, Gloucester, 0242 580789.

Clwyd. Contact John Poole, 6 Ridgway Close, Connah's Quay, Clwyd CH5 4LZ.

Corby. Contact Peter Ashby, 215 Wincohn Way, Corby, Northamptonshire, 05363 4442.

Coventry. Meets at Stoke Park School and County College at 7pm on fourth Wednesday of month except July, August, December. Subs: £2.50.

Derby. Meets at Derby Professional Colour every other Tuesday at 7pm. Contact Robert Watts, 03322 72569.

Durham. North-East Pet and ICPUG. Meets at Lawson School, Burnley at 7pm second and third Mondays of month. Contact Jim Cocalis, 20 Worcester Road, Newton Hall Estate, Durham.

Essex. No meetings, software library. Contact Simon Kniveton, 097 086 303.

Hainault. Meets at Grange Remedial Centre, Woodman Path, Hainault, Contact Carol Taylor, 101 Courtlands Avenue, Cranbrook, Ilford, Essex.

Glasgow. Contact Dr Jim MacBrayne, 27 Daidmyre Crescent, Newton Mearns, Glasgow, 041-639 5696.

Gloucester and Bristol Area. Meets at 23 Sheppard Leaze, Wotton-under-Edge, Gloucester, on last Friday of month.

Hampshire. Meets at 70 Reading Road, Farnborough, on third Wednesday of month. Contact Ron Geere, 109 York Road, Farnborough, Hants, 0252 542921.

Hertfordshire North. Meets at Provident Mutual Assurance, Purwell Lane, Hitchin, on last Wednesday of month. Contact B Grainger, 73 Minehead Way, Stevenage, Herts SG1 2HS, 0438 727925.

Kilmarnock. Meets at Symington Primary School on first and third Thursdays of month at 7pm. Software library. Contact John Smith, 19 Birelands Road, Symington, Kilmarnock KA1 5RW, 0563 830407.

Liverpool. Meets at The Merchant Taylor School for Boys, Crosby, on second Thursday of month at 7pm. Software exchange. Contact Tony Bond, 27 Ince Road, Liverpool L23 4UE, 051-924 1505.

London. Contact Alan Birks, 135 Queen Alexandra Mansions, Judd Street, London WC1, 01-430 8025.

London North. Contact Barry Miles, Department of Business Studies, North London Polytechnic, Holloway Road, London N7, 01-607 2789.

Norfolk. Contact Peter Petts, Bramley Hale, Wretton, King's Lynn, Norfolk PE33 9QS, 0366 500692.

Northumberland. Proposed new club. Contact Graham Saunders, 22 Front Street, Guide Post, Northumberland. **Slough.** Meets at Slough College on second Thursday of month at 7.30pm, visitors — 65p adults, 40p students. Contact Brian Jones, 53 Beechwood Avenue, Woodley, Reading RG5 3DF, 0734 661494.

South-East. Regional Group. Meets at Charles Darwin School, Jail Lane, Biggin Hill, Kent, on third and fourth Thursday of month at 7.30pm. Subs: £7.50. Free library, discount service, courses and newsletter. Contact Jack Cohen, 30 Brancaster Road, Newbury Park, Ilford, Essex, 01-597 1229.

South Midlands. Meets at 12 York Street, Stourport-on-Severn on last Thursday of month. Help available with business programming problems. Contact M J Merriman at above address.

Staffordshire. Annual subs: £6.50. Group newsletter. Contact at 57 Clough Hall Road, Kilsgrave, Stoke-on-Trent.

Teddington. Contact G Squibb, 108 Teddington Park Road, Teddington, Middlesex, 01-977 2346.

Watford. Meets on second Monday of month. Contact Stephen Rabagliati, c/o Institute of Grocery Dist. Grange Lane, Letchmore Heath, Watford, Herts, 01-779 7141.

Commodore Pet

Blackpool. West Lancashire Pet Users Club. Meets at Arnold School, Blackpool on the third Thursday of month. Contact D Jowett, 197 Victoria Road, East Thornton, Blackpool FY5 3ST.

Southern Users of Pets Association. Contact Howard Pilgrim, 42 Compton Road, Brighton BN1 5AN.

Pet User Group Crawley. Contact Richard Dyer, 35 Farham Road, Ilfield, Crawley.

Pet Users Education Group. Produces newsletter. Contact Dr Chris Smith, Department of Physiology, Queen Elizabeth College, Camden Hill Road, London W8 7AH.

UK Pet Users Club. Annual subs: £10, newsletter. Contact 360 Euston Road, London NW1 3BL.

Pet Users Group. Meets at Polytechnic of North London, Eden Grove, Room 320. On alternate Tuesdays, 6pm. Meets at Barry Miles on 01-607 2789.

Pet User Club. Contact Margaret Gulliford, 818 Leigh Road, Slough Industrial Estate, 0753 74111.

Independent Pet Users Group. Contact 57 Clough Hall Road, Kilsgrave, Stoke-on-Trent, Staffordshire.

Commodore Vic

Burnley. Proposed club. Contact John Ingham, 72 Ardwick Street, Burnley, Lancashire.

London. Vic Users Group. Meets on alternate Tuesdays at 6.30pm at Polytechnic of North London, Community Centre. Contact Robin Bardbeer.

Norfolk. Proposed club. Contact J Blair, 7 Beach Road, Cromer, Norfolk, 0263 512849.

Compucolour

Caversham. Compucolour Users Group UK. Meets at Community Centre, Caversham Park Village twice a year. Subs £15. Contacts with USA, Australia and Canada. Newsletter, program library. Contact Peter Hiner, 11 Pennycroft, Harpenden, Hertfordshire, 05827 64872.

CP/M

Irish CP/M Users Group. Subs: £5, meets monthly in Dublin area. Newsletter. Contact Doug Notley, Gardner House, Ballsbridge, Dublin 4, Dublin 686411.

UK CP/M Users Group. Subs: £7. Software library, newsletter, help service. Contact Lesley Spicer, 11 Sun Street, London EC2M 2QD, 01-247 0691.

COSMAC

COSMAC Users Group. Contact James Cunningham, 7 Harrowden Court, Harrowden Road, Luton, Bedfordshire, 0582 423934.

Digital Equipment

Digital Equipment Users Society. Program library. Contact The Secretary, PO Box 53, Reading, Berkshire, 0734 387725.

Dragon

Brixham Dragon Owners Club meets at Computer Systems (Torrey), Pump Street, Brixham, every Saturday at 2.30pm. Contact Ian Chipperfield, 22 Brookdale Court, Brixham, Devon, Brixham 59224.

Education

Birmingham. Education ZX80/81 User Group. Subs: £2.50. Contact Eric Deeson, Highgate School, Balsall Heath Road, Highgate, Birmingham B12 9DS.

Birmingham. MUSE. Subs: £10, student £6.50. National body for co-ordinating activity in schools, colleges. Contact Lorraine Boyce, MUSE Information Office, Westhill College, Weoley Park Road, Birmingham, 021-471 3723.

Dublin. Computer Education Society of Ireland. Subs: £3. Contact Dairmaid McCarthy, 7 St Kevins Park, Kilmacud, Blackrock, Co. Dublin.

Middlesex. Educational Users Group. Offshoot of national TRS-80 Users Group. Contact Dave Fletcher, Head Teach, Beaconsfield First and Middle School, Beaconsfield Road, Southall, Middlesex.

Worcestershire. Mini and Microcomputer Users in Education. National organisation. Contact R Trigger, 48 Chadcote Way, Catshill, Bromsgrove, Worcestershire B61 0JT.

Forth

Forth Users Group. Produces newsletters and covers a variety of machines. Subs £7.50. Contact David Husband, 2 Gorleston Road, Branksome, Poole, Dorset BH12 1NW, 0202 764724.

Forth Interest Group UK. Meets at Room 408, South Bank Polytechnic on the first Thursday of month. Subs: £7. Newsletter. Contact K Goldie-Morrison, 15 St Albans Mansion, Kensington Court Place, London W8 5QH, 01-937 3231.

Forum

Forum 80 Users Group. Contact Frederick Brown, 421 Endike Lane, Hull HU6 8AG.

FX-500-P

FX-500-P Users Association. Contact Max Francis, 38 Grymsdyke, Great Missenden, Buckinghamshire HP16 0LP.

Genealogists

Society of Genealogists Computer Interest Group. Subs: £3. Newsletter. Contact Anthony Camp, 01-373 7054.

Intel MDS

UK Intel MDS Users Group. Newsletter. Contact Lewis Hard, c/o S.P.A.C.E., The Old Coach House, Court Row, Upton-on-Severn, Worcester WR8 0NS.

Ithaca Audio S100

Ithaca Audio S100 Users Group. Software exchange, discount. Contact Dave Weaver, 41 Dore Avenue, North Hykeham, Lincoln LN6 8LN.

Jupiter Ace

Jupiter Ace Users Group. Subs: £7. Newsletter, add-ons. Contact John Noyce, Remsoft, 18 George Street, Brighton BN2 1RH.

Mattel

Mattel Intellivision TV Game Group. Proposed group to organise games, competitions. Contact Warrington 62215 after 4pm.

Medical

Durham. Primary Health Care Group. Contact Dr Alastair Malcolm, British Computer Society, Cheveley Park Medical Centre, Belmont, Durham, 0385 64282.

London. Medical Micro Users Group. Newsletter. Contact Medicom, 1-2 Hanover Street, London W1.

Middlesex. TRS-80 Medical and Laboratory Users. Newsletter. Contact Dr Robinson, The Residency, Northwick Park Hospital, Harrow, Middlesex.

Nascom

Berkshire. Nascom Thames Valley User Group. Meets at Frogmore Hotel, Windsor, on Thursday fortnightly, 8pm. Newsletter. Contact Mike Rothery, 37 Eaton Wick Road, Eton Wick, Windsor, Berkshire, Windsor 56106.

Birmingham Nascom User Group. Meets at Davenport Social Club, Granville Street, Birmingham on the last Thursday of month, 8pm. Contact Martin Sidebotham, 021-744 3093.

International Nascom Microcomputer Club. Subs: £5. Newsletter, program library. Contact 80 Oakfield Corner, Sycamore Road, Amersham, Buckinghamshire HP6 5EQ.

Merseyside Nascom User Group. Meets at Mona Hotel, St James Street, Liverpool, on the first Wednesday of month, 7.30pm. Contact Mr T Searle, 051-526 5256.

Newbrain

Brighton Independent Newbrain User Group. Subs: £5. Monthly newsletter, SAE to J Hudson, 6 Swanborough Place, Whitehawk, Brighton.

Wakefield Independent Newbrain User Group. Contact Anthony Hodge, 15 St John's Court, Wakefield WF1 2RY.

Ohio

Ohio Scientific User Group. Subs: £5. Newsletter. Contact Tom Graves, 19a West End, Street, Somerset, 0458 45359.

