PERSONAL weekly COMPUTER NEWS

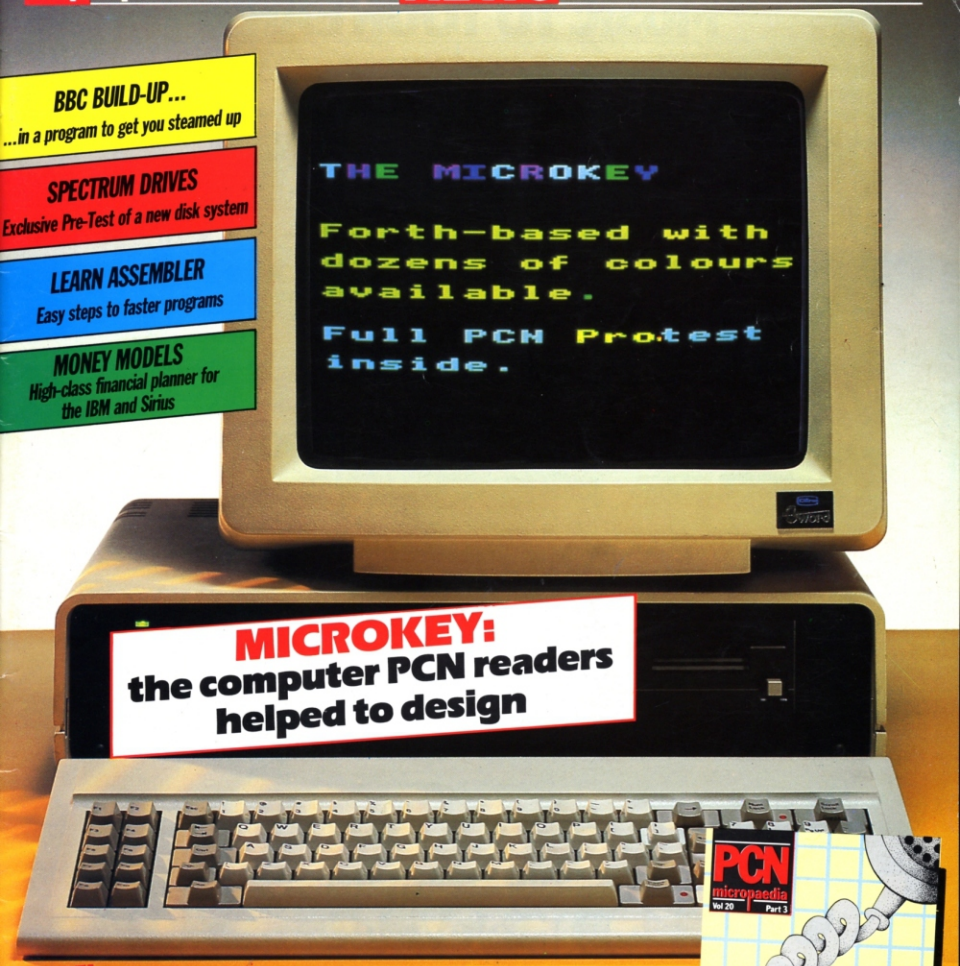
50p April 14, 1984 No 57 BRITAIN'S BIGGEST WEEKLY

BBC BUILD-UP...
...in a program to get you steamed up

SPECTRUM DRIVES
Exclusive Pre-Test of a new disk system

LEARN ASSEMBLER
Easy steps to faster programs

MONEY MODELS
High-class financial planner for the IBM and Sirius



MICROKEY: the computer PCN readers helped to design

INSIDE!
INSIDE!
INSIDE!

Communications directory to pull out and keep

PLUS new packages for Dragon, Commodore 64, Oric & Spectrum

TELEVIDEO TS 804

THE MASTERPIECE FOR UP TO FOUR KEYBOARDS

ITS PERFORMANCE WILL BE MUSIC TO YOUR EARS

POWER TO HAND – FOR UP TO EIGHT HANDS

Initially, you may only need your system to be run by a single operator – expanding it later as the need arises. This is where the TS 804 really comes into its own. As a single-user system it is extremely efficient and powerful. As your business grows, and your requirements change, it will support up to four users – working independently – via any ASCII terminal.

With its high-performance architecture and unrivalled array of peripherals, the TS 804 is a versatile and significant addition to the extensive TeleVideo microcomputer range. It is the perfect answer for professional business users who do not need the even more elaborate facilities and greater capacity of the TS 806 or TS 816.

SO MUCH, FOR SO LITTLE

There's never been anything quite like the new TeleVideo TS 804.

For a start, it's the only multi-user micro in one single desktop unit and given its outstanding specification and performance, its economy is little short of astounding. Whatever the claims made for other systems, we challenge you to find a comparable system at the same cost.

IT'S HARD TO BEAT FOR SOFTWARE

The TS 804 has available to it one of the largest libraries for any micro, its standard MP/M II operating system being fully compatible with CP/M. The OASIS system is offered as an alternative. In all, you can call on some 2,000 high-quality software packages.

WHICH WAY DO YOU WANT TO GROW?

With the TS 804, you can choose not only how big you want to grow, but also in which direction. You have several choices.

Any ASCII terminal, serial printer or modem can be supported by each of the user ports, and a parallel printer can also be added. An expansion disk provides 15 Mbytes of formatted hard disk storage and a 14 Mbyte cartridge tape unit allows for easy system back-up.

TS 804 provides a high degree of compatibility with software written for the ALTOS 580 product line.

AND THERE'S A LOT MORE...

We simply cannot do justice here to the impressive advantages of the TS 804. For the full, fascinating details, and for more information on the TeleVideo Business Computer range, contact **THORN EMI TeleVideo Marketing,** Silbury Court, 372 Silbury Boulevard, Witan Gate East, Central Milton Keynes, MK9 2AF, or telephone (0908) 668778.

THORN EMI

TELEVIDEO. THE COMPUTER THAT MOVES WITH THE TIMES.

THORN EMI TeleVideo Business Computers

MENU

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Cover photo: Paul Wilson

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MICROPAEDIA

Pull-out wall chart to hang by your micro
We send communications services to the wall in the final part of our communications Micropaedia. Our free pull-out wall chart lists the popular services with numbers, costs and interfacing status details. We give you all the essential details on hooking up to a range of specific bulletin boards and database services both in the UK and overseas.

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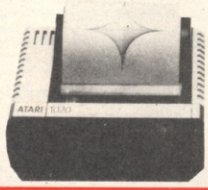

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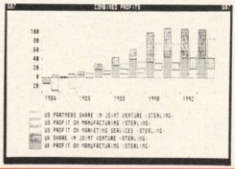

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You can scroll your screen sideways with this machine code utility.

Games prices crash

By David Guest

Games prices are hitting the floor as the day of pocket-money software dawns.

As of last week Pulsonic is selling Commodore and Sinclair games for £2.99 and a new company, Mastertronic, is going even lower at £1.99.

At those prices you probably shoufdn't expect too much, and Pulsonic's Richard Bailey admitted: 'I don't pretend that our games are up to the standard of the Hobbit.' But Mastertronic aims 'to ensure a flow of top quality products' by selling the software of established software houses; even so, it declined to name its suppliers last week.

The development of a new bargain basement hasn't thrown the industry's big names into ferment. 'It sounds reasonable to me,' said Virgin Games' Nick Alexander, also chairman of the Guild of Software Houses. 'Budget albums exist quite happily alongside full price albums.'

But he added that it could be too soon for the idea to work. 'There may not be enough computers out there to sell at those particular prices.'

One tactic both Pulsonic and Mastertronic have adopted to counter that possibility is to go for the top-selling micros. Nine of Mastertronics' first 12 titles are for the Spectrum, which accounts for four out of 14 from Pulsonic. The rest of the games are split between the Commodore 64 and Vic 20.

But Alan Sharam of Mastertronic said that the company has a Dragon game in the works and that it will be looking at other systems as well. It also intends to sell educational software.

'We'd like to have a cluster of software houses working around us,' said Mr Sharam.'

Mastertronic says that software has generally been over-priced. Pulsonic disagrees. 'We're not out to rock the market,' said Mr Bailey, 'we won't take business away from other people but generate new business at a different level.'

Whatever the prospects for software at these prices they add a new dimension to the increasingly unstable software business. Nick Alexander predicts: 'It's going to be a rough year.'

Compaq — UK debut includes hard disk portable.

Compaq here at the double

The Compaq IBM-compatible portable is now available in the UK.

In its most basic form — a single floppy disk and 128K of memory — the portable sells for £1,795 plus VAT. Adding a second drive and another 128K to the system raises the price to £2,195, while the 10 Mb hard disk version of the system will cost you £3,945 (again plus VAT).

The introduction of the Compaq into the UK follows a massive success in the US. Compaq sold $111.2 million worth of portables to the home crowd last year and has high hopes of repeating that success here. It has tied up with many dealers that sell IBM PCs, in the obvious hope that comparisons will spur sales.

Sinclair retreats on QL as delivery dates slip again

By Geof Wheelwright

Delivery dates for Sinclair's QL micro have slipped yet again.

The company had promised to begin shipping QLs from the end of March (after initially promising to start deliveries by the end of February) but now says only that deliveries will meet the promised customer delivery dates — which seem to start not much earlier than the end of April. 'No QLs have been shipped, but we remain confident that we can fulfill all customer target delivery dates,' said a Sinclair spokeswomen. 'I can't comment on the exact time those deliveries will begin.'

But Sinclair has confirmed that design difficulties surrounding the development of the QL have been resolved and that delays are now due to the business of bringing QL production to full capacity. The company did not confirm earlier reports that there were problems in developing the QL's 'SuperBasic' and in fitting all the elements of the Q-DOS operating system onto a ROM.

All it would say is that earlier delays have been resolved and that a final testing program for the QL is now in progress.