Oric

Oric Owners Group. Subs: £10. Communicates through bi-monthly newsletter. Contact Paul Kaufman, 3 Club Mews, Ely, Cambridgeshire.

Osborne

British Osborne Owners Group. Subs: £18. Newsletter. Contact J Anglesa, Flat 19, Rowan House, Mitton Road, Handsworth, Birmingham B20 2JR.

OSI

OSI UK User Group. Contact Richard Elen, 12 Bennerley Road, London SW11 6DS.

Pascal

Pascal User Group. Subs: £9. Contact Nick Hughes, PO Box 52, Pinner, Middlesex HA5 3FE.

PDP

Buckinghamshire. PDP8 User Group. Newsletter. Contact Nigel Dunn, 21 Campion Road, Widmer End, High Wycombe, Buckinghamshire, 0494 714483.

Hertfordshire. PDP11 User Group. Information service only. Contact Pete Harris, 119 Carpenter Way, Potters Bar, Hertfordshire EN6 5QB, 0707 52091.

Pilot

UK Pilot User Group. Contact Alec Wood, Wirral Grammar School for Boys, Cross Lane, Bebington, Wirral, Merseyside LG3 3AQ.

Prestel

ACC National Prestel Committee. Administrates Club Spot 800 (hobbyists on Prestel). Contact secretary, Rupert Steele, St John's College, Oxford OX1 3JP.

Research Machines

Birmingham. Research Machines 380Z. Contact Peter Smith, Birmingham Educational Computing Centre, Camp

Hill Teachers Centre, Stratford Road, Birmingham B11 1AR.

Leamington Spa. West Midland RML User Group. Contact Spencer Instone, c/o 59 Avenue Road, Leamington Spa. **Newcastle.** NERML 380Z User Group. Meets monthly at Micro-Electronics Education Centre of the Polytechnic Coach Lane Campus. Subs: £5. Contact Mr Hatfield or Mr Reed, Computer Unit, Northumberland Building, Newcastle Polytechnic. 0632 326002.

Oxford. Research Machines National User Group. Contact RML, Mill Street, Osney, Oxford OX2 0BW, 0865 249866.

Oxford. Research Machines Ltd National User Group. Contact M D Fisher, PO Box 75, Oxford OX4 1EY.

Sharp MZ80

Postal MZ80K User Group. Contact Noel Williams, 07425 88058.

Aberdeen. International Sharp Users Group. Subs: £3. Newsletter. Contact Graham Knight, c/o Knights Computers, 108 Rossmount Place, Aberdeen, 0224 630526.

Essex. Sharp MZ80K User Group. Contact Joe Street, 16 Elmhurst Drive, Hornchurch, Essex RM11 1PE.

Leeds. Sharp PC1211 Users' Club. Subs: £5. Newsletter. Contact Jonathan Dakeyne, 281 Lidgett Lane, Leeds LS17 3AQ.

Somerset. Sharp MZ80 Users Club. Contact Tim Powell, Computer Centre, Yeovil College, Yeovil, Somerset BA21 4AE.

Sinclair

Brighton. ZX Users Group. Contact J Ireland-Hill Jnr, 145 Godwin Road, Hove, Brighton.

Aylesbury. Sinclair ZX Computer Club. General monthly meeting, newsletter. Equipment for hire, specialist meetings, library. Contact secretary, Ken Knight, 0296 5181.

Colchester. Sinclair User Group. Meets fortnightly. Contact Richard Lawn, 102 Prettygate Road, Colchester, Essex.

Cardiff. ZX Club. Meets on last Sunday of month, 2pm. Subs: £5. Telephone service, software library. Contact Mike Hayes, 54 Oakley Place, Grange Town, Cardiff, 0222 371732.

Edinburgh. ZX. Meets at Claremont Hotel, Claremont Crescent, Edinburgh on second and fourth Wednesdays every month, 7.30pm. Subs: £5 adults, £3 juniors, students, OAP and unemployed. Newsletter. Contact John Palmer, 56 Meadowfield Drive, Edinburgh, 031-661 3183.

Glasgow ZX80/81 User Group. Contact Ian Watt, 10 Greenwood Road, Clarkston, Glasgow, 041-638 1241.

Liverpool. ZX Computer Club. Meets at ZX Computer Centre, 17 Sweeting Street, Liverpool, on Wednesday, 6.30pm. Contact Keith Archer, 051-260 4950.

London. National ZX User Club. Monthly magazine 'Interface'. Contact Tim Hartnell, Interface, 44-48 Earls Court, London W8.

London. Sinclair User Group. Meets at Polytechnic of North London, Room 2-5 Tower Block, Monday, 6.30pm. Contact Irving Brand, Polytechnic of North London, Holloway Road, London.

ZX Spectrum Club. Proposed new club for teenagers. Contact D Beattie, 63 Kingsley Crescent, Sawley, Long Eaton, Nottingham NG10 3DA.

Staffordshire. ZX80 National Software Association. Subs: £6. Newsletter, software available on cassette. Contact 15 Woodlands Road, Wombourne, Staffordshire WV5 0JZ.

Suffolk. ZX Amateur Radio User Group. Newsletter. Contact Paul Newsman, 3 Red House Lane, Leiston, Suffolk. SAE essential. No telephone enquiries.

Surrey. Guildford ZX81/80 Users Group. Meets Fridays, club magazine. Contact A Bond, 54 Farnham Road, Guildford, Surrey GU2 5PE, 0483 62035.

Surrey. ZX80/81 User Club. Newsletter. Contact David Bigden, PO Box 159, Kingston-upon-Thames, Surrey KT2 5UQ.

West Sussex. Hassocks ZX Micro User Club. Contact Paul King, 25 Fir Tree Way, Hassocks, West Sussex.

Sirius

Sirius User Group. Newsletter, program library. Contact Ray D'Arcy, Sirius User Club, The Microsystems Centre, Enterprise House, 7-71 Gordon Street, Luton. 0582 412215.

68XX

68XX Special Interest Group. Contact Tim Turner, 63 Millais Road, London E11 4HB, 01-558 3681.

Software

London. Software Group. Meets at Polytechnic of North London, Room 2-3 Tower block Thursday, 6pm. Contact Mike Duck at Polytechnic of North London, Holloway, London N7. **Oxford.** Program of the Month Club. Discount programs, newsletter. Contact Mr Durrant, 55 St Thomas Street, Oxford OX1 1JG, 0855 250333.

Sorcerer

Liverpool European Sorcerer Club. Monthly meetings. Subs: £7.50, newsletter. Contact Colin Marle, 32 Watchyard Avenue, Formby, near Liverpool L37 3JU, 070 48 72137. **Surrey.** Exidy Sorcerer User Group. Newsletter, program exchange. Contact Andy Marshall, 44 Arthurs Bridge Road, Woking, Surrey GU21 4NT.

Spreadsheet

International Electronic Spreadsheet Users Group. Newsletter. Contact UK Alpha House, 7th Floor, Rowlands Way, Manchester M22 5RG.

Tangerine

Bristol. Tangerine Homebrew. Contact A Coates, 35 Mogg Street, St Werburghs, Bristol BS2 9UB. **Bournemouth.** Tangerine Users Group. Hardware and software suppliers. Contact Bob Green, 16 Idlesleigh Road, Charminster, Bournemouth.

Texas Instruments

Leeds. TI99/44 User Group. Meets at 30 Gipton Wood Road, Leeds 8, Mondays 7pm. Subs: £6. Contact I Youlden, 0532 401408. **Manchester.** TI User Group. Proposed new club. Contact T Grimshaw, 21 Allingham Street, Longsight, Manchester. **Manchester.** TI9900 User Group. Software, data libraries. Contact Chris Cadogan, Department of Computer Science, University of Manchester M13 9PL.

Triton

Triton User Group. Subs: £4. Newsletter, software exchange. Contact Nigel Stride, Transam Ltd, 12 Chapel Street, London NW1, 01-402 8137.

TRS-80

Birmingham. National TRS-80 User

Group. Meets at Adam & Eve Pub, 1st Floor, Bradford Street, Birmingham on last Friday of month. Subs: £2.50. Newsletter, software library. Contact Michael Gibbons, 1 New Street, Castle Bromwich, Birmingham B38 9AP, 021-747 2260.

Chelmsford. TRS-80 User Group. Contact Michael Dean, 22 Roughtons, Galleywood, Chelmsford, Essex.

Durham. North East TRS-80 User Group. Meets at Information Technology Centre, Gateshead on the third Wednesday of month, 7pm. Subs: £5. Newsletter. Contact J Dunn, 8 Ettrich Terrace, North Gateshead, County Durham.

Edinburgh. Scottish TRS-80 and Genie User Group. Meets at Mansion House Hotel, Milton Road, second Thursdays of month, 7.30pm. Contact Dick Mackie, 3 Warrender Park Crescent, Edinburgh EH9 1DX, 031-229 6032.

Isle of Wight. TRS-80 User Club. Meets at London Hotel, Ryde on last Friday of month, 7.30pm. Contact Sean Coulson, 0903 614589.

Kent. TRS-80 User Group. Contact Alan Reid, 22 Woodeys Road, Rainham, Kent, 0634 367012.

Bolton. Northwest TRS-80 User Group. Meets at Barton Aero Club, Barton Aerodrome, Irlam, near Manchester on last Wednesday of month, 8pm. Subs: £8. Sub-group meets at Crown Hotel, Blackfriars Street, on first and third Monday of month. Newsletter, software library. Contact Melvin Franklin, 40 Cowlees, Westhoughton, Bolton, Lancashire.

Liverpool. UK DOSPLUS User Group. Contact Peter Tootill, 101 Swanside Road, Liverpool L14 7NL.

Liverpool. Merseyside TRS-80/Video Genie User Group. Meets second Thursday of month, 7.15pm. Contact Peter Tothill, 101 Swanside Road, Liverpool L14 7NL, 051-220 9733.

London, SW. TRS-80 User Group. Contact Ron Everitt on 01-394 2123.

Merseyside. TRS-80 User Group. Subs: £5. Software library, newsletter. Contact N Rushton, 123 Roughwood Drive, Northwood, Kirby, Merseyside.

Milton Keynes. National TRS-80 and Genie User Group. Fee £7 for six months, newsletter. Contact Brian Pain, 24 Oxford Street, Stony Stratford, Milton Keynes.

London. TRS-80 Genie Group. Meets at Central Common Room, The Residency, Northwick Park Hospital on first Sunday of month. Contact Dr Nick Robinson, Central Room, The Residency, Northwick Park Hospital. **Northants.** TRS-80 Users Group. Meets at Welwyn Park Community Centre on alternate Thursday at 7pm. Subs: £12, Saturday workshop. Contact Neil Griffiths, 0858 65718.

Nottingham. East Midlands TRS-80 Users Group. Newsletter. Contact Mike Costello, 15 Langbank Avenue, Rise Park, Nottingham NG5 5BU, 0602 751753.