Delays have dogged the QL since its launch in January. Heralded as the developer of probably the most important micro of 1984, Sinclair has since:

- announced that it cannot honour the 28-day delivery date orginally printed on QL order forms and had to alter order forms to delete the 28-day promise;
- cashed thousands of cheques for orders of QLs which may take up to three months to be delivered;
- opened a 'readers account' into which it deposited the money from cashed QL cheques and from which it cannot collect until QLs are delivered;
- admitted that the interest generated by the money in that readers account will fall to Sinclair, rather than to the people whose money they are holding;
- and promised a 'free gift' to people who have had to wait an inordinately long time for deliveries of their machines.

Prize winner

Three weeks ago we promised a £10 gift to the best suggestion as to how Sinclair should reward its patient customers, *ie* what the famous QL gift should be.

True to our word and on schedule, we've picked a winner and the prize will be on its way long before 28 days elapse. Barry Graham wins our vote for the simplicity of one of his suggestions: Another QL, since the first one will probably go wrong.

Jobs for girls

Macs don't seem to be the major concern of Apple's multi-millionaire boss Steve Jobs. Though Lisa could be in with a chance.

Far from putting total energy into flooding the worlds with his micros, the man behind Apple Computer claims he's concentrating on searching the lands for a new girlfriend (preferably one who cooks good pasta and likes cycling . . . and, presumably, likes money . . .) After all, he is a 28-year-old Californian.

But it's not the mood of spring which has sent him on a whistlestop tour of Europe. His mission is to push Macintosh and the new Lisas and win back lost ground from IBM.

So how is the Macintosh, (Issue 46), due for delivery here in May, doing in America? 'We've sold 40,000 machines in the first 60 days,' said Jobs. This year he expects to shift a quarter of a million of the machines.

The computer, with a single floppy disk drive built-in and a high resolution black and white display, was designed to enable users to master it in a couple of hours. 'Who wants to read a novel to use a computer?' Jobs remarked.

Jobs rules out colour graphics as a Mac development. 'That can only be done for $10,000,' he remarked. But he did promise a laser printer currently under development at the company's Cupertino headquarters in Southern California.

Steve Jobs: foresees flat-screen Mac.

Looking ahead over the next two to three years, Jobs expects Mac to be fitted with a flat screen which could reduce the size of the system to the dimensions of a book.

Apple is determined to make Macintosh into an industry standard alongside the Apple II and the IBM PC. The company has gone out of its way to court independent software companies, and some 100 have become involved in producing Mac progams.

Apple is also wooing the young through a series of schemes to put Apple products in US schools and universities. And there is a chance that cheap machines will be offered to students in this country too.

Oric disk shock

By Piers Letcher

Oric's microdisks are at last on the verge of general release but they could be a let-down.

A sneak preview of the manual reveals that the drive is little more than an advanced (and expensive) cassette system, relying on serial access and cassette filing commands.

The manual also gives detailed descriptions of 5.25in disks, although according to Paul Johnson, Oric's technical director, Oric has no plans to market these, preferring users to stick with the black and red microdisks.

Rumours that the disks could be very slow for some applications caused some confusion at Oric. An engineer said: 'We haven't done any timings' and this was confirmed by Mr Johnson, who said that the timings hadn't been evaluated because Oric didn't believe that home users were interested in that sort of thing. Nor were they interested in random access, he said. Whether or not home users will be interested in the microdisk, when it arrives in the shops, remains to be seen.

On paper at least, the ITL Byte Drive 500 and hybrid cable perform much better than the microdisk — as well as curing some of the Oric's known bugs and freeing 16K of the Oric's memory for machine code programmers. The microdisk also has a weakness in the utilities that form the DOS. These take up space on the disk (about 11K) and have to be loaded in from the disk into memory.

Barry Muncaster, Oric's managing director, said that the microdisk was in mass production, and that many thousands had been shipped. He said that they had gone abroad, mostly to France. He attributed the lack of drives in British shops to the fact that orders had not been placed at the shops in which *PCN* had looked—those mentioned in Oric's extensive advertising campaign.

Spectral CP/M

By Piers Letcher

CP/M will soon be available to Spectrum users as part of ITL's latest disk drive and hybrid cable package (Issue 52).

The new hybrid will contain a disk interface, an output to monitors for 80 column displays and a Centronics printer interface, as well as the extra 16K RAM needed to put most CP/M software within range. The package is expected to retail at under £350, including a Byte Drive 500 and a disk containing CP/M on one side and a Spectrum DOS on the other. It should all be on display at the ZX Microfair at Alexandra Palace on April 28. Production is due to start in May.

A version of the hybrid is in the pipeline for the Commodore 64, at a similar price, and this should be available in June.

CP/M's main appeal is that there is so much applications software available. ITL plans to bring out some of this on disks to fit its Byte Drive 500 in the near future.

STEADY PLOTTER — The cost of attaching a plotter to an IBM, Apple or CP/M micro has reached a new low with the launch of the Sweet-P Personal Plotter. Now available from Reflex (0734-884611) at £574, it is a single colour plotter with a drawing speed of 6 ins a second, and is compatible with the graphic output from Lotus 1-2-3, VisiCalc, SuperCalc and other programs. To overcome the limitation of single colour plotting, the Sweet-P has a software adressable pause command to allow the user to change the colour of the pen. Reflex plans to lauch a 14ins per second model in the middle of May, to sell for about £900.

Atmos sparks price rise

Will Atmost games be more expensive than their Oric versions? 'Pasta Blasta' from Arcadia Software will cost £5.50 on the Oric-1, but the Atmos version will be 'in the region of £8'.

Arcadia says it is to increase the price of all its software because customers have been sceptical about the potential quality of its lower-priced games. This is an interesting view, especially in the light of price movements elsewhere in the software business.

Most games cost between £5.95 and £6.95, so Arcadia could be pricing itself out of the market, unless it's relying on the desperation of Oric owners because of the lack of Oric games.

Hannover fest springboard

By Ralph Bancroft

The German word for trade fair is 'messe' and the Hannover Messe lives up to the description. Acres and acres of exhibition space covers subjects as different as German-India trade and recent advances in earth-moving equipment.

Within the maze of stands is to be found one of the biggest annual congregations of computer companies. The Hannover Fair has become the traditional spring launching point for products new to the European market.

Portables are strongly in evidence with the Gavilan making its long awaited arrival on European shores. Lap-held in size, it features a unique touchpad that functions as mouse.

It also has a decent sized screen in its flip-up lid (shades of the Sharp PC-5000 here) which can display eight 66-character lines. A 50 cps thermal printer is available with its own battery supply and can plug neatly into the rear of the micro.

Inside the box is an 8088 processor chip with 80K of RAM, expandable to 336 bytes. Software can be loaded from either plug-in modules or the single integral 3½in microfloppy.

At the more economical end of the market is the new Sord IS-11. Costing around £1,000 it aims to challenge the NEC-8201A/Tandy Model 100/Olivetti M10-type machine. Although costing more, it does offer a built in 128K cassette drive (as in the Epson HX-20) and 64K of RAM.

A spreadsheet, database, word processor and communications program come included in the price and plug-in ROM cartridges can provide other packages. The 40 character by eight line screen is unusual in that up to eight windows can be defined.

If you are serious about word processing, the Wang PC (Honorably mentioned in the London computer marathon last year) and the Wang Professional Image Computer, it was also demonstrating all manner of ways to hook these machines up to something else.

More news from Hannover in next week's issue.

Gavilan: spring launch in Europe.

Sinclair draws up list

By John Lettice

Hot on the heels of the appearance of the Microdrives in the shops, Sinclair is planning a list of Microdrive-compatible software.

Provided it gets off the ground, this will be included in the Microdrive packaging, and letters have gone out to all the major software houses as a preliminary to drawing up the list.

If the project goes ahead it could present interesting copyright questions. It is likely that the list would include tape software that can be converted to Microdrive, and the more robust of the software houses already state on their labels that they would regard such an enterprise as a breach of copyright.

Naturally, individual packages won't be included in the list if the relevant software house doesn't want it to be, and the criteria for inclusion can't be finalised until some measure of agreement is reached.

There may also be more space on your Microdrive cartridge than you think. If you format the same cartridge on a number of different Microdrives you may well find that you get a number of different formatted capacities. Although the cartridge capacity can vary between 80K-95K, the divergence for individual Microdrives is usually only around 3K.

This would suggest that differences in capacity have very little to do with the drive differences in capacity have very little to do with the drive skipping faulty sectors and a lot more to do with variations in the Microdrives. So if anyone out there has a Microdrive that formats at 99K there would seem to be a market for souped-up cartridges. Sinclair says that this is due to variations in the motor speed, and that differences should be more in the region of 88K to 90K.

Sinclair has also completed development of a revised ROM for Interface 1. The company is reluctant to describe this as an enhanced version, saying rather that it is a slightly improved model, in the same way that the issue 3 is an improved Spectrum. Rumour has it, however, that the new Interface 1 ROM will include a *MOVE command for copying cartridges.

VIEW FROM AMERICA

Smokestack America lets off steam

By Chris Rowley

It's easy to second guess somebody 101 years after their death but the fact remains that Karl Marx never predicted the micro or the Japanese, which between them provide a new dynamic for US capitalism.

Look at it this way: who would have predicted that the fastest growing occupation in the US for the next 15 years would be Computer Service Technicians? Now Marx might well have foreseen that the number two occupation would be Legal Assistance — even in the 1880s the nascent industrial US was a lawyers' paradise — but Computer Service Technicians? Not even the sci-fi writers got that one right; subservience to mainframe monstrosities, yes, but having our kids become computer repair people, no.

However the US Bureau of Labour forecasts that five of the top ten growth occupations until the end of the century will be computer-related and that doesn't include good old electrical engineers.

As smokestack USA declines, Silicon America arises. These technological shifts are producing an anguished debate. Anyone thinking of holding a decent job in the '90s has to confront the issue — things are changing so fast the future is developing a split personality. Turn yourself into a highly paid CAD chip creator and you might find some pesky robot running 1-2-3 in Japanese taking your place in five years. Don't laugh, just think of all those unfortunates who might become computer repair people.

Because of the Japanese challenge, US companies have ruthlessly shed Stateside labour and flown to third world low-wage havens. In past years firms such as Atari and Tandon have shifted all their manufacturing operations to lands where people will happily assemble disk drives for $1 an hour compared with $6 in California. But a counter-current has developed, exemplified by Apple's Mac factory, which is 90 per cent automated and requires only 90 people per shift on a line that produces one Mac every 27 seconds.

The semiconductor industry is also building new plants in the US, having learned the Japanese lesson. Japanese semiconductor 'clean rooms' are the cleanest places on earth, with fewer than 100 dust particles per cubic foot. By comparison a hospital theatre has more than 10,000 and so-called fresh air one million particles of one micrometer or less. Since human beings (including Japanese human beings) shed dust, skin oils and hair the Japanese plants are almost totally automated. As a result their chips have at least six times fewer defects than US-made chips. With Reagan administration tax breaks to encourage them, US chip makers are abandoning cheap third world labour for no labour back home; in time they expect to make chips just as good as the Japanese ones.

This is only one example of a new trend — indeed the widespread use of micros in US business has produced vast improvements in work analysis and planning. Several pundits now predict a surge towards automation in many industries. US products may soon be just as good as their Japanese counterparts and even cheaper. Already General Motors is bringing production back from Mexico, to a Detroit factory loaded with robots instead of workers.

Micro-equipped business people are also aware of likely future pricing of micros as they descend Sinclair's Curve and wind up at $30 giveaways. Ten years from now, if your 1Mb pocket micro ever breaks, you'll just throw it away; thus savvy parents, when confronted by children anxious to become computer repair people, will confound the poor old Bureau of Labour by counselling courses in poetry or colour graphics. They will understand the new rules, which make creativity the only advantage that human workers will have.

Marx, which is where we started, had plenty to say about workers, mechanisation, and the resultant stresses and strains. 'The labourer is worthy of his hire' is more or less what it all boils down to, but the labourer whose class consciousness consists of nothing more than an awareness of a few lines of re-entrant code and an arm with three degrees of freedom, isn't apt to be an effective class warrior. Those who lose not only their chains, but their jobs will have time to reflect on this.

Kaypro opens up with sale

Portable specialist Kaypro has set up shop in the UK with an opening sale that puts a 10Mb system well below £3,000.

The Kaypro 10, with a Winchester disk, now costs £2,640. The Kaypro 2, Kaypro's original machine, is down to £1,288. The company has also added dBase II to the bundle of software it includes in the prices of the 4 and 10, and it has enhanced the Kaypro 4.

But Andrew Kay, the company's founder, said that UK users shouldn't expect to see the IBM-compatible A4-sized Notebook Computer until much later in the year.

He revealed that Kaypro had yet to finalise an agreement with its Japanese supplier, but hinted that the company had its own version under development in any case.

Kaypro UK will retain its earlier distributor, CK Computers, as its main distributor, and will look for extra outlets that are intended to include major high street shops.

Products like Kaylink, to connect a Kaypro to any mainframe, and Kaynet, a local area network package, are not likely to come to the UK until next year.

Mr Kay himself is surprisingly reticent about where the portable business is going. But he also resists the temptation to gloat over the fate of Adam Osborne, who once upon a time wasn't slow to cast doubt on Kaypro's survival prospects.

SAAB DRIVER — Software that lets your BBC drive a Saab doesn't sound like a major contribution to road safety until you realise that in this case Saab is the name of a UK-designed controller system. The Supervisor Programmable Controller System, to give it its full title, costs £499 and is designed for use in educational establishments teaching basic control and automation techniques. Saab Industrial Systems is on 0438 814777.

IBM in time

IBM has put the pride of its text processing packages on the PC — but don't hold your breath waiting for it.

The company announced last week that with DisplayWrite 2 on the PC it could offer PC users the features of its well-established Displaywriter with links to other IBM office and data processing systems.

But deliveries won't begin until July, and there will be a further wait before a UK (as opposed to US) version is available. As for the connections to other systems, IBM has committed itself to making a statement before the end of the year on the implementation of the architecture that will facilitate it. This statement will not, of course, make interconnection possible — you'll have another wait for that.

DisplayWrite 2 costs £275. It is based on the Textpack 4 software of the Displaywriter, requires 256K in the eventual English version, and is best used with twin 360K disks. It includes mathematical functions, a 100,000 word lexicon, and a 4,500 character reservoir for the user's own purposes.

It runs under PCDOS 2.1, the operating system announced for the Portable and Junior PCs.

99/4A bounces back

By David Guest

Far from lying down and dying, the discontinued Texas Instruments 99/4A is staging a remarkable comeback.

The manufacturer may have pulled out of the home micro business (Issue 35) but the enthusiasm of independent suppliers in the UK hasn't diminished and the number of users has grown by leaps and bounds.

'Literally thousands of people have bought the machine since Christmas,' said Parco Electrics' Francis Parrish. 'We've had to take on two extra staff and we're building a warehouse; our stock level is about £250,000 — need I say more?'

The exact number of users in the UK isn't known; it could be as many as 100,000. Supplying them is turning into a major operation, and new add-ons are appearing despite the apparent lack of future for the machine itself. US software modules are being imported and some UK firms are getting into the manufacturing business.

TI has put together an information package which lists the European suppliers of 99/4A-related equipment. This includes Parco (0404 44425), which has Atari-produced games modules in stock featuring titles like Donkey Kong, Defender and others; Christine Computing (0923 672941) with its 32K expansions; Arcade Hardware (061-225 2248) with a plug-in thermal printer, an RS232 card, and the £80 MBX voice recognition system.

Tim Freeman of Carlynsoft (02514 28895) said: 'There is more interest than ever. A lot of people have got the machine, and it's a very easy machine to get along with.' Carlynsoft typifies the independent suppliers — it has just announced the availability of joysticks for the 99/4A, priced at £13 for a pair, with an extension lead coming in at £3.50.

Mr Freeman doesn't expect interest in the machine to wane — other suppliers joined him in forecasting that it would actually increase.

The breakthrough that will secure the 99/4A's future in the UK will come when the question of TI licences to produce ancillary equipment is sorted out.

'Quite a few people are gearing up for the off,' said Mr Parrish. 'But there are a lot of halfpenny and copper firms that aren't big enough, that don't have sufficient funds to get it off the ground.'

It requires a major manufacturer to set the ball rolling, he said.

Rent-a-VTX scheme lures Sinclair users

Sinclair Spectrum owners are to be offered a cheaper way of hooking up their micro to the telephone system.

Prism Microproducts (01-253 2277) is launching a scheme where the user pays £11 a month and in return gets a VTX 5000 modem, Prestel membership, Micronet membership, installation of a British Telecom jack socket and free software to allow user-to-user communications.

The subscription will drop to £20 a quarter in the second year and users will pay the subscription through their telephone bills.

With the VTX 5000 alone costing £99.95, the package should help Spectrum owners who want to spread the cost of joining the communications revolution.

The inclusion of the user-to-user software is also something of a breakthrough. So far, Prism has not provided the means to allow VTX 5000 owners to take advantage of the modem's ability to allow micro-to-micro communications.

The Umpire strikes back

Conquer the galaxy on your Spectrum! Empires, the first game from Imperial Software, offers this and more, but at a price.

For £19.95 you get four tapes for the four-player 'interactive' strategy game. Imperial hopes the high price won't daunt buyers and it sees four Spectrum users chipping in a fiver each for the game.

Each player takes the role of a race of beings with the aim of empire-building, by exploiting mineral resources on planets and by domination of the other races.

Alliances between players can be made and at the end of each move data is saved to tape and passed, or sent, to an umpire. The umpire's roles is to assess the moves, pass messages to participants about the state of play, and generally mediate between players.

It's debatable whether games players will put up with the slow pace of the game and the need to pass tapes to and fro after each move. It's the sort of game that cries out for real-time interaction via Micronet or Interface 1 but Imperial doesn't think there are enough users of the systems to make such a venture worthwhile.

Versions of the game for other machines are being considered, but Imperial doesn't plan a Microdrive version on the grounds that it doubts the reliability of Sinclair's device.

Empires reflects the trend to more complex games, but its main failing is a lack of graphics.

Touchy H-P cuts price of new micro

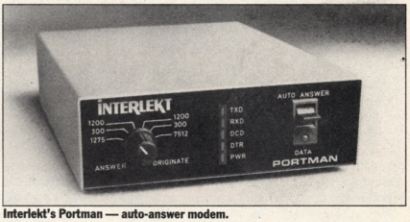
No sooner has Hewlett Packard started to deliver its HP150 touch-screen micro than it has announced a 14 per cent price cut across the board.

The new prices (exclusive of VAT) are £2,595 for the dual floppy disk machine and £4,795 for the 15Mb hard disk version.

The HP decision responds to changes in the European personal computer market. With IBM recently announcing price cuts of up to 20 per cent on the PC, it was inevitable that other manufacturers would find it necessary to follow suit.

Hewlett Packard aims to sell 200,000 HP150s worldwide in 1984, a tough target in a market increasingly dominated by the Big Blue.

Modem trio



Interlekt's Portman — auto-answer modem.

By Ralph Bancroft

More companies have announced modems this week, giving weight to *PCN*'s prediction (Issue 56) that we are in for a modem war.

Alone of the new releases, the Busbee from Bee Systems (0204 395440) has the seal of approval from the British Approvals Board for Telecommunications.