Colour Genie

National Colour Genie User Group. Subs: £10. Products monthly newsletter, has software library and prepares national workshops. Contact Marc Leduc, 46 Highbury Avenue, Nottinghamshire NG6 9DB.

UCSD

Hants. UCSD System Users Society. Contact John Ash, Dicol Data Systems Ltd, Bond Close, Kingsland Estate, Basingstoke, Hants RG2 0QB.

Oxford. UCSD Pascal UK Users Group. Contact Malcolm Harper, Oxford University Computing Laboratory Programming Research Group, 45 Banbury Road, Oxford OX2 6PE.

CUA

CUA User Group. Contact Adrian Waters, 9 Moss Lane, Romford, Essex.

6502

Bedfordshire. 6502 User Group. Contact Walter Wallenborn, 21 Argyll Avenue, Luton, Bedfordshire LU3 1EG, 0582 26927.

Hants. 6502 Users Club (Southern Region). Contact Steve Cole, 70 Sydney Road, Gosport, Hants.

Remember

Let us know about your micro club or user group so we can be sure the information printed here is up to date. Drop a card to Sandra Grandison, Listings Editor, at *Personal Computer News*, 62 Oxford Street, London W1A 2HG, or give her a call on 01-636 6890.

SPECTRUM FORTH

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DATA BASICS

This week PCN Databases lists a selection of add-ons for your micro. PCN keeps you up to date in three-week cycles, listing peripherals, then software, followed by micros.

Printers are best categorised by print-head type. The two most common methods of transferring type to paper are the **Dot matrix** and **Daisywheel** techniques.

A dot matrix printer uses a row of pins which are programmed to strike the paper through a ribbon and form the character as a pattern of dots.

The daisywheel acts more like a conventional typewriter, the character set being pre-formed on a wheel with each character on a separate spoke. As the interchangeable wheel rotates it is struck by a hammer to form the character impression.

Dot matrix printers tend to be faster than daisywheel but offer lower print quality.

In selecting a printer make sure the **interface** on your computer is compatible with those available as standard or at extra cost on the printer.

The ● sign means the interface is included in the price; ○ means you have a choice of interfaces included in the price; + means the interface will cost extra.

PERIPHERALS

Make & Model	Price inc VAT	Printhead type (M = matrix)	INTERFACES					IEEE	Centronics	20ma	RS232	Others ●	Others (+)
			● inc in price	○ = option	at extra cost (+)								
PRINTERS													
Adler TRD 170	£833	Daisywheel	●	●	●	●	●						
Anadex DP 9000A	£1,397	M 7×9, 9×9	●	●	●	●	●						
Anadex DP 9001A	£1,397	M 7×9, 11×9	●	●	●	●	●						
Anadex DP 9500	£1,397	M 9×9	●	●	●	●	●						
Anadex DP 9500A	£1,397	M 7×9, 9×9, 13×9	●	●	●	●	●						
Anadex DP 9500L	£1,295	M 7×9, 9×9	●	●	●	●	●						
Anadex DP 9501	£1,397	M 7×9, 11×9	●	●	●	●	●						
Anadex DP 9501A	£1,397	M 7×9, 11×9	●	●	●	●	●						
Anadex DP 9620A	£1,489	M 7×9, 9×9, 13×9	●	●	●	●	●						
Anadex WP 6000	£2,616	M up to 18×20	●	●	●	●	●						
ASP 3500	£977	M 9×7, 9×9	○	○	○	○	○						
Brother HRI	£747	Daisywheel	○	○	○	○	○						
Canon AP400	£1,140	Daisywheel	●	●	●	●	●						
Centronics 159/4	£962	M 9×7	●	●	●	●	●						
Centronics 150/4	£682	M 9×7	●	●	●	●	●						
Centronics 152/4	£788	M 9×7	●	●	●	●	●						

PRINTERS

Proportional spacing puts the same space between characters whether they are a long 'm' or a short 'i'. **Block graphics** builds up pictures using rectangular blocks, while **High Resolution Graphics** uses smaller dots. **Bidirectional** means the printer can save time by printing left to right and then doing the next line backwards right to left. Similarly, **Logic Seeking** enables the machine to save more time by printing the short lines without sweeping over the whole width of the page.

Feed methods comprise **fanfold** which uses continuous stationery sheets folded road-map style drawn into the printer by a tractor mechanism. The tractor cog fits into holes in the fanfold paper and takes the paper past the printer mechanism. **Roll** is a roll of paper that feeds into the printer, usually using **friction feed** where the paper is gripped between two rollers, typewriter-style. **Cut sheet** indicates the printer uses single sheets like a typewriter.

Distributor: to find which company distributes a particular add-on, use the code listed in this column to refer to the distributor table.

The table is at the end of the listings, and gives the distributor's name and telephone number.

PERIPHERALS

Make & Model	Price inc VAT	Printhead type (M = matrix)	INTERFACES					Max baud rate	Buffer Memory Size (in characters)	Lines per inch	Characters per inch	Max print Speed (CPS)	Max paper width in inches	Size (base area in cms)	Weight (in kilos)	Max Copies	Underlining	Bold Type	True Descenders	Proportional Spacing	Block Graphics	High Resolution Graphics	Bi Directional	Feed Method					Distributor		
			1-EEE	Centronics	20ma	RS232	Others																								
							Others ●																	Others (+)							
PRINTERS																															
Adler TRD 170	£833	Daisywheel	●	●	●	●	9600	256	6.8	10,12,15	17	198	15.5	56×37	13	6	●	●	●	●	●	●	●	●	●	●	●	●	T2		
Anadex DP 9000A	£1,397	M 7×9, 9×9	●	●	●	●	9600	2700	6.8	10,12,5,15,16,7	200	106	9.5	40.9×57	13.6	6	●	●	●	●	●	●	●	●	●	●	●	●	●	I1	
Anadex DP 9001A	£1,397	M 7×9, 11×9	●	●	●	●	9600	2700	6.8	10,12,5,15,16,7	200	132	9.5	40.9×57	13.6	6	●	●	●	●	●	●	●	●	●	●	●	●	●	I1	
Anadex DP 9500	£1,397	M 9×9	●	●	●	●	9600	700	6.8	10,12,13,3	200	176	15.5	39×59.9	16	6	●	●	●	●	●	●	●	●	●	●	●	●	●	I1	
Anadex DP 9500A	£1,397	M 7×9, 9×9, 13×9	●	●	●	●	9600	2700	6.8	10,12,13,3	200	176	15.5	40.9×70.3	16	6	●	●	●	●	●	●	●	●	●	●	●	●	●	I1	
Anadex DP 9500L	£1,295	M 7×9, 9×9	●	●	●	●	9600	700	6.8	10	150	132	15.5	39×59.9	16	6	●	●	●	●	●	●	●	●	●	●	●	●	●	I1	
Anadex DP 9501	£1,397	M 7×9, 11×9	●	●	●	●	9600	2700	6.8	10,12,5,15,16,7	200	220	15.5	39×59.9	16	6	●	●	●	●	●	●	●	●	●	●	●	●	●	I1	
Anadex DP 9501A	£1,397	M 7×9, 11×9	●	●	●	●	9600	2700	6.8	10,12,5,15,16,7	200	220	15.5	40.9×70.3	16	6	●	●	●	●	●	●	●	●	●	●	●	●	●	I1	
Anadex DP 9620A	£1,489	M 7×9, 9×9, 13×9	●	●	●	●	9600	1500	6.8	10,12,15,16,4	200	216	15.5	40.9×70.3	16	6	●	●	●	●	●	●	●	●	●	●	●	●	●	I1	
Anadex WP 6000	£2,616	M up to 18×20	●	●	●	●	19200	4500	6,8,12,16	10,12,16,7	285	220	15.5	46.7×74.9	25	6	●	●	●	●	●	●	●	●	●	●	●	●	●	M1	
ASP 3500	£977	M 9×7, 9×9	○	○	○	○	9600	80	6.8	10,12,16,5	180	217	14	61.5×40.5	19	6	●	●	●	●	●	●	●	●	●	●	●	●	●	J1	
Brother HRI	£747	Daisywheel	○	○	○	○	9600	2000	4,5,6	10,12,15	35	198	16.5	38.1×71.2	16	8	●	●	●	●	●	●	●	●	●	●	●	●	●	D1	
Canon AP400	£1,140	Daisywheel	●	●	●	●	19200	4000	4,6,8	10,12,15	25	197	15.5	50.8×48.2	18.5	6	●	●	●	●	●	●	●	●	●	●	●	●	●	B1	
Centronics 159/4	£962	M 9×7	●	●	●	●	9600	768	6	5.8,18,10,16,36	150	80	10	38×35.6	10	5	●	●	●	●	●	●	●	●	●	●	●	●	●	R1	
Centronics 150/4	£682	M 9×7	●	●	●	●	9600	768	6.8	10,12,16,36	150	132	9.5	38.1×35.5	9.1	3	●	●	●	●	●	●	●	●	●	●	●	●	●	R1	
Centronics 152/4	£788	M 9×7	●	●	●	●	9600	708	6.8	10,12,16,5	150	217	9.5	38.1×35.5	9.1	3	●	●	●	●	●	●	●	●	●	●	●	●	●	R1	

PRINTERS

PRINTERS

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PRINTERS

	£1,259	Thermal 7×5							9600	256	6	10,17	120	80	8.5	40.6×15.24	8.5	1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
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MONITORS

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

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

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

Dimensions indicates the area the unit occupies on the desktop.

Make & Model	Price inc VAT	Screen size (in inches)	Signal				Audio channel	Anti-glare filter	Band width (in Mhz)	Dot resolution	Dimensions (cms)	Weight (kilos)	Distributor
			Modulated PAL	Unmodulated PAL	TTL RGB	75 Ohm linear	32 bit 4 bit TTL						
Crofton C1401	£300	14	●						10	600	37x42	10	C4
HM 2713	£3,120	13	●						25	720	54x40	36	B1
HM 2719B	£2,553	19	●						25	960	50x49	46	B1
HM 2719C	£3,042	19	●						25	960	50x49	46	B1
HM 3619	£3,548	19	●						45	1280	50x44	48	B1
Lion Cub 1431-TTL	£286	14	●						7	585	65x57.5	11.5	S6
Lion Cub 1436	£316	14		●					7	585	65x57.5	11.5	S6
Lion Cub 1439	£339	14		●					7	585	65x57.5	11.5	S6
Lion Cub 1441-TTL	£546	14	●						15	585	65x57.5	11.5	S6
Lion Cub 1445	£633	14		●					15	895	65x57.5	11.5	S6
Lion Cub 1449	£604	14		●					15	895	65x57.5	11.5	S6
Lion Cub 1451-TTL	£430	14	●						10	653	65x57.5	11.5	S6
Lion Cub 1455	£483	14		●					10	653	65x57.5	11.5	S6
Lion Cub 1459	£459	14		●					10	653	65x57.5	11.5	S6
Lion Cub 2031-TTL	£344	20	●						7	585	65x57.5	11.5	S6
Lion Cub 2035	£431	20		●					7	585	65x57.5	11.5	S6
Lion Cub 2036	£390	20		●					7	585	65x57.5	11.5	S6
Lion Cub 2039	£371	20		●					7	585	65x57.5	11.5	S6

COLOUR MONITORS

Make & Model	Price inc VAT	Screen size	Composite video	Audio channel	Mono tint	Anti-glare filter	Band width (Mhz)	Dot resolution	Dimensions (cms)	Weight (kilos)	Distributor
AVT DM 210G	£138	12	●		Green	●	12	750	30.8x29.6	9.5	L1
EG 100	£77	12	●		Green		8	700	37.5x29	8	L1
EG 101	£91	12	●		Green		12	700	37.5x29	8	L1
LEDM 091D	£99	9	●		B&W	●	12	750	22x24	5.4	L1
LEDM 0910	£121	9	●		Green	●	12	750	22x24	5.4	L1
Luxor 10	£212	10	●		Orange	●	22	625	N/A	8	P1
Luxor 15	£283	15	●		Orange	●	22	625	N/A	13	P1
M9	£131	9	●		Green	●	15-22	650	22.4x25.7	5.7	P1
M12	£144	12	●		Green	●	15-22	800	29.3x30	9.3	P1
Novex	£114	12	●		Green	●	12	750	N/A	N/A	P1
N12 1003	£112	12	●		Green	●	24	800	23x26.5	7	P1
Prince	£126	12	●		Green	●	24	800	33x50	7	C4
PM 102	£126	9	●		Green	●	24	800	22x28	7	C4
PM 1201	£138	12	●		Green	●	24	800	33x50	7	C4
Zenith ZVM121	£99	12	●		Green	●	15	N/A	29x29	6.5	P2

MONOCHROME MONITORS

Make & Model	Price inc. VAT	Screen size	Composite video	Audio channel	Mono tint	Anti-glare filter	Band width (Mhz)	Dot resolution	Dimensions (cms)	Weight (kilos)	Distributor
Lion Cub 2051-TTL	£646	20	●		TTL RGB	●	10	940	65x57.5	11.5	S6
Luxor Digital	£574	14	●		75 Ohm linear	●	25	800	N/A	15.7	P1
Luxor Linear I	£597	14	●		Unmodulated PAL	●	25	800	N/A	15.7	P1
Luxor Linear II	£643	14	●		Modulated PAL	●	25	800	N/A	15.7	P1
Microtech 14	£402	14	●			●	18	585	33.7x40.8	12.6	M6
TM 22	£329	6	●			●	5.5	N/A	22x34.5	4.1	J3
VM 14 PSN	£378	14	●			●	5.5	300	47x40	13.6	J3
Wolf Cub 1435-TTL	£358	14	●			●	7	653	65x57.5	11.5	S6
Wolf Cub 1446-TTL	£587	14	●			●	15	895	65x57.5	11.5	S6
Wolf Cub 1456	£454	14	●			●	10	653	65x57.5	11.5	S6

DISK DRIVES

This section is divided into categories covering 5 1/4 in and 8 in floppy drives.

Disk data **capacity** is measured in kilobytes (K): one kilobyte = 1,024 characters. A **no of disks** column is included because some disk units contain two disk drives.

Manufacturers can vary the number of disk data **tracks** and these are divided into sectors. This **sectoring** system allows the information to be stored and retrieved by reference to a timing mark on the disk so the computer can keep track of its rotation. The system can be hard, where reference is kept by a hole in the disk, or soft, where the disk position is monitored by magnetic signals.

Some drives have one read/write head for each side of the disk so the buyer has a choice between **single** or **double-sided** drives. **BS** means that the drives are both single and double-sided.

As disk technology advanced it became possible to cram more data onto the floppy so drives will feature either **single** or **double** (data) **density**. **BD** means that the drives are both single and double density.

The interface acts as an interpreter so the computer and disk can exchange information. Each device must have the same interpreter before a useful cable connection can be made. The **connect** to column allows you to match the disk interfaces to those included in the disk drives or available at extra cost.

Make and Model	Price inc VAT	Capacity	No. of disks	Tracks	Sectoring	Sides and density	Connects to	Distributor
							Apple II BBC RS232 I-EE	St. Shugart Nasbus Gemini 20ma Others
5 1/4" DISK DRIVES								
Atari	£299	90K	1	40	Soft	SS,SD		A4
BASF 6106	£195	500K	1	48	Both	SS,BD		B6
BASF 6108	£240	500K	1	48	Both	DS,BD		B6
BASF 6118	£279	1Mb	1	96	Both	DS,BD		B6
Canon X8300	£600	640K	2	80	Soft	DS,DD		C5
CD 40	£679	400K	2	40	Both	SS,BD		C6
CD 50A	£424	500K	2	40	Both	SS,BD		C6
CD 50E	£569	1Mb	2	80	Both	SS,BD		C6
CD 50F	£712	2Mb	2	80	Both	DS,BD		C6
CD 80	£765	800K	2	80	Both	SS,BD		C6
CD 80D	£949	1.6Mb	2	80	Both	DS,BD		C6
Commodore 2031	£454	171K	1	35	Soft	SS,DD		C2
Commodore 4040	£799	343K	2	35	Soft	SS,DD		C2
Commodore 8050	£1,029	1Mb	2	77	Soft	SS,DD		C2
Commodore 8250	£1,489	2Mb	2	154	Soft	DS,DD		C2
Commodore VIC 1541	£345	171K	1	35	Soft	SS,DD		C2
Control Data 9408	£221	250K	1	40	Both	SS,BD		C7
Control Data 9409T	£272	500K	1	40	Both	DS,BD		C7
Control Data 9409T	£420	1Mb	1	80	Both	DS,BD		C7
Control Data ZL141	£225	250K	1	40	Both	SS,DD		M5
Control Data ZL141B	£175	250K	1	40	Both	SS,DD		M5
Control Data ZL142	£360	500K	2	40	Both	SS,DD		M5
Control Data ZL241B	£240	500K	1	40	Both	DS,DD		M5
Control Data ZL291	£380	1Mb	1	80	Both	DS,DD		M5
Control Data ZL291*	£405	500/1Mb	1	40/80	Both	DS,DD		M5
Control Data ZL291B	£320	1Mb	1	80	Both	DS,DD		M5
Control Data ZL292	£640	2Mb	2	80	Both	DS,DD		M5
CS 40	£482	200K	1	40	Both	SS,BD		C6
CS 50A	£229	250K	1	40	Both	SS,BD		C6
CS 50E	£305	500K	1	80	Both	SS,BD		C6
CS 50F	£397	1Mb	1	80	Both	DS,BD		C6
CS 80	£523	400K	1	80	Both	SS,BD		C6
CS 80D	£627	800K	1	80	Both	DS,BD		C6
Cumana AS100	£252	200K	1	35	Soft	SS,BD		C6
Cumana DA8035	£857	655K	2	80	Soft	SS,BD		C6

Make and Model	Price inc VAT	Capacity	No. of disks	Tracks	Sectoring	Sides and density	Connects to	Distributor
							Apple II BBC RS232 I-EE	St. Shugart Nasbus Gemini 20ma Others
EG 401AT	£370	102K	2	40	Soft	SS,BD		L1
Gemini 825	£403	400K	1	80	Soft	SS,DD		G2
Gemini 825	£518	800K	1	160	Soft	DS,DD		G2
Gemini 825	£661	800K	2	80	Soft	SS,DD		G2
Gemini 825	£776	1.6Mb	2	160	Soft	DS,DD		G2
Lowe EG 400AT	£426	200K	2	40	Soft	SS,BD		L1
Lowe EG 400T	£253	102K	1	40	Soft	SS,BD		L1
M 4853	£311	1Mb	1	80	Soft	DS,DD		A3
M 4854	£368	1.6Mb	1	77	Soft	DS,DD		A3
Megastore M10S	£1,034	1.2Mb	2	80	Soft	DS,DD		V1
Multi Floppy Drive	£592	8Mb	5	770	Soft	SS,DD		H1
RM MDS-1	£1,950	144K	1	40	Soft	DS,DD		R3
RM MDS-2	£2,147	288K	2	40	Soft	DS,DD		R3
Scorpio 8	£863	8Mb	5	770	Soft	SS,DD		H1
Sharp MZ80 FB	£856	560K	2	70	Soft	DS,DD		S7
Tandy Colour	£449	175K	1	40	Soft	SS,DD		T1
Tandy 26-1160	£299	75K	4	40	Soft	SS,DD		T1
Tandy 26-3023	£299	156K	4	35	Soft	SS,DD		T1
Tandy Model 1	£389	90K	1	35	Soft	SS,DD		T1
Tandy Model 111	£369	175K	2	40	Soft	SS,DD		T1
TM 101-4	£282	1Mb	1	160	Soft	SS,DD		H1
TM 102-2	£393	2Mb	1	160	Soft	SS,DD		H1
TM 848-1	£389	800K	1	77	Soft	SS,DD		H1
TM 50-1	£147	250K	1	40	Soft	SS,DD		H1
TM 100-1	£158	250K	1	40	Soft	SS,DD		H1
TM 100-2	£221	500K	1	80	Soft	DS,DD		H1
TM 100-4/4M	£247	1Mb	1	160	Soft	DS,DD		H1
Tracker 1	£373	1Mb	2	80	Soft	SS,DD		D7
Tracker 2	£497	2Mb	2	80	Soft	DS,DD		D7

Make and Model	Price inc VAT	Capacity	No. of disks	Tracks	Sectoring	Sides and density	Connects to	Distributor
							Apple II BBC RS232 I-EE	St. Shugart Nasbus Gemini 20ma Others
ACP 700 (AC)	£293	1Mb	1	77	Soft	DS,DD		E2
ACP 750 (DC)	£316	1Mb	1	77	Soft	DS,DD		E2
ACP 1500 (DC)	£403	2Mb	1	77	Soft	DS,DD		E2
Caldisk 142M	£465	500K	1	77	Both	SS,BD		E2
Caldisk 143M-1	£522	1.2Mb	1	77	Both	DS,BD		F1
Commodore 8280	£2,760	987K	2	77	Soft	DS,DD		F3
Canon X 8330	£1,200	2Mb	2	153	Soft	DS,DD		C2
Control Data 9404B	£684	800K	1	77	Both	SS,BD		C5
Control Data 9406-4	£1,144	1.6Mb	1	77	Both	DS,BD		M5
Eicon FD8/1D/DD	£1,438	1Mb	1	77	Soft	SS,DD		E3
Eicon FD8/1D/SD	£1,397	500K	1	77	Soft	BS,SD		E3
Eicon FD8/2D/FBR	£1,740	1Mb	2	77	Soft	DS,SD		E3
Eicon FD8/2D/DD	£2,013	2Mb	2	77	Soft	SS,DD		E3
Eicon FD8/2D/SD	£1,972	1Mb	2	77	Soft	SS,SD		E3
Eicon FD8/1D/FBR	£1,240	500K	1	77	Soft	DS,SD		E3
F 311	£1,725	1.2Mb	2	76	Soft	DS,SD		B5

8" DISK DRIVES

8" DISK DRIVES

	F 320	E2,300	2.4Mb	2	76	Soft	DS-DD					B5
M 2894		£499	1.6Mb	1	77	Soft	DS-DD					A3
M 2896		£493	1.6Mb	1	77	Soft	DS-DD					A3
Megastor 11 DD		£1,133	2Mb	2	77	Soft	DS-DD					V1
Megastor 11SD		£1,018	1Mb	2	77	Soft	DS-SD					V1
Megastor 111		£1,121	2Mb	2	77	Soft	DS-DD					V1
R.M. FDS-2		£3,789	1Mb	2	77	Soft	DS-SD					R3
Tandy Model 11		£999	486K	1	77	Soft	DS-SD					T1
Tandy Model 16		£949	1.2Mb	1	77	Soft	DS-DD					T1
Tandy Model 16		£1,549	2.5Mb	2	77	Soft	DS-DD					T1

MODEMS

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

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

Some modems can **originate** a call or start a two-way conversation. **Answer** means they can respond to a call from another computer.