The £100 (plus VAT) modem operates at 1200/75 for use with Prestel and other Viewdata services and connects to the 1MHz bus on the BBC micro. The company also has approval to use the modem with the Commodore 64, Vic 20 and Commodore Pet micros.

However, it is unlikely to be marketed under the Bee Systems brand as the company intends to license the device to other distributors.

An interesting feature of the Busbee is that it allows you to dial up a telephone number by keying the number from the computer keyboard. Most modems require you to dial the number on a normal telephone until the high-pitched screech of the carrier tone indicates that the computer is on-line.

Bee Systems has designed the modem so that it can be used as a secure means of distributing software over the telephone network. The modem can be equipped with a unique serial number and software dongle so that the downloaded software will run only if the modem is attached.

To complement the modem, the company is also bringing out a device called Viewer which generates a Prestel colour display on a VDU for micros which don't have the Prestel capability. It costs £150 (plus VAT).

On the multi-rate front, Interlekt (0734 589551) has announced the Portman modem which costs £190 (plus VAT). Like the Minor Miracles WS2000 and Pace modem (Issue 56), the Portman has the ability to operate at 300/300 baud full duplex, 1200/75 and 75/1200 full duplex and 1200/1200 half-duplex.

Switching between CCITT and Bell standards can be achieved by changing an internal link.

Unlike the other two modems, the Portman offers auto-answer as a standard feature.

The Portman has also completed the board's approval procedure, so it should be legal to use it in about six weeks' time.

For users looking for faster and more error-free communications, Tech-Nel (0295 65781) has launched a V26 modem, the DM-2426. It offers synchronous communications at either 1200 or 2400 baud and can run at either full duplex on four wires or half-duplex on two wires. It costs £350 (plus VAT).

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2 TENS AND UNITS SUBTRACTION Choose simple or difficult sums. Either of the two methods of subtraction taught in schools may be selected at the start of the program. Detailed help is given if errors are made. Correct answers add sections to a bridge. If no mistakes are made, the tank will drive across the completed bridge and fire its gun.

3 PICTURE PLOTTER. This program has been written so that children can create their own pictures on the television screen. It is so simple that even pre-reading children can use it, yet its sophistication makes it suitable for producing multicolour maps and diagrams.

4 NORTH AMERICAN INDIANS. This program helps to develop reading and comprehensive skills. You complete sentences using a word from the list on the screen. Correct responses are rewarded by the creation of an Indian scene which includes tipis and buffalo.

You may replace the questions in this program with your own (create a bank of up to 250 questions with a 48K Spectrum). Any subject area may be chosen.

J. J. Warren 1983
Published by Calpac Computer Software, 108 Hermitage Woods Crescent, St Johns, Woking, Surrey GU21 1UF

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11 THE STRUCTURE OF THE FLOWER. This program explains how the parts of the flower are involved in the formation of seeds. This is a three part program which makes full use of high resolution colour graphics.

12 LONG DIVISION. This detailed program takes the learner through long division sums in easy stages. Correction sequences are automatically provided when they are needed. Sums with remainders can be chosen if required.

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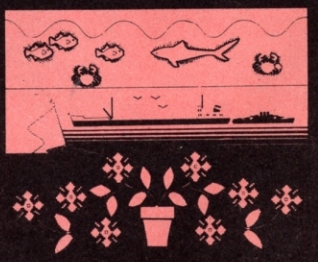

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Toad is set to spawn

A UK-built Apple-compatible system called the Toad (Issue 25) is making a second bid to get into the mainstream.

Phil Moore of Total Organised Analysed Data Systems first revealed his plans for the Toad last August. It had 64K, a U-Micros motherboard, a Franklin-style keyboard and Rodime disks. Though he expected no trouble from Apple, Mr Moore claimed shortly afterwards that the system had attracted Apple's attention. Later in the year Apple took to the courts almost as often as Martina Navratilova and it was the clone makers who were on the receiving end. The Toad disappeared quietly into the mud.

Now it has re-surfaced as a Systematics-compatible machine, less provocative and possibly more descriptive than saying Apple-compatible. The Toad computer is as Mr Moore demonstrated last year, but it now runs integrated Systematics business software and the name is about to change.

Otherwise much of the emphasis is the same. Toad Systems aims to make life easy for users; Keep it Simple (KIS) is the message of its advertising and it will form the basis of the new name.

'We like to think we're selling the service and the software, and giving the computer away,' said managing director Barry Mace.

But Toad plans to replace its hardware with an acceptable Apple clone, and add IBM-compatibility by putting an IBM clone in its catalogue. 'At the moment we're bringing in boards and bits and pieces from different suppliers and assembling them in Borehamwood, but we don't see that as the way to continue,' said Mr Mace.

It expects to have a complete product range, a new identity, and a rosy future in about four weeks.

ARCADE DIGEST — Latest in the Pan/PCN Computer Library series are two paperbacks which describe arcade games for the Spectrum, Vic 20 and Commodore 64. 'The Best Software Guide for the Spectrum' contains 239 pages of reviews, screen shots, playing tips and useful peripherals for £3.95. The Commodore machines get similar treatment sharing a 269-page book for the same price. Both books are in shops now.

Coleco sheds Adam workers

The gloom from a winter of discontent shows no sign of lifting at Coleco, still struggling to make its Adam home computer a success.

The Adam (Pro-Tested, Issue 38) is a dream turned into a nightmare for the toy and home micro manufacturer. Last month it laid off workers in three separate groups, the last totalling 1,300 people. It said that it expects to recall some of the workers later in the year.

The layoffs anticipate a seasonal drop in demand, but its supply of the Adam has never really got off the ground.

The Adam became the overnight sensation of the micro business when it made its debut last year at the Consumer Electronics Show (Issue 15).

Since then its development and production have been bedevilled by technical and legal problems, and a yawning credibility gap has opened among the kind of people who might have been expected to translate Coleco's hopes into realities — the retailers.

SOFTWARE

The new releases

Education

BBC: The first software products from the National Magazine Company, publisher of magazines *She* and *Good Housekeeping*, are early learning programs covering letter and number recognition counting, telling the time, and others. The six programs are available for the BBC, but should be released for the Spectrum and the Commodore 64 next year.

Spectrum: Described as a program for healthy living', *Diabetes* is designed for all kinds of diabetics of all ages, and teaches newly diagnosed diabetics how to keep it under control and avoid serious complications. The program was written at Charing Cross Hospital with the support of the British Diabetic Association. It runs on the Spectrum.

Games

Spectrum: A rags to riches game from Incentive Software gives you the challenge of running or ruining your own company. The experience will only cost you £5.50. It may prove easier in the long run to escape from a maximum security prison, and Colditz Adventure from Phipps Associates (01-393 0283) is intended to help you find out; film buffs will know most of the scenarios available. The price is £6.95. On a similar theme Lothlorien (0625 876642) has announced Special Operations in its Warmaster range — the tape costs £5.95. Meanwhile, in the dark night skies, 'Only aces survive', according to Digital Integration (0276 684959) about its Night Gunner, £6.95. Ad Astra, which coincidentally crops up in the motto of the RAF, is the title of Gargoyle Games' (021-236 2593) first production; this is a 3D combat game that starts off slow and tops you when you least expect it. Those with a Currah Microspeech unit can squeeze intelligent life out of Ocean Software's (061-980 3488) Pogo, but the game will run adequately without it. The price is £5.90. Salamander has increased its range of Spectrum games with two Jeff Minter conversions — Matrix and Metagalactic Llamas Battle at the Edge of Time, both at £6.95.

Dragon: Hewson (0273 600164) has adapted two of its Seiddab series and the third will be available for Dragon users later this month. The translated games are 3D Space Wars and 3D Seiddab Aattack, costing £7.95 each. Orion (0203 29048) has launched Toppler, a fairground targets game, and Crazy Chaser, dodgems by any other name, for £6.95.

Oric: Leeds' Darkstar is selling Superior Software titles for the Oric-1 with the promise of Atmos versions 'in the near future'. At £7.95 each it has Lunar Mission, World Geography, and Krokatile Waltz. For £9.95 there are Assembler-48K and Toolkit-48K. Darkstar is on 0532 450879. A seven-level arcade game, Spooky Mansion, is available for both systems from Mercury Microware (061-681 2875) at the price of £7.95.

Commodore: Beaver Software (Melton Mowbray) has released Brain Master for £7.95; a feature of this is the protective device called Top Secret that Beaver also produces — the company claims this makes the tape completely uncopiable.

Atari: Creative Sparks (0252 543333) has an address and is therefore presumably a company, but it is also described as a range of entertainment software from Thorn-EMI. This split identity doesn't extend to the games, which are all concerned with mayhem of one sort or another: Tank Commander, Orc Attack, Carnival Massacre, Submarine Commander and Computer War. The software costs £8.95 or £9.95 on cartridge.

Pogo — carrot and stick from Ocean.

Acorn: BBC and Electron users can now enjoy Heathrow Air Traffic Control from Hewson (0273 600164) with the addition of Concorde to the earlier Spectrum version of the game. It costs £7.95.

Various: Virgin Games (01-221 7535) has launched six games for four machines. On the Spectrum it has Sorcery and Atlas Assignment (£5.95), on the Electron Jungle Jive (also the BBC) and Bugs, each £7.95, on the BBC Checkout, £7.95, and on the Commodore 64 Ambush, £7.95.