Make and Model	Price inc VAT	Connection	Data Rates (baud)	Interface	Others	Capabilities						Distributor Code
						Asynchronous	Simplex	Half Duplex	Full Duplex	Originate	Answer	
AJ 311	£320	B	300	RS232		●		●	●	●	●	A5
AJ 1222	£736	D	1200	RS232			●				●	A5
AJ A211	£263	A	300	RS232		●			●	●	●	A5
AJ 1234	£684	A	1200	RS232					●	●	●	A5
AJ 1256	£684	B	1200	RS232		●			●	●	●	A5

DISTRIBUTORS

A1 Appropriate Technology, 01-625 5575 **A2** Advent Data Products, Melksham 706289 **A3** Allox Microcomputers Ltd, Reading T91579 **A4** Atari International (UK), Slough 33344 **A5** Anderson Jacobson Ltd, Slough 25172
B1 Bytech, Reading 61031 **B2** British Olivetti, 01-785 6666 **B3** Barron McCann, Biggleswade 316286 **B4** Bencom Sendata (UK), 01-940 1386 **B5** Baydel Ltd, Leatherhead 378811 **B6** BASF, 01-388 4200
C1 Centronics, 01-581 1011 **C2** Commodore Business Machines, Slough 79292 **C3** Calcomp Ltd, Bracknell 50211 **C4** Crofton Electronics, 01-891 1923 **C5** Canon (UK) Ltd, 01-680 7700 **C6** Cumana, Guildford 503121 **C7** CBL, Reading 792097
D1 Discom, Evesham 3591 **D2** Dalratrade Ltd, Northampton 22289 **D3** DNCs Ltd, 061-643 0016 **D4** DRG, Weston-super-Mare 415398 **D5** Data Systems Division, Bedford 223889 **D6** Data Efficiency, Hemel Hempstead 63561 **D7** Data Track Technology, New Milton 619650 **D8** Dacom Systems, Milton Keynes 676797
E1 Epson (UK), 01-900 0466 **E2** Elecomatic, 041-881 5825 **E3** Eicon, Barnhill 81825 **E4** Environmental Equipments Northern Ltd, Nantwich 625115
F1 Fastcol, Reading 791557
G1 Geveke Electronics, Woking 26331 **G2** Gemini Micros, Amersham 28321
H1 HAL Computers Ltd, Farnborough 517175 **H2** Haywood Electronic Assoc. Ltd, 01-428 0111
I1 Informer Ltd, 01-318 4213 **I2** Inlac Data Systems, Rotherham 547170 **I3** ITT Business Systems, Brighton 507111 **I4** ITT Consumer Products, Basildon 3040 **I5** Intelligent Interfaces, Stratford-upon-Avon 296879

AM 211	£387	B	300		RS232				A5
Bermac 1200/1 Model A	£414	D	1800		RS232				B3
Bermac 1200/1 Model B	£460	D	1800		RS232				B3
CCTT CAT	£228	A	300		RS232/V24				D8
CDSV22	£719	D	1200		RS232/V24				D8
DSL2123	£329	D	300/1200		RS232/V24				D8
Sendata 700 Series A	£253	A	300	1	RS232, 20ma				B4
Sendata 700 Series B	£224	A	300	1	RS232, 20ma				B4
Sendata 700 Series C	£309	A	600-1200	1	RS232, 20ma				B4
Sendata 700 Series D	£309	A	75-1200	1	RS232, 20ma				B4
Sendata 700 Series E	£149	A	300-1200	1	RS232, 20ma				B4
Racal 126 LS1	£782	D	2400		V24				R2
Racal MPS 3021	£295	D	300		V24				R2
Racal MPS 1222	£678	D	1200		V24				R2

PLOTTERS

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

Make and Model	Price inc VAT	Type	Max Pens	Paper Size	Maximum Plotting Speed in secs.	Interface (+ at extra cost)	Distribution
Calcomp 81	£3,392	Flat	8	A3	30cm	RS232 or IEEE	C3
HP 7470A	£1,317	Drum	2	A4	38.1cm	RS232 (IEEE+)	H2
PD4	£585	Flat	1	A4	700mm	(IEEE+)	J2
Strobe 100	£662	Drum	1	A4	7.6cm	(RS232, Parallel+)	D6
TRS-80 Pen Plotter	£1,399	Flat	6	A4	6.8cm	RS232	T1
Watanabe WX 4633	£2,772	Flat	10	A3	250mm	(Centronics, RS232, IEEE+)	E4
Watanabe WX 4634	£2,515	Flat	2	A3	250mm	(Centronics, RS232, IEEE+)	E4
Watanabe WX 4635	£2,301	Flat	1	A3	250mm	(Centronics, RS232, IEEE+)	E4
Watanabe 4636	£3,074	Flat	10	A3	400mm	(Centronics, RS232, IEEE+)	E4
Watanabe 4637	£2,862	Flat	2	A3	400mm	(Centronics, RS232, IEEE+)	E4
Watanabe 4638	£2,635	Flat	1	A3	400mm	(Centronics, RS232, IEEE+)	E4
Watanabe WX 4671	£1,129	Flat	1	A3	50mm	Parallel (RS232, IEEE+)	E4
Watanabe 4675	£1,638	Flat	6	A3	50mm	Parallel (RS232, IEEE+)	E4
Watanabe 4731	£1,761	Drum	4	A3	200mm	(Centronics, RS232, IEEE+)	E4

J1 Jones & Brother, 061-330 6531 **J2** J J Lloyd Instruments, Locksheath 4221 **J3** JVC, 01-450 2621

L1 Lowe Electronics. Matlock 4995

M1 Mitsui & Co Ltd 01-600 1777 **M2** Modata Tunbridge Wells 41555 **M3** Monnemann Tall, Ltd Pa

MT Mitsui & Co Ltd, 01-600 1777 M2 Modata, Lunbridge Wells 41555 M3 Mannesmann Tally Ltd, Re
Macclesfield 615384 M5 Microvera 01-272 6227 M6 Microtech Leeds Leeds 67654

Macclesfield 615384 M5 Microware, 01-272 6237 M6 Microtech Leeds, Leeds 679964

N1 Newbury Data Recording, Newbury 48864

P1 Phoenix Technology, 01-737 3333 **P2** Pete & Pam Computers, Rossendale 227011

Q1 Qume (UK) Ltd, Reading 584646

R1 Rair Ltd. 01-836 6921 **R2** Riva Terminals. Woking 71001 **R3** Research Machines Ltd. Oxford 240

S1 Sintron Electronics Reading 875464 **S2** Sord 01-930 4214 **S3** Statron Coventry 612521 **S4** Sun
RI Hall Ltd, 01-836 6921 **HZ** Hiva Terminals, Woking 71001 **R3** Research Machines Ltd, Oxford 249

S1 Sihtron Electronics, Reading 8/5464 **S2** Sord, 01-930 4214 **S3** Stotron, Coventry 613521 **S4** Sys

S5 Sinclair Research, Camberley 681666 **S6** Sillicon Express, Leicester 274017 **S7** Sinter

S5 Sinclair Research, Camberley 681666 **S6** Silicon Express, Leicester 374917 **S7** Sharp Electronics

T1 Tandy Company, Walsall 648181 **T2** Triumph Adler, 01-250 1717 **T3** Technology For Business, 01-250 1717

Office International, Sunbury-on-Thames 85666

V1 Vlasak, High Wycombe 448633

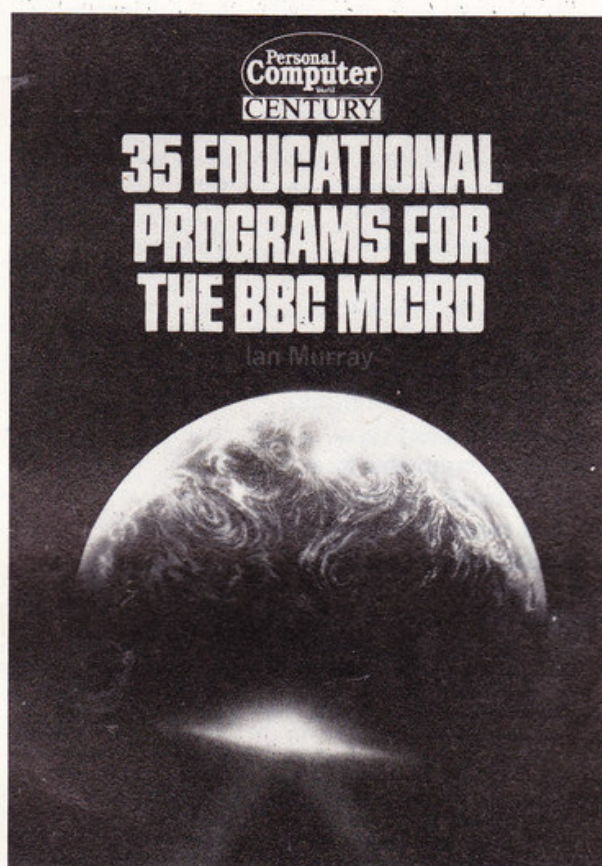
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CENTURY

Philips G7000 videogame, 16 cartridges including Muchkin (Pac-man), Space Invaders, Satellite Attacks (asteroid), Black Jack and various others. Also included a dust cover and TV/aerial combiner, £200. Tel: Glasgow 041-883 3589.

BBC Model B, one month old with cassette cable and blank tapes, Acorn Users magazines, mint condition, hence £400. Also Rocket-Raid and Monsters at half list price. Tel: Kang on 01-703 4621 evenings/weekends.

Sinclair ZX81 16K with manual, leads etc. boxed, over 150K software on tape inc. Invaders, Scramble, Breakout, Football Manager, £75. Tel: Johnstone (Scotland) 24183.