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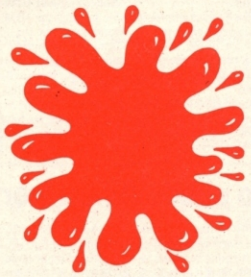

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▼	2	1	Fighter Pilot	Digital Integration	SP	£7.95
▼	3	2	Chequered Flag	Psion	SP	£6.95
▼	4	3	Manic Miner	S/W Projects/Bug-Byte	SP, 64	£7.95
▲	5	22	Bugaboo (The Flea)	Quicksilva	SP, 64	£7.95
▲	6	7	Hunchback	Ocean	SP, 64, OR	£6.90
▼	7	5	Atic Atac	Ultimate	SP	£5.50
▲	8	11	Chinese Juggler	Ocean	64	£6.90
▼	9	6	3D Ant Attack	Quicksilva	SP	£6.95
▼	10	8	Flight	Psion	SP	£7.95
▲	11	15	Fred	Quicksilva	SP	£6.95
▲	12	17	Rev. of Mut.C's	Llamasoft	64	£5.95
▲	13	28	Night Gunner	Digital Integ	SP	£7.95
▲	14	26	Pinball Wizard	CP Soft	64	£5.95
▲	15	18	BlueThunder	Richard Wilcox	SP	£5.95
▼	16	12	Lunar Jetman	Ultimate	SP	£5.50
▼	17	9	Wheelie	Microsphere	SP	£5.95
▲	18	24	Blagger	Alligata	64	£7.95
▶	19	19	Alchemist	Imagine	SP	£6.50
▼	20	4	Scuba Dive	Martech Durell	SP, 64, OR	£6.95
▲	21	—	Forbidden Forest	Cosmi	64	£8.95
▼	22	30	Twin Kingdom Valley	Bug-Byte	SP, 64	£9.50
▲	23	—	Space Pilot	Anirog	64	£7.95
▲	24	—	Super Pipeline	Taskset	64	£6.90
▼	25	10	Stonkers	Imagine	SP	£3.95
▲	26	—	Bear Bovver	Artic	SP	£6.95
▲	27	—	Snooker	Visions	SP,64,AC,OR	£5.95
▲	28	—	Pogo	Ocean	SP	£5.90
▼	29	25	Skull	Games Machine	SP	£6.95
▼	30	21	Deathchase	Micromega	SP	£6.95

MICROS

Top Ten up to £1,000

TW	LW	MANUFACTURER	PRICE	DISTRIBUTOR
▲1	3	CBM 64	£200	CBM
▼2	1	Spectrum	£99	SI
▲3	4	BBC B	£399	AC
▼4	2	Vic 20	£140	CBM
▲5	9	ZX81	£40	SI
▲6	10	Electron*	£199	AC
▶7	7	Oric 1/Atmos	£99/175	OR
▼8	5	Dragon 32/64	£175	DD
▶9	9	Apple IIe	£750	AP
▲10	—	Atari 800XL	£250	AT

Top Ten over £1,000

TW	LW	MANUFACTURER	PRICE	DISTRIBUTOR
▲1	2	ACT Sirius	£2,525	ACT
▼2	1	IBM PC	£2,390	IBM
▲3	4	Apple III	£2,755	AP
▼4	3	ACT Apricot	£1,760	ACT
▶5	5	DEC Rainbow 100	£2,359	DEC
▲6	7	Wang Professional	£3,076	WANG
▼7	6	Olivetti M20	£2,180	OL
▲8	—	Televideo TS 1603	£2,640	EN, CT, MID
▼9	8	NCR Decision Mate V	£1,984	NCR
▼10	9	Kaypro 10	£2,595	CKC

These charts are compiled from both independent and multiple sources across the nation. They reflect what's happening in high streets during the fortnight up to **April 5**. The games chart is updated every other week.
Neither mail order nor deposit-only orders are included in these listings. The prices quoted are for the no-frills models and include VAT.
Information for the top-selling micros is culled from retailers and dealers throughout the country and is updated every month.
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Will our enterprise go unrewarded?

Like Mr I Skelly (Issue 54), I too have had problems with tax relief. I believed I could recoup some of my £2,500 outlay on a Research Machines 380Z, which I use in connection with my work as a teacher. It seems that unless you can prove the equipment is essential to your work, no relief is available.

In my case, although the purchase of the machine was not 'essential' at the time, computing has now become a major part of my job as a direct result of the purchase, and my programming has led to the purchase by my college of other (British-made) systems which it would not otherwise have bought.

So much for rewarding individual enterprise, which is supposed to be the cornerstone of the policies of the present government.

Incidentally, the screen-clearing method (Issue 54 Microwaves) (CALL "RESOLUTION",0,2) proposed by SS Alg for the 480Z is fine as long as you don't mind clearing the whole of graphics memory in addition to the current screen.

Margaret J Leonard,
London SE23

Maybe not — if you know the system

Mr Skelly (Issue 54) has fallen foul of the usual problem besetting people in employment, rather than self-employment, who purchase equipment or supplies to help them in their work.

The problem is that in order to obtain tax relief for such expenditure it must be made wholly and exclusively for the purpose of his employment. The furtherance of one's own knowledge so that one may better perform one's duties of employment is not recognised by the Inland Revenue as falling within that definition.

In Mr Skelly's case he can undoubtedly perform his duties adequately without purchasing a micro.

One solution that occurs to me is that Mr Skelly should set up his own software publishing business. If his programs are as good as his letter implies they would surely be of use to other educational institutions and similar bodies. No elaborate organisation needs to be set up and, provided advice is sought from a professional advisor as to the proper way to do this, Mr Skelly will then be able to claim his computer against tax, as well as gain an income benefit.

In view of the budget proposals on capital allowances for expenditure of a capital nature this needs to be done as soon as possible.

R K Nicholls,
Chartered Accountant,
Sevenoaks, Kent

I'm sure this could be of benefit to many; (looks like there could be a run on off-the-shelf companies). — Ed.

PCN £10 Star Letter

Act in haste, repent at leisure

I decided to get rid of my 48K Oric 1 and buy a new Oric Atmos and was very disappointed to find that most of my games would not run.

On contacting one or two local software manufacturers I was told nothing could be done about it. This was confirmed by a computer retailer who added that, although the Atmos was a nice little micro, I was silly to buy one so early as there would be very little choice of arcade action software available for some months.

I understand that some of the 16K games will run but most of those are very tame to the point of being boring, so it looks like I will be able to run only my own programs and that my Atmos will be used only to half its potential for some time.

L F J Rumens,
Stockport, Cheshire

Simple solution to tape trouble

Having owned four assorted micros for a number of years and having access to a Spectrum, I know only too well the problems of using cassette tape to store programs.

I have found that, with constant use, the volume setting necessary to achieve a successful SAVE, LOAD or VERIFY has to be increased gradually, until eventually a result is impossible.

In November my mother bought a Spectrum and tape recorder — within a couple of months there was a SAVEing and LOADing problem. But suddenly I realised the heads were probably magnetised.

I sent mother out in search of a solution, with the idea that she would come back with an expensive electric demagnetising tool (*the eternal optimist — Mum*). She returned with a W H Smith's 'Head cleaner and demagnetiser' tape (*mother's stroke of genius, this — Mum*).

After using this on her tape recorder and one of my own, the problem completely disappeared, restoring successful SAVEing and LOADing on both the Spectrum and my Microtan 65.

In answer to this problem, the popular reply seems to be that the heads could be misaligned. If you are having trouble — before going to the expense of having your recorder professionally serviced — try a Head cleaner and demagnetiser tape. It could do the trick!

D G Lawson,
Database secretary,
National Westminster Personal Computer Society

A rare mum . . . being 'sent out' . . . solving the problems . . . showing us all how . . . bet there aren't many who'd do that. — Ed.

And did you push the Record button?

While catching up with a backlog of reading, I came across Glenn Knights' saving problems with the Spectrum (issue 46).

In my experience of giving micro program advice I feel your experts missed a very important point — did Mr Knight actually press the Record (not just the Play) button on his recorder? You would be surprised how many of my customers (including myself) have made this mistake while getting used to a tape recorder.

Frances Daniel,
Programming consultant,
Bugbear,
Kenilworth, Warwickshire

No joke this. Have you heard the one about. . . . — Ed.

Atari's prices aren't justified

Does Mr Best (Issue 54) or the other Atari owners have any idea of the profit the games side of Atari generates? Warner Bros (owners of Atari) is believed to have made more money from Pac-Man than 20th Century Fox made from Star Wars (the film). Yet Atari owners justify the £30+ you pay on quality grounds.

As for the argument that there are plenty of cheap games available if you look around, I recently tried to purchase games produced by Stargrade of Liverpool. To find someone who stocked its games was like looking for the Holy Grail. No big chainstore seems interested in stocking cheap games. Even the small games' shops charge more for an Atari cassette than, for example, a Spectrum. Why?

I phoned Stargrade. A spokesman said the company now sells by mail order at reasonable prices as the shops are not interested in stocking its games (there's nothing wrong with their quality).

What about the £50 you pay for the hunk of plastic called a data recorder? Is that justified on quality grounds?

I recently purchased a 600XL and I would recommend it, providing you can get round the problem of the overpriced recorder and games.

Stephen Majkut,
Wrexham, Wales.

Supply and demand determine prices

Mr R Rancans (Issue 51) quotes the cost of a Microdrive cartridge (£4.95) against that of a C-60 cassette (60p). I suggest the cost of each — materials and manufacture — is about 15p-20p.

However, there is a competitive market for C-60 cassettes whereas there is only one manufacturer of Microdrive cartridges, hence the price is set at what the market will stand.

Like many others, I am not buying a Microdrive until the cartridge price falls to around £1. Even then it is expensive on a cash per K storage basis, and I would still prefer disks.

B G Bryan,
Sudbury, Suffolk

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Spectrum loading needs right volume

Q I have just purchased a 16K Spectrum. Could you tell me where I can upgrade it to 48K, and roughly how much this would cost. Now for the main problem. I can't LOAD JetPac on my Omega tape recorder, but when I try it on a Pye 9110 it works. Not many games will load on the 9110 because of a poor ear to ear connection, so why should JetPac?
Chris Bailey,
Norton, Northants.

A There are a number of suppliers of upgrades. Try the Buffer Micro Shop, on 01-769 2887, East London Robotics on 01-474 4430 or Fox Electronics on Basingstoke (0256) 20671. It should cost between £20 and £25.

As for your loading problem, with some newer games high volume can be as much of a problem as low volume. When the Spectrum first came out you could load most games by turning up the volume. However, tape duplication has improved to the extent that lower volumes can help.

Pasta Blasta outa now

Q I sent a cheque off to Arcadia Software for Pasta Blasta on the Oric-1 on January 21, but haven't received the goods yet. I have written five letters to the company without reply. Can you help?
C Turner,
Cheddleton, Staffs.

A Arcadia says there was a problem with the tape duplication on Pasta Blasta, and that deliveries were delayed until the first few weeks of March. We've passed on your details, so even if you haven't received the game yet it should, in fact, be on the way.

Quite often you'll find that games aren't actually available when the advertisement first appears, so in future check on availability first.

Rules of the game exchange

Q I want to start a software exchange club. Would I need permission from the manufacturers to use their tapes for exchange, and can I sell their tapes to club members at my own prices?
P Ginger,
Camberley, Surrey.

A You've probably noticed that software houses have been getting a little sensitive about enterprises of the sort you propose. Read the back of an Imagine cassette inlay to find out what the top of the market attitude to copying, loaning, hiring, part exchanging or anything at all is.

Mind you, the legal status of these dire imprecations is dubious to say the least. You'd be on much dodgier ground if your club were being used by people to pirate software. If this happened on a large scale you might find youself on the receiving end of a good deal of sabre-rattling, or worse.

There's no need for you to sell tapes at the recommended retail price, but if you were going to do this you'd really have to go in for sales in some volume and get the tapes at wholesale prices.

Now this, if you were also offering an exchange or try and buy system, might well be difficult, because if software houses didn't like what you were doing they might well try to stop you getting the software.

Our advice to you here would be either stay very small, as just a group of friends, or go into business properly. If you choose the latter, a software exchange would probably be a lot more aggravation than it's worth.

Load Oric program before picture

Q I have a 48K Oric-1 and cannot work out how to write a short program to load a screen picture and then a program. So far I've got:

```
10 POKE #26A,43
20 PAPER 0:INK7:HIRES
30 CLOAD"":CLOAD""
```

But this only loads the picture, not the main game.
Ian Eden,
Cannock, Staffs.

A As you probably know, the way to save a HIRES picture to tape is to save it as a block of memory. CSAVE" filename", A40960 E49119 will do this and to load it you replace CSAVE with CLOAD. The letters A and E indicate the start and end addresses of the HIRES screen.

It's not easy to load a picture then a program from Basic. You can't use CLOAD" ": CLOAD" " because the first CLOAD loads a program which overwrites the second. Nor can your use CLOAD"", A40960, E49119:CLOAD"" as the second CLOAD is ignored.

What you could do is CSAVE both the program *and* the picture. you'll need to know where the program begins in memory and you can get this number by DEEKING #9A. You would then use CSAVE" NAME", A (number), E49229. This will, of course, require rather a lot of tape and take a long time.

Alternatively, you could CALL the loading routines, described in 'Oric Owner' Issue 2 1983, (contact Tansoft on (02205) 2261/2/3/4). The article describes how to set up registers and call the relevant routines to CLOAD and CSAVE data, so you should be able to adapt them to suit your particular needs.

Modems for phone conversation

Q I am a hearing-impaired person thinking of buying a home computer, such as the Sinclair Spectrum, to 'phone up' my hearing-impaired friends.

However, I have been warned that if my modem operates at 300 baud and my friend has one that operates at 1200 baud, telephoning would be out of the question.

Is this really the case?
Janet McCoy,
Birmingham.

A The warning is totally correct. Many people have bought 1200/75 baud modems (as used to dial up Prestel) and found that they cannot talk direct to other users either because the other user has a 300/300 baud modem or because the modem they are using does not have the hardware or software to talk to other users at 1200/1200 baud.

The Spectrum may not be the best choice of micro to buy in your case. The only modem that is available runs at 1200/75. 1200/1200 baud is possible but only by manually flicking a switch. Fine if you want to exchange programs or files, but useless for chatting.

A possible solution is to buy an Interface 1 adaptor which has an RS232 port and enables you to plug in another modem that either operates at 300/300 baud or one of the multi-rate modems that are just becoming available.

Since the adaptor costs £49.95 it could be an expensive solution. And since the Spectrum's rubber keys are a hindrance to typing at speed, you might like to take a look at other micros with a proper keyboard.

Providing the micro has an RS232 interface you should be able to plug in virtually any make of modem, one of which should be suitable for your needs.

For more information, see *PCN*'s Communications Micropaedia (Issues 55, 56, 57).

Another Spectrum bites the dust

Q The 48K Spectrum (issue 3) I've had for over a month now has been working perfectly until quite recently, but now when I switch on, instead of getting the copyright message all I get is a black square on the screen.

Do you have any idea what can have gone wrong?
S Ahmad,
London SW12.

A We assume you mean that the whole of the centre of the screen is black. This is nature's way of telling you your Spectrum is bust, and you should send it back to Sinclair.

As it's still under guarantee you shouldn't have any trouble getting it replaced, just pack it off to the address shown on your guarantee card. As for what's gone wrong, one of the most common causes of this sort of breakdown is when the user has plugged in or pulled something out from the edge connector while the machine's powered up. This often zaps the Spectrum, and sometimes zaps the peripheral as well.

So if you have done this, try not to do it again.

MICROWAVES

More hints and tips to make programming a little easier.

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.

ARCOS error on the Newbrain

I have recently found an unusual fault with the Newbrain's arithmetic ARCOS function. Quite by accident I happened to use a certain value in the function which the NewBrain failed to evaluate correctly. This led to hours of debugging which finally traced down the problem.

I put in two PRINT statements to check the values before going on with the program:

```
PRINT X
PRINT ACS (X)
```

of which the results were 0.8660254 and 0.0022552707 respectively.

If I then type PRINT ACS (0.8660254) I get the answer 0.52359878, which is correct. The answer to the problem lies in the fact that the full precision of the number had not been typed. If I type PRINT X(10F) I find the answer 0.8660254038. Two more tests revealed the following answers:

X	ACS (X)
0.8660254037	0.5235987759
0.8660254038	0.002255270665
0.8660254039	0.5235987754

Is this a rare case of a non-convergent algorithm?

M A Ball,
Kingston Park, Newcastle upon Tyne

Spectrum skips the SAVE prompt

Quite often a micro user (especially one not yet lucky enough to own a Microdrive) will want to SAVE either a program, data, or code automatically, jumping the START TAPE THEN PRESS ANY KEY prompt. This can be done simply by using the following POKE. On a Spectrum without Interface 1 connected, use POKE 23736,181 before the SAVE command. On a Spectrum with Interface 1 connected, use POKE 23794,181 before the SAVE command.

This works by changing the channel address for the keyboard routine; in effect it is simply skipped over.

Chris Haine,
Rugby, Warwickshire

Typing on the Atari window

On the Atari 800, if you type GRAPHICS 2 or any other GRAPHICS mode as a direct command and then fill the text window up twice with any character and press Return, you will be able to type in the graphics window.

Lawrence Staveley,
Rhondda, Mid Glamorgan

BBC answers 'yes' or 'no'

I use this tip on my BBC, but it could work just as well on any machine, depending on the codes returned for each key.

When asking yes or no questions, it is usual to check for both upper and lower case *ie*

```
10 X$=INKEY$:IF X$=""THEN 10
20 IF (X$="y" OR X$="Y")
   THEN PROCYES
30 IF (X$="n" OR X$="N")
   THEN PROCNO etc.
```

The double comparison can be avoided by forcing the input to be a capital letter by ANDing the input with 223. Hence use:

```
10 X$=INKEY$:IF X$=""THEN 10
20 X=ASC(X$) AND 223
30 IF X=89 THEN PROCYES
40 IF X=78 THEN PROCNO
```

David Abbot,
Horsham, Sussex

(An alternative, on machines that have the INSTR function is:

```
10 X$=INKEY$: IF X$="" THEN
   10
30 ON INSTR ("yynn",x$)+1
   GOTO 10, 100, 200, 200
```

where 100 is the routine for yes, and 200 is the routine for no — BS.)

Newbrain CIRCLE gets around the ARC

The expansion interface for the Newbrain provides a set of extra commands. Most of these are documented in the manual. By trial and error, I have discovered an undocumented graphics command. The format of this is:

CIRCLE (X,Y,R)

where X,Y are the centre of the circle coordinates on the graphics screen and R is the radius.

David Scott,
Glenrothes, Fife, Scotland

Stopping Oric AUTO files made easy

In a number of Routine Inquiries about stopping Oric AUTO files, you suggested this was difficult and requires some machine code to be written. On the contrary, it can be done as follows:

POKE #35,0	Set up filename ""
POKE #67,SPEED	Fast=0, Slow=1
CALL #E6CA	Set up VIA for tape
CALL #E4A8	Find and load the file from tape.
CALL #E804	Reset VIA.

All this should be entered as a single line direct command and works because the check for AUTO is within the CLOAD routine which we have avoided.

The above method will work perfectly with any Basic program but there is a slight hitch with machine code programs; a ?SYNTAX ERROR message is displayed and the keyboard remains disabled. However, pressing the reset button on the bottom of the Oric fixes this without harming the program; that is, unless it has been loaded into the area normally reserved for the character set as this is initialised on reset.