Atari TV game + five cartridges, Combat, Space Invaders, Missile Command, Defender and Pac-man. Also cartridge box, £110 ono. Tel: Bathgate (0506) 52290.

Video Genie 16K, Much software inc level III basic, EDTASM, Databases, etc. Also included printer interface, manuals, original packing, etc. £175 or exchange for DOT matrix printer. Tel: 01-761 1692 (Dulwich, S London).

Open University course PT502, Microprocessors and Product Design, 8085 based development system. Proper Keyboard, peripheral board with motor, speaker, thermistor etc to model virtually any product. Complete course work, £270. Tel: Paul on 01-991 0029.

48K Spectrum, perfect condition, £160 software including Pimania, Schizoids, Hobbit, Timegate, Orbiter, Black Crystal, Assembler, Chess, Ground Attack, Intruders, Gnasher, Escape, Flight Simulator and many more. Only £180. Tel: Mark (Ruislip) 35966.

Good computer books, hardly used, eg Programming The Z80 and four other books about computing and Basic. Tel: 01-864 4581.

TRS-80, Level 2 plus high resolution graphics, monitor, cassette deck and over 40 programs. Total cost over £700. Sell for £350 ono. 8 Woodlands Park Road, Maidenhead, Berkshire or tel: Maidenhead 73707 after 5pm.

Atari VCS complete with 11 cartridges including Space Invaders, Basketball, Superman. Cost new around £320. Will accept £100. Might separate. Tel: Southampton (0703) 787036.

ZX81 and 16K RAM with Dean high quality keyboard and metal case with space bar and six extra keys, also £90 worth of best software available. Will accept £120. Tel: 01-654 6986 (Croydon).

Exchange Mattel Intellivision plus cartridges (all boxed as new) for Atari 400 or 800 computer. Tel: Wolverhampton (81) 759970.

Dragon 32K, plus £200 worth of software and joystick. Only £250. Tel: 01-997 9708 after 7pm.

ZX81 16K two months old with computer tape recorder, sound box, manual and five game tapes. £100. Tel: 051-334 6316 after 5pm.

Centronics printer, 64 ASCII characters only. (No graphics). Standard Centronics Interface. Will run on Dragon 32, BBC, Oric, Bi-directional industrial quality, with stand. £150. Tel: 01-856 1198 after 8.30pm.

ZX81, 16K plus power pack, leads, manual, very good condition. Worth £70, will accept £60-£65. Robert Pearson, 11 Fernleigh Gardens, Doxey Fields, Stafford ST16 1HA. Tel: 52207 after 7.30pm weekdays. Plus magazines.

Pet 4032 computer, Basic 2 and Basic 4. Textool ZIFs on main PCB. Comes with JCL eeprom programmer, IEEE to Centronics interface, programs and manuals. £375. Nuttall, Guildford. Tel: (0483) 892217.

Vic-20 + C2N Switchable 10K-RAM Adventureland, Star Battle, River Rescue, Starquest and Encounter Prog, Night Flight, Blitz, and many more, with joystick, very good condition, only four

PCN Billboard

months old. Costs around £375. Will accept £230. Tel: Lee on 01-941 0619 after 4pm weekdays.

Atari VCS with six cartridges — Pac-Man, Defender, Space Invaders, Asteroids, Combat and Tennis. Cost owner £230, good condition, paddles, joysticks and all leads included. Only £150. Tel: (0793) 764338 (Swindon).

Vic-20 Software for sale, Frogger, Cosmo, Shark Attack, Blitz, plus Getting Acquainted With Your Vic-20, £18 the lot. Wanted Super Expander or Programmer's Aid Cartridges. Tel: 061-368 6935 after 6pm.

Sharp MZ80K1, 19 months old, excellent condition, four languages, Knight Commander, Copy File, plus approx 185 programs, dust cover, £430 or will swap for BBC B. Tel: 0264 58454 evenings.

Casio FX502P programmable pocket computer complete with cassette interface unit, manuals, case, overlay cards etc. Music facility. Cost about £100 originally, will accept £50. Phone: 01-531 2892 evenings/weekends.

BBC B two months old, mint condition, original packing, including Welcome package cassette lead £360 ono. Telephone 0384-64345 office hours only. Ask for Idris. Can deliver Birmingham area.

ZX81+, 16KRAM also Kayde's 4K graphics board and high resolution

tractor feed up to 10-inch paper, under guarantee. New £290, yours for £240. Tel: 08692-2831.

Casio-702P with manual and printer, good condition for use, £80. And Casio-3600P programmable with Integration. £10. Write to C Chan, 21 Bunbury Road, Northfield, B'ham B31 2DR.

UK101 8K cased 1.2MHz new monitor 300 and 600 baud rates, large quantity of software £75 ono. Ring March 55871 evenings only.

Tandy Colour Computer? Five games written in Basic. Learn programming techniques, includes Lander. Tel: Mark Davies (0922) 691618. Requires 16K or 32K extended Basic.

Atari VCS perfect condition, complete with all accessories. 14 cartridges including star raiders, Warlords, Missile Command, Adventure, Indy 500, Asteroids, Basic Programming. £200. Ring 01-578 5938 evenings + weekends.

MPFII computer 64K Applesoft compatible 3 months old, hardly used. Cost £284. Will sell for £175 ono. Telephone Skelmersdale 25190 after 6pm or weekends.

48K Spectrum, Modeller, Superview, Masterfile, Spectsound, Timegate, Meteors, Horizons, Print 'n' Plotter Jotter, +2 demo tapes; all excellent

joystick and £400 worth of software. £350 ono for quick sale. T. Wilson, 21 Cheriton Field, Fulwood, Preston, Lancs. PR2 3WH.

ZX81 16K RAM professional keyboard, £25 of books, £60 of software, plus ZonX81 sound board, worth £200, sell for £100 ono. Contact 720-4531 after 4pm. Complete with leads.

Swap or sell two-month-old VIC-20 + books, £105 or swap for 16K Spectrum with tapes or preferably 48K Spectrum. Quick sale. (Snaresbrook) Tel: 01-989 4307 ask for Neil.

Will swap — a 6ft x 3ft snooker table and accessories, new unwanted Xmas gift, for Vic-20 expanded or unexpanded. Phone 01-300 3073.

ONE BBC Computer for quick sale. Excellent condition, seven cassettes, including magazines, and manuals. Accept £175 ono. Tel: 444 1580 after 6pm, ask for Roger.

Epson HX-20 complete with micro cassette and case bought £480 sell practically unused £350 including cables, manuals, extra ribbon and cassettes. Tel: 01-883 5153 all day.

Acorn Atom 12K + 12K F.P. PSU. Software: Pacman, Invaders, Galaxian, Scramble, Asteroids, Startrek, etc. £200. Tel: Southend (0702) 202142.

Sharp MZ80K 48K RAM with SP5025, Xtal Basic and manuals, also software including Startrek, Valley, Dark Star, Mexican Adventure, Wizards Castle and many more. £300. Tel: Bradford 0274 668247 after 6pm please.

Do you write space games or adventure games for the ZX81 or Spectrum? I'm a beginner and would like some hints. A Bone, 138 Singwell Road, Gravesend, Kent, England.

Wanted. Any Spectrum software for 16K or 48K. Especially The Hobbit and Flight Simulation. Phone Gravesend (0474) 332477 after 5pm and ask for Andy. Many thanks.

16K ZX81. Games for sale: Scramble £1, Asteroids £1, Flight Simulation £1.50, Breakout £1. Phone Gravesend (0474) 332477 after 5pm and ask for Andrew. Great Bargains!! (copies).

ZX81 64K and seven games tapes. Cost around £140 going for only £90. Tel: Horndean 595304.

ZX81 1K plus cassette with six games £30 ono. Also super programs 1 and 20 £4 each ono. Nigel Magowan, 46 Drumlough Road, Hillsborough, Co Down BT26 6PX.

For sale, Atari video computer system, two joysticks, two paddles, plus two free cartridges Pacman and Combat. Tel: 63609 Jason Boswell, The Chase (PH) Thetford, Norfolk, Anglia.

Texas TI-59 magnetic card programmable calculator, C/W printer Aviation module, separate power supply/charger & manuals. Tel: 01-958 5600 anytime.

ZX81 plus 16K RAM pack, software plus another 140+ 1-16K games on six cassettes, Sinclair books and magazines plus Sinclair recommended tape recorder with tape counter. Will accept first offer of £90. Tel: Southport 60079.

Oric-I game-tapes The Castle and Oric Flight as new, £12 only. Computer's been sold. C Kong, 24 Horton Park Avenue, Bradford BD7 3BL, West Yorkshire.

Atari VCS and eight cartridges: Space Invaders, Pacman, Asteroids, Starmaster, Dragster etc. All leads and controllers, £130 ono. Tel: Hertford 551173 (after 6pm).

Pet 4032, all manuals, software cassette unit, lots of extras, £300 ono. Tel: 0908 677931.

Acorn Atom 12K+12K, VIA. Floating Point, colour board (not fitted), manuals and data sheets, software includes Backgammon, Invaders, 3D Maze, Minefield, adventure-type game and more. PSU included. £200. Tel: 0480 212904.

I've got a huge collection of software for the BBC, Dragon, Spectrum, ZX81 or

The overwhelming response to PCN's Billboard service is causing delay in publication of some advertisements. To solve this growing backlog and to cover some of the publication costs we propose to make a small charge for each ad. So to take advantage of the free service while it lasts get your completed form to PCN's offices at 62 Oxford Street, London W1A 2HG by Friday, June 10. Every form received after this date must be accompanied by a postal order or cheque for £1.50 made payable to VNU Business Publications. And remember — we can publish only non-business advertisements sent in on the Billboard form provided.

toolkit. Games and book. Total worth £130, still under guarantee. Bargain at £80. Telephone 021-360 1896, after 3pm.

16K ZX81 all leads, books including games like Defender, Gold, Island and more books etc. The lot £65. Also wanted Texas TI99/4A complete, please phone Tenterden 4726.

48K Spectrum, printer, software £50. Magazines 3 rolls of printer paper. 7 months guarantee, original packing, worth £350. Sell for £230. Telephone Farn 58497 after 6pm.

TI99/4A software modules. Tombstone City £15. Addition and Subtraction II £15. Also Editor/Assembler manual £12 and Teach Yourself Basic (two cassettes) £5. Phone: 01-206 0796 evenings/weekends.

Spectrum. Software swap: Arcadia, QS Chess Player, QS Meteor Storm, Great Britain Ltd., Ground Attack (Silversoft), for other Spectrum software. Tel: Michael 01-340 2630 (Archway/Highgate).

Free booklet with ZX81 1K games pack: Defender (three attack waves), Oxo and Pontoon (play computer), Horse Racing (exact simulation) and many more. Only £1.50, G Parkes, 18 Field View, York, YO3 6EJ.

Wanted Dragon 32K, plus leads and any software, preferably in Yorkshire area. Details please and price to Paul 0535 272726 after 5pm urgent.

Star DP 8480. High res graphics friction/

condition; all available documentation, just £215 ono. Amazing offer! Phone: 01-866 1444 after 7pm.

WANTED BBC Model B in good condition. Tel: Holywell 713531 eves or weekend.

48K Spectrum for sale excellent condition + plenty of software (Hobbit + time-gate + Pimania etc.). Manual misplaced but Spectrum book, therefore only £120. Phone: 0382-74559 (Dundee) and ask for David.

ZX81 unwanted cassettes include Flight Simulation, £3.50. Gulp £1.50. 3D Monster Maze, £3. 1K Breakout, £1 or all for £8. Tel: Neil on Fareham 237806 after 6pm.

Atari 400 software original 16K tapes, excellent condition. Caverns of Mars £12, Ghost Hunter £10, Rearguard £7, Sunday Golf £7, Chicken ROM £10. Phone Swanley 69281.

BBC Model B (OS 1.2) + disk interface + drive, cassette player, manuals, leads etc. Also tons of software inc. Machine Code monitor in ROM. Only £699, sell disk separately if required. Phone Uxbridge (0895) 35129.

Sell swap Sony TC377 open reel stereo recorder Ditton 161, Denton speakers Avo 7 needs repair, £70, £60, £25, each or want computer etc. Mel Saunders, 7 Drumliff Rd, Leicester.

VIC-20 cassette, Machine Code monitor 8K RAM expansion, 3 slot mother-board, Machine Code and Basic books,

V-Genie computers. Ready to swap? Call: 01-455 5743.

ZX Spectrum unwanted present 16K, with 8 game tapes and cassette recorder, program games book, worth £190. The lot for £130. Phone: 578 4961 after 7pm. Greenford, Middx.

BBC software to swap for other software, particularly utilities and adventures but anything considered. Tel: 061-225 2769, ask for Paul.

Intellivision TV game with voice module and B17 Bomber, plus 12 more games, cost £500. For quick sale only £225 ono. Tel: 01-891 3079.

Newbrain word processor options include save/load to tape, paged organisation, directory look-up, full error detection, advanced text packing. Most normal w/p functions. Manual, cassette, £5. K. Polston, 19 Marshalls Drive, Romford, Essex RM1 4JR.

ZX81 (16K) Kempston keyboard, ZonX sound unit, games book, £20 worth of software and manual, leads etc. Worth £170. Bargain at £127 ono. Phone: S. Kenton on 660-6007 after 4.15 pm. Inc Spectrum Extension board.

Wanted urgently, Sharp MZ80B cash waiting, good price paid. Watford 46955.

Sharp converter tapes. MZ-80A to MZ-80K and MZ-80K to MZ-80A £6 each. Other cassettes also. For details phone 061-439 4841 or sac. 38 South Parade, Bramhall, Stockport.

Sharp MZ80K 48K, Basic, Zen Assembler, Machine Code, all manuals, 150+ programs including Toolkit, Arcade Games, Adventures, utilities and machine code floating point routines. £400. Nantwich (0270) 628587.

Adventure cartridges for Vic-20 available for swap. Adventureland available in exchange for any other. Ring Lichfield (05432) 55355 evenings.

ZX81 joysticks for sale. Twin micro-gen joysticks complete with interface plus instructions cost £45. Bargain at £20 ono. Tel. Bridgend 68371.

Sinclair ZX81 1K perfect condition with Kempston Click keyboard and JRS £5 software voucher. £40 ono. Tel: Steve Churchill 852405, evenings and weekends only.

ZX81 16K with filesixty buttonset; 3 software cassettes; 3 books; leads £45. Tel: 0656 62804 (6pm).

Spectrum Programs on cassette Yatze £3. Compass Logo draws pictures and teaches compass directions £4. Cheques to M Dolphin, 8 The Handbridge, Highgate Park, Fulwood, Preston, Lancashire PR2 4LE s.a.c. for details.

Sinclair ZX81 with 16K RAM. Basic manual and power pack. Good condition, only £50. Tel: Medway 369557, evenings.

Wanted for 16K ZX81 tapes and possibly books. Pay and reasonable price. Write: David Bunce, The Boarding House, Q.E.S., Kirkby Lonsdale, via Carnforth, Lancs, LA6 2HJ. Phone after 4pm, Kirkby, Lonsdale, 71061.

Atari software for sale or exchange. Sae for list. Hepburn, 4 Cardinal Avenue, Kingston, Surrey KT2 5SB.

PC1500 software — send for list. Clifford, 47 Carters Way, Wisborough Green, West Sussex.

American PC magazines available and wanted. Sae list. Smith, 84 Edenfield Gardens, Worcester Park, Surrey KT4 7DY.

BBC software to exchange for other original software Planetoids, Philosophers Quest, also Bug Byte Music Synthesiser. Tel: Lancing (Sussex) 762093.

Vic-20 plus C2N cassette, 3K RAM pack, joystick, Space Storm, Nightflight, Presentation programs, books. £180. Will swap for 48K Spectrum. John Dunn, 82 Plessey Road, Blyth, Northumberland.

Heath Electronics, semiconductor, digital, and microprocessor home study courses. All complete with learning labs, course materials and many components.

PCN Billboard

£50 each. Send ssae for details. M Goodson, 44 Baillieswells Drive, Bieldside, Aberdeen, Scotland.

Sinclair ZX81 16K. New Filesixty keyboard. All leads and manual included plus new tutorial book and Sinclair tape. Everything still boxed, only 6 weeks old, £65. Phone: 041-558 9107.

Acorn Atom 12K, 12K BBC Basic board, power pack, floating point, manual, software, only 6 months old. £200 ono. 0582 67560.

Ideal experimenters Tangerine Microtan 65 lowercase, Chunky Graphics, Tanex 7K RAM, X-bug, 10K Basic, P.G.M. — Toolkit, power supply, case, keyboard, keypad, games, TUG newsletters, manuals, £320 ono. Letchworth 79839 after 6.30 for more details.

Wanted: Atom Forth and other Acorn Atom games in exchange for other Atom games software. Tel: Ian on Ramsbottom 2666 after 5pm.

Computer magazines. Practical Computing (Oct 80-May 82), Personal Computer World (Oct 80-Aug 82), Your Computer (various 81-82). Sold as sets or single issues. Offers to J Ledingham 57 Lilyhill Terrace, Edinburgh.

Apple II software, many games and utilities for sale. List includes Zork II, Germany, Southern Command, Moridists Crypt, Pool and many more. Phone Paul on 01-549 3045 any time.

Wanted Super Expander for Vic-20. Will pay £15 to £20. Also wanted cassettes and Omega Race cartridge. Phone 01-577 3093 after 6pm.

Sharp MZ-80K (48K) as new, 11 months guarantee. Four Basics, Forth, Fortran, MIC-code language. Games: The Valley, Space, Defender, £100's of software for £350. Tel: 01-864 2636 after 6pm.

Atari VCS + Combat + Asteroids + joysticks + paddles + adaptor + aerial splitter. All in original packing and in very good condition. £59 ono. Buyer collects. Tel: 01-572 3650 weekdays 4.30pm-6.30pm.

Rowtron video game plus 6 cartridges. Air-sea Battle, Pac-man, Horse Racing, Space Invaders, Combat and Sports World. Good condition £60. Tel: Rotherham (0709) 527195 anytime.

Apple II 64K Eurocolorcard disk drive controller £895. 2nd disk drive £219. Coolstack fan £55. Ezport and Kraft joystick £39. Epson MX80FT3 interfaced £419. Applewriter software £29. B/W TV £49. The lot £1,590. 01-505 4470.

Intel 8271 disk controller chip wanted for cash. Tel: Peter on 01-460 6356 (evenings).

Printer wanted. Any type but preferably 80 cols or more. RS232/Centronics interface. May consider if not working. Good price paid. Phone Giles on 030-885 301 with details, please.

American PC magazines for sale or exchange. Sae list. Smith, 84 Edenfield Gardens, Worcester Park, Surrey, KT4 7DY.

Spectrum 16K boxed as new. A few months old. Any reasonable offer around £100. Tel: Brian on 0698 860620.

ZX81 computer 16K with Kaye keyboard, video inverter, 11 game cassettes, plus books, magazines. All for £90 ono. Tel: Whitley Bay, 520337, Brian Entwistle.

BBC Micro software in exchange for other BBC software. Tel: Neil on Glasgow 883 3468.

Swaps for Intellivision Donkey Kong and Demon Attack, interested in Dragonfire Swords and Serpents, Beauty and Beast. Will sell £20 each. Steve Saunders, Tel Kidlington Oxon (08675) 3579.

Swap Spectrum Scramble (condition red)

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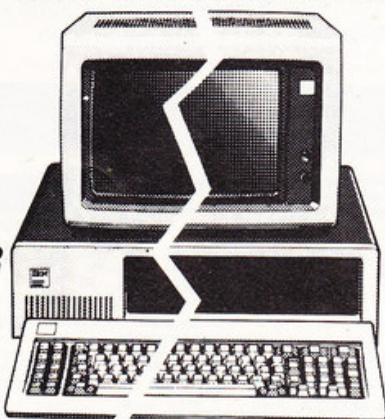
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● **Oric-1 48K** Hop-Frog and city bomber written with machine code for fast action thrills. The sorcerer (GP). Eight great games with full colour and sound. £4.95 each. Cosmos Computer Software, 65 Wood Crescent, Motherwell, Lanarkshire ML1 1HN.

● **Spectrum** Hi-res colour graphics tool kit. 25 new commands (48k) £7.50. Arcade quality, sound synthesiser, 27 channel (48k) £7.50. Free power filter with orders. Zen Software, 6 Park Street, Scarborough, Yorks.

● **Cycle Planner:** computes important dates of female menstrual cycle. Growth Tracker: guide to childhood development and illnesses. Unique programs on one cassette 48K Spectrum Cheque/PO £7.25. Medidata, PO Box 26, NW9 9BW.

● **Vic 20 and Pet Owners.** 16 line interface for intruder alarms and data collection. Suitable for production analysis, timing sequences, averages. Software examples included. £19.95 inc. Kit form. Cleveland Interface, 18 Chelmsford Ave., Fairfield, Stockton, Co. Cleveland.