Below is a routine which sets up the ! command to do exactly the same job as above but using machine code to avoid the hitch. To use it, first of all POKE #405,SPEED (as above) then simply type ! and press return.

```
A=#400:D$="A9008535A900856720A8E44C04E8"

FOR I=1 MTO LEN(D$)STEP 2:V=VAL("#"+MID$(D$,I,2)):POKE
A,V:A=A+1:NEXT

DOKE #2F5,#400
```

C Hamilton, Belfast, N Ireland

Routine to POKE at Spectrum listings

The standard Spectrum does not come with a list option function (like LISTO on the BBC) so I have written a machine code version of this function. The routine will indent all FOR-NEXT loops. It can be placed anywhere in available RAM. Location 23728 may be POKEd with the number of spaces wanted between the line number and the line code. For example POKE 23728,2 will leave 2 spaces. POKE 23728,32 leaves a whole line blank, in between the program lines—producing an easy-to-read listing.

As there is no printer option, it is possible to type OPEN#2,"P" to send everything to the printer and CLOSE#2 to stop the printer.

```
10 CLEAR 31999
20 FOR a=32000 TO 32076
30 READ d:POKE a,d
40 NEXT a
50 DATA 62,2,205,1,22,42,83,92,237,91,
   75,92,235,167,237,82,200,216,
   235,205,40,26,62,32,215,17,176,92,
   26,254,0,40,8,245,62,32,215,241,
   61,24,244,35,35,35,126,254,235,
   32,4,235,52,52,235,126,254,243,
   32,4,235,53,53,235,205,182,24,205,
   55,25,126,254,13,32,226,35,24,188,
   187
60 POKE 23728,2
70 RANDOMISE USR 32000
90 REM try the routine on other
   programs that use multiple FOR-NEXT
   loops.
```

Jim Patterson, Huonville, Tasmania, Australia

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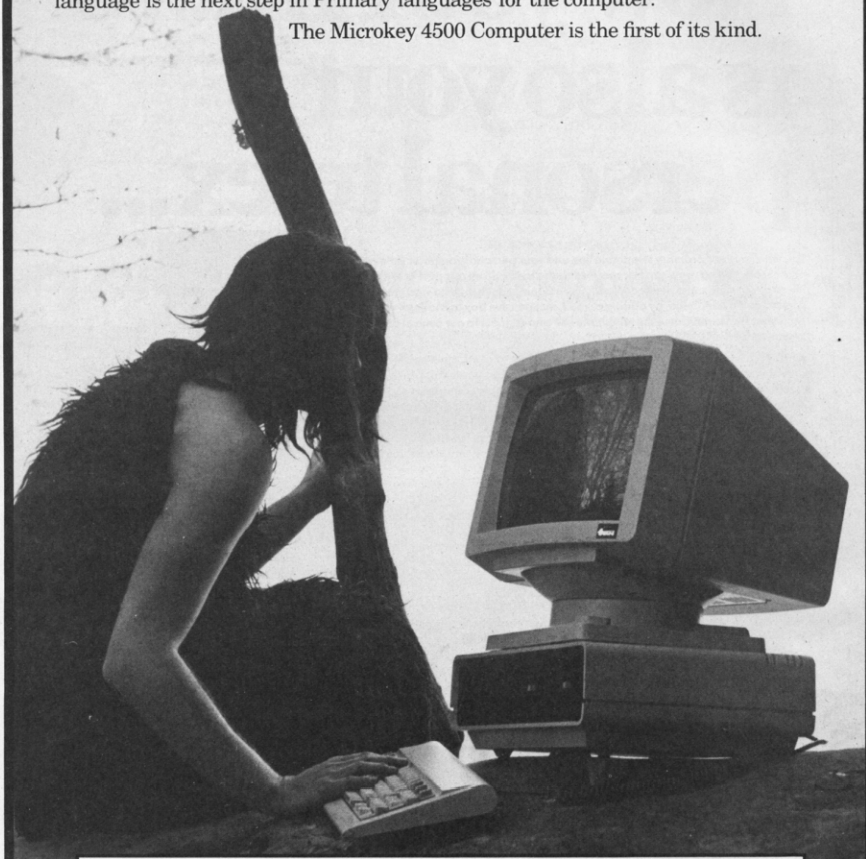

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A North London BBC user group is attracting attention to itself.

BBCs interface to mainframes

Networking of BBC micros to mainframe computers is the current main project for the North London BBC Micro User Group, which has built its own interface for the purpose.

As the 40-strong club meets in a pub, which has no facilities for using micros, members meet outside of club hours to work together on their various projects.

Recently a member working on a project at a West London hospital helped draw Acorn's attention to the fact that BBCs are being used to analyse and store data in an experiment which looks into ways of improving the diagnosis of asphyxia in newborn babies.

When this came to Acorn's attention they decided to launch an advertisement, due for release in autumn, based on this project.

Former organiser, Dr Leo McLaughlin, a chemistry lecturer at London's Westfield College, says the group is looking to local radio to give it more publicity. The group's new leader, Ric Keyworth, has plans to make a video showing their activities, also to this end.

Several members are writing their own games, including Backgammon, and the group also had a stand at the Electron and BBC Micro Users Exhibition at Westminster on April 1.

Janice McKenzie

Name The North London BBC Micro Users Group **Venue** The Prince of Wales, 37 Fortune Green Road, London NW3
Meetings Each Tuesday at 7pm
Contact Ric Keyworth, 01-734 9235

If your association has something special on the agenda or if you've just started a new one, contact us at *Clubnet, Personal Computer News*, VNU, 62 Oxford Street, London W1A 2HG. Clubnet keeps you in touch with enthusiasts throughout the country. It is divided into clubs and user groups and lists of both will be published every four weeks.

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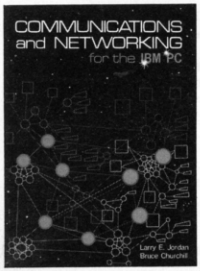


'Communications and Networking for the IBM PC' by Larry Jordan and Bruce Churchill, published by Prentice/Hall at £17.05 (paperback, 237 pages).

It says a lot for the advances in both communications hardware and applications, and the dominant position of the IBM PC in the US, that thick, substantial books can be written on the subject.

This is a competently written, meaty treatise on communications — the IBM PC tag is important, but much of the information would be equally valuable to anyone who wants to learn about communications and not necessarily do it on a PC.

The first few chapters concentrate on communications in a general sense — codes, interfaces, hardware. After this the book gets specific and covers communications software, local area networking and applications for the PC.

One interesting section is 'Answers to frequently asked questions' — whether this, coming at the end as it does, was a quick exercise in padding for the benefit of the publisher is unsure, but I like it anyway.

The appendices should ensure the book stays useful as reference material — such goodies as a table of the ASCII characters complete with hex values, and another for Baudot code should prove useful. Also included is a Basic communications program which will enable the PC user to transfer data from an IBM PC keyboard to a communications link and send received data to the screen, printer and disk drive. **IS**

'Choosing a word prcessor' by Francis Samish, published by Granada at £6.95 (paperback, 182 pages)

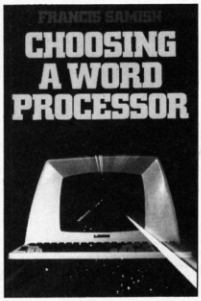
This book has all the signs of being poorly researched and two years in the writing. The author seems to think that the only micros around are made by Apple, Commodore and Tandy or are CP/M machines for which Wordstar is the only word processing package available.

If you are amazed at the sheer scope of the book's survey of available technology you will truly marvel at its incredibly patronising tone.

From the start of chapter one through to the glossary at the end, the author labours through the subject stopping every second sentence to put a word in quotes and following it up with a definition that confuses rather than clarifies what he is talking about.

Whether you will be better informed after reading the book is a moot point. In my experience someone who is at the stage of thinking of buying a word processor will have already read numerous newspaper and magazine articles on the subject.

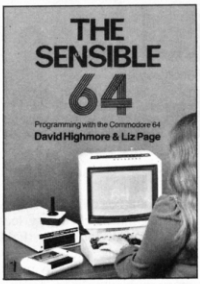
What the prospective purchaser now needs is hard facts and in this book they seem to be thin on the ground. And what there is, is hopelessly out of date. **RB**



'The Sensible 64' by David Highmore and Liz Page, published by Microbooks, distributed by John Wiley at £5.95 (paperback, 117).

Yes, yet another book on programming the Commodore 64. But, there is a difference, and a welcome one. *The Sensible 64* concentrates on practical matters with just enough theory to make things comprehensible.

Also welcome is the omission of the introduction to Commodore Basic which most authors seem to regard as compulsory. There's no messing about here — by page 11 we're into user defined characters.



Production of the book leaves a little to be desired; the cover is not the most attractive and the bulk of the text seems to be daisywheel output. But do not be put off by appearances. The number and quality of example programs (all straight printouts) put this title well ahead of most of the competition.

In keeping with its practical approach, most of the programs are presented as routines which can be incorporated into your own programs. Where speed is essential, the Basic listing is supplemented by a machine code version. Topics covered include high-resolution and sprite graphics, sound, and brief sections on disk drives and printers. **PW**

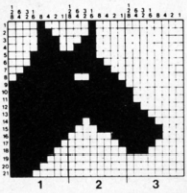


Illustration: drawing a sprite

'Fortran for Human Beings' by LWB Browne, published by Interface Publications at £3.95 (paperback, 92 pages).

There aren't too many new books these days about the Fortran programming language (perhaps because there aren't many people programming in Fortran), so Mr Browne's book won't suffer due to too much competition.

But then Mr Browne's book and its subject matter aren't all that new either. The inside leaf reveals this book was first published in Australia in 1982 and has only just reached these shores in the form of a British version published by Interface.

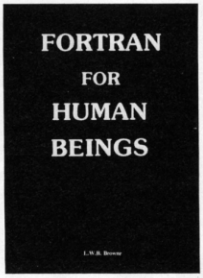
Mr Browne set himself a difficult task in attempting to write a book that could seriously deserve the title 'Fortran for Human Beings' as the language in question is distinctly inhuman and unfriendly. He has responded to this challenge with a book that is short on detailed explanations of Fortran (and short in general — it's only 92 pages long), and relies instead on example program listings.