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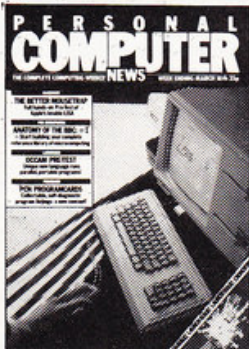
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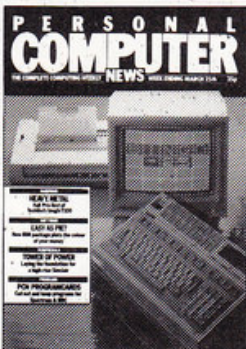
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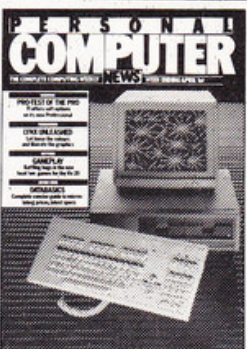
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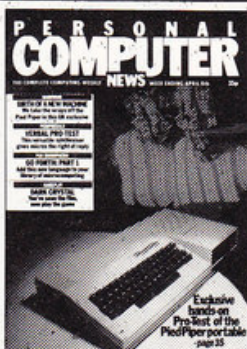
Issue 1, w/e March 18
Pro-Tests: Apple's Lisa, Textet TX8000; Spectrum speech synthesiser, Apple printer, Commodore network; 3D on Spectrum, graphs package for Apple and IBM, BBC graphics system.
Features: computer chess, Occam parallel processing language, Victor/Sirius function keys.
ProgramCards: Towers of Braham (Pascal), Biohythm (Apple II), Roman Year (Apple II), Shape Utility (Apple II).
Gameplay: Darts, Soccer (Atari); Castle of Riddles (BBC Model B); Pimania (Spectrum); Flight Simulator (IBM PC).
Databasics: micros and peripherals.



Issue 2, March 25
Pro-Tests: Toshiba T100, Casio PB100, ZX81/Basicare, Vic speech synthesiser, Spectrumsheet, IBM graphics, BBC word processing.
Features: Colecovision, micro backgammon, nursery computing.
Gameplay: Ultima II (Apple), Trader (ZX81), Starquest (Vic 20), Hungry Horace (Spectrum).
ProgramCards: String editor (Spectrum), Analogue Clock (BBC Model B), Chart generator (Spectrum), String extract/replace.
Databasics: full software listings.



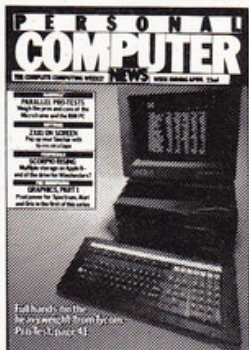
Issue 3, April 1
Pro-Tests: TI Professional, Apple speech synthesiser, Facit 410 printer, IBM keyboards, Petspeed compiler, Sirius toolkit, Dragoncalc.
Features: Atom upgrade, Lynx programming, Apple music.
Gameplay: Mangrove (Vic 20), Mutant Herd (Vic 20), Compendium (Dragon), Patience (Spectrum), Noughts and Crosses (Dragon), Great Britain Ltd (Spectrum), Ulysses (IBM PC).
ProgramCards: Magnify (Spectrum), Spider (Vic 20), Firing Range (BBC).
Databasics: micros.
Micropaedia: Anatomy of the BBC, part 3.



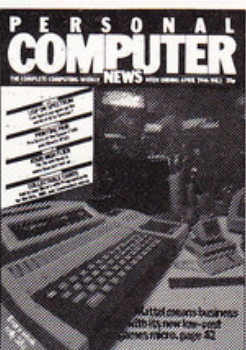
Issue 4, April 8
Pro-Tests: Pied Piper Communicator, Olympia ESW3000 printer, Namal Supertalker, Commodore Calcsult, Spectrum Pascal, Cashbook (BBC).
Gameplay: Dark Crystal (Apple II), St George (Dragon), Wizard War (Dragon).
ProgramCards: Fruit Machine (C64), Timesmith (Oric), Array Editor.
Databasics: peripherals.
Clubnet Micropaedia: Go Forth, part 1.



Issue 5, April 15
Pro-Tests: Commodore 700, Ikon Hobbit, 1-2-3 (IBM), ZX81 machine code.
Features: speech packs, monitors.
Gameplay: Grand Prix (Dragon), Derby Day (Spectrum), Deadline (Apple).
ProgramCards: Wacky Racers (Oric), Fruit Machine (C64), Parse Integer.
Databasics: Software.
Clubnet: full list of user groups.
Micropaedia: Go Forth, part 2.



Issue 6, April 22
Pro-Tests: Tycom Microframe, IBM PC, Scorpio Disks, Dragon sound module, ZX81 graphics, Bottom Line Strategist (CP/M), PaperClip word processor.
Features: IBMPC DOS, BBC word processing, PC-1251.
Gameplay: Mined Out (Spectrum), Transylvanian Tower (Spectrum), Lunar Lander (Apple II), Evolution (Apple II).
ProgramCards: Wacky Racers (Oric), Mortgage Comparison (Sharp MZ80K), Computer Set Up (BBC), Day of Week.
Databasics: micros.
Micropaedia: Graphics, part 1.



Issue 7, April 29
Pro-Tests: Mattel Aquarius, Epson FX80, Olivetti JP101, Lisp on Spectrum, Vic 20 assembler, Supergraf on Victor/Sirius.
Features: Dealer support, Atari graphics.
Gameplay: Krakit (ZX81), Cruising On Broadway (Spectrum), Kaktus (Vic 20), Fantastic Voyage (ZX81).
ProgramCards: CBM controls, Computer Set Up (BBC), Wacky Racers (Oric), Julian Dates.
Databasics: Peripherals.
Micropaedia: Graphics part 2.

MICROPAEDIA LIST

Anatomy of the BBC micro

Part 1: Tune into the BBC — an exploded view; Tube map; blossoming into colour; second opinion — a first timer's look; maths and science on the Beeb; programming the function keys; learning with Logo; BBC Basic; User Guide extra; alternative languages.

Part 2: Introduction to peripherals; playing games — reviews and programs; word processing on chip and cassette; history.

Part 3: Networking; interview with Acorn's Herman Hauser; faults and servicing; video recorder link-up; turtle graphics; Beeb books.

Go Forth

Part 1: Basic and Forth compared; Forth on your micro; assembler language; changing up; the Jupiter Ace.

Part 2: Jupiter Ace software; guide to Forth; Forth on Apple, IBM and ZX81; more implementations; Forth 79 v FIG-Forth; books.

Graphics

Part 1: Colour co-ordinated; Spectrum, Oric, Atari.

Part 2: Graphics on the Vic 20; the Video Interface Chip explained; Dragon displays; video easel on Atari 800.

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A new range of soft wear, US style

The name of the game in big business is diversification with diversification into information technology being the favoured route. How refreshing then to find it working the other way round.

An American company, I/O Devices Inc, has been going in for some fancy corporate manipulations recently. First it restructured its stock (that's stock as in shares) then it changed its name to Medcomp Technologies Inc. Finally it decided to go into the chinchilla business.

These cuddly rabbits are much prized for their white fur and Medcomp is splashing out \$2.3 million to buy 7,000 of the animals. They will be shipped out to Israel where the company anticipates they will breed more and produce more closely matched pelts.

So where does this all lead us? You'd probably best look out for a spate of fur-covered computers, in tasteful white.

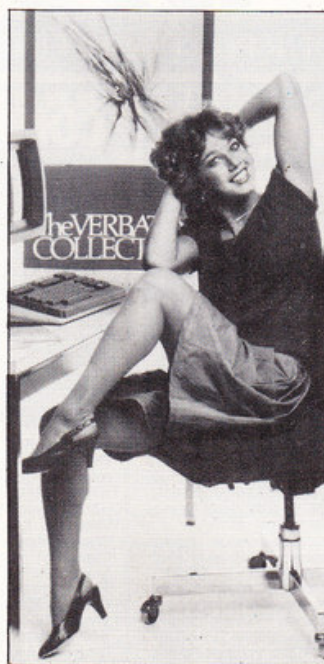
Terminal fitness

Denise Katnich is happy in her work. Anybody who can sit in that position without wearing a fixed grimace must be. Denise is demonstrating how to spend all day at a terminal without developing all manner of health problems.

In our picture she risks a dislocated shoulder for the benefit of media maker Verbatim, which has just issued a booklet called *Tone Up at the Terminal*.

So the next time you see somebody hugging themselves, wobbling their neck, breathing heavily, and flinging their limbs around, take a leaf out of their book — or write to Verbatim for your own copy. The address is 6 Stanley Park Road, Wallington, Surrey.

But how do you manage to hold the book?



Syntax Errors

Sprite lines

In last week's review of the Sord M5 Richard King was just explaining why 'the so-called "sprite graphics" are the most interesting feature of the display' when a line of text was spirited away. The next sentence should have read: 'Sprites are little programmable displays which can be moved around the screen.'

Advance billing

We pride ourselves on being up to the minute at PCN, but we got a week ahead in last week's Menu page. We billed this week's page 35 early giving you advance warning of Mike Whitney's paddle among the Apple pixels.

Master mistake

Due to an oversight, Kuma's Deskmaster Series somehow became Datamaster on page 12, Issue 12. Apologies.

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
Apple '83	June 3-5	Fulcrum Centre, Slough	John Riding, Database Publications, 061-456 8500
ZX Microfair	June 4	Alexandra Palace, London	Mike Jonstone, 01-801 9172
Office Automation Show & Conference	June 7-9	Barbican Centre, London	Clapp & Polliak, 01-747 3131
4th Commodore Computer Show	June 9-11	Cunard International Hotel, London	Commodore Business Machines UK, 75 74111, Ext 220
Blackburn Computer Fair	June 11	King George's Hall, Blackburn	Bradley Enterprises, 0772 312677
South of England Personal Computer Fair	June 12	Exhibition Hall, Wood Green School, Witney	Julian Wilde, 0993 2355
Computer Fair	June 16-19	Earls Court, London	Roy Bratt, Reed Exhibitions, 01-643 8040
Computer Open Day Exhibition	June 16	Holiday Inn, London	Tony Kaminiski, Couchmead Communications, 01-778 1101
Fylde Computer Show	June 17-19	Winter Gardens, Blackpool	Northern Exhibitions, 0706 877687
Compec North '83	June 21-23	Belle Vue, Manchester	Roy Bratt, Reed Exhibitions, 01-643 8040
Leeds Software Fair	June 21	John Taylor Teacher's Centre, Leeds	Graham Creighton 0532 782181
BBC Micro User Show	June 24-26	Renold Building, UMIST Manchester	Database Publications, 061-456 8500

OVERSEAS EVENTS

Event	Dates	Venue	Organisers
Exhibition & Conference			
International Computer Technology	June 7-10	Hong Kong Exhibition Centre, Hong Kong	Terry Hill, Industrial & Trade Fairs International Ltd, 021-705 6707
Mini Computer Show for Office, Home, Hobby	June 23-26	Exhibition Hall, Cologne	German Chamber of Industry and Commerce, 01-930 7251
International Micro Computer Exhibition	Aug 2-5	Kuala Lumpur, Malaysia	Conference & Exhibition Management Services SDN BHD, 9-A Jalan SS24/8 Taman Megah, Petaling Jaya, Selangor
National Computer Business & Office Systems	Aug 16-19	Auckland, New Zealand	Trade & Industrial Exhibitions, 12 Heather Street, Parnell, PO Box 9682, Auckland

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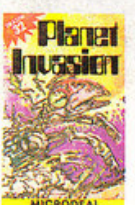
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