Mr Browne explains his rationale thus: 'Most Fortran texts are 'wordy'. Their intention is to fully explain all the features of Fortran and many of them do this very well. However, I believe the beginner needs a text which establishes the important features quickly, enables extensive program writing and also concentrates on programming style. This book assumes no previous knowledge of program writing.'

Though reasonably readable, the text seems to have been set on a daisywheel printer. The program examples themselves are of the iteration calculation, loan-interest calculation, spherical volume determination type (no-one ever said Fortran was going to be fun), but given the limited nature of the language this is not surprising.

If you are in the position of having to learn Fortran, then this slim volume might be a reasonable place to start — though you would need a comprehensive reference guide as a companion to it. **GW**

69 ▶



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Forth feature

Ted Ball looks at the prospects for a new Forth system.

Nearly a year ago, PCN readers were asked to contribute suggestions for the ideal micro. The 1,700 responses resulted in the Microkey.

In theory a computer is a general-purpose machine that can, with suitable programming and connections to the outside world, be adapted to perform any task we require. In practice each model comes equipped with a range of programs and interfaces that give it an identity and point to specific areas of application.

The Microkey 4500 does not fit into any of the usual categories. The hardware and price suggest a business system, but the machine lacks a standard operating system that would allow it to run widely available business applications programs. It resembles a home computer in having a programming language and its own operating system in ROM, but the programming language is Forth instead of the usual Basic.

The clue to the Microkey is, of course, the Forth language. Forth was developed originally for programming applications involving the control of scientific and industrial equipment, and the Microkey is ideally suited in its hardware and software for such applications, and also for use in technical education.

First impressions

The system is intended for experienced computer users, and although the manual includes sections on setting up the system and getting started, a novice is likely to have difficulty with this.

The system consists of the computer cabinet (which may include up to two disk drives), a keyboard and a monitor, which have to be plugged together. Connecting up the system is quite straightforward if you have a little technical knowledge, otherwise the terse technical labelling on the diagram of the rear panel connections could be confusing.

Once you have the system set up and switched on you have to boot the system disk following step by step instructions in the manual. The machine is then ready for you to start programming.

Documentation

The documentation consists of a reference manual and an introductory textbook on Forth.

The textbook is *The Complete Forth* by Alan Winfield, published by Sigma Technical Press. Although not written for the machine, it deals with the same standard Forth 79 language that is implemented on the Microkey. The book covers all the features of Forth systematically, with examples and exercises to try out. It is a first-class introduction to programming in Forth, and has been widely recommended both for self-study and class use.

The reference manual gives technical details of the hardware and software and includes everything you need to make full use of the Microkey 4500 system. It covers the program editors, the Forth vocabulary (with extensions to Forth 79 listed separately), the 6502 assembler in Forth, the hardware specification (with details of all the interface connectors and pinouts but no circuit diagrams), the system monitor commands and the use of operating system routines.

The manual is purely a reference document and you need considerable technical knowledge to understand it fully.

Keyboard

The keyboard is an IBM type, and is the only thing about the Microkey that I really dislike. There has been so much criticism of the IBM keyboard that I don't need to say much here, but my main objections are the non-standard layout and the too springy feel of the keys.

Display

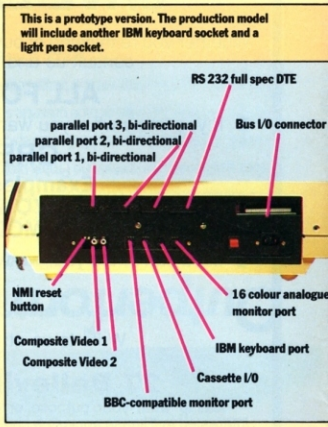
The Microkey 4500 has two high-resolution graphics display modes. In colour it gives 640 by 200 pixels with eight colours available (which can be extended to 16 colours by fitting an additional colour card), and in monochrome, 1280 by 200 pixels. There are no separate text and graphics modes; text and graphics can always be mixed on the screen.

The resolution available is more than can be handled by a normal TV, so no UHF output is provided. Microkey Ltd recommend the Cotron Sword 16 colour analog monitor, but the Microkey 4500 also has video outputs for an RGB monitor and two monochrome monitors.

Hardware

The Microkey 4500 is based on a 6502 microprocessor running at 1.843 MHz, with 128K RAM and 32K ROM. It has a large number of interfaces, two parallel input/output ports, 7-line bi-directional RS232, and connectors for four disk drives (which may be any mixture of Sony 3½in, Epson 3½in, and standard 5¼in), and a system bus compatible with the Apple II bus.

The machine has been designed to accept more modern processors than the 6502 in order to ensure its long term usefulness. The additional processors allowed include the 6809, (although no firmware is available for this yet) and the Western Digital 16-bit microprocessors W65SC816 and W65SC802. These Western Digital processors can operate as an 8-bit 6502 (so no new firmware is required) and also as full 16-bit processors with an enhanced instruction set. The Microkey's RAM can be expanded to 512K if the W65SC816 is fitted.



This is a prototype version. The production model will include another IBM keyboard socket and a light pen socket.

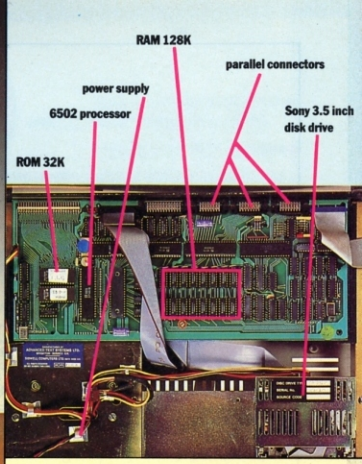
Software

The major part of the software is the Forth programming language, which is held partly in ROM and partly on disk. It is standard Forth 79 with a few extensions. The extensions consist of some system dependent words, for interfacing with the system monitor and handling the graphics, and some Fig Forth words that were omitted from the Forth standard.

Other software includes a system monitor in ROM which allows various input and output operations independently of Forth, an operating system ROM with the input and output routines documented so they can be called from user programs, and a 6502 assembler in Forth.

The only software available for the Microkey so far is what is included with the machine. However, there are many programming utilities in Forth available as source listings or on disk for other systems, and it is likely that much of this software will become available for the Microkey once the machine is in production.

Paul Wilson



In use

One of the advantages of a standard programming language is you don't have to re learn it or rewrite your programs every time you move to a new machine. I was able to use the Microkey quite easily after a few minutes' study of the section of the manual that describes the non-standard and machine dependent features of Microkey Forth.

The Microkey includes the usual line-oriented editor that comes with Forth, but this is difficult and tedious to use, requiring separate commands to select a line of program, position in the line and for insertion and deletion of text. However, there is also a screen editor which is much easier to use, allowing you to move the cursor to the place you want to edit and then insert or delete directly.

Although the Microkey system has a cassette interface to allow it to be used without disk drives it is very difficult to use with cassette only. The system monitor allows you to save and load blocks of memory on cassette and it is possible (though not documented) to save and load programs in this way. However, without a disk drive it is not possible to edit programs without retyping everything.

The review machine included one Sony 3½in drive, which made it possible to use the machine in the way it was intended. The main problem with only one disk drive is the difficulty of making a backup copy of a disk. It can be done, but involves frequent changing of disks. The disk copy utility in the Microkey only works when you have two disk drives.

Forth is used a lot in control applications because it is almost as fast as machine code but much easier to write than assembly language. The speed of the Microkey is demonstrated by the software that allows two users with separate keyboards and monitors to operate the machine at the same time.

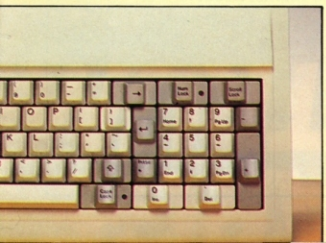
Support

Microkey Ltd intends to provide full support for the machine including the new processors mentioned earlier, extra hardware including Centronics amd modem interfaces and additional software. The company will also be issuing its own 'Seal of Approval' for hardware and software provided by outside suppliers.

Verdict

The Microkey 4500 is aimed at scientific and industrial control applications and at education in these fields. The built-in Forth and the many interfaces make it well suited for these uses, and with the total cost being comparable to that of any similar hardware. The robust construction and forward-looking design make the machine good value for money.

Although the Microkey 4500 is not meant for the ordinary home user, I would expect many Forth enthusiasts to buy a Microkey system for their personal use. PCN



SPECIFICATIONS

Price Microkey 4500: £748. Cotron Sword 16-Colour Monitor: £402, Sony 3½in disk drives: £241 each.
Processor 6502 (which may be upgraded to 6809, W65SC816 or W65SC802).
RAM 128K.
ROM 32K.
Text screen 80 by 25 or 160 by 25.
Graphics screen 640 by 200 in 8 colours or 1280 by 200 monochrome. Analog, RGB, and 2 composite video outputs.
Keyboard IBM types, 87 keys, 10 function keys and numeric keypad.
Storage Up to 4 disk drives, single or double density, which may be any combination of Sony 3½in, Epson 3½in, and5¼in.
Interfaces RS232, 2 parallel user ports, 2 IBM-type keyboard interfaces, Apple compatible cassette interface, Apple compatible system bus.
Language Forth 79 with extensions.
Distributor Microkey Ltd, 98a St. James's Street, Brighton, Sussex BN2 1TP, (0273) 672911.

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The Market Leaders

This is the first of a series on Assembler programming. Keith Hook introduces the initial concepts.

From binary to hex

Have you heard the one about 'how difficult it is to program a computer using machine language?' Many myths have grown up around this subject, but with a little help and a few easy to learn rules, most people are capable of programming in machine code. Things may seem complicated at first, but don't be put off, because the fog will soon clear, and within a short time you will be writing your own routines.

This series of articles will explain the rudiments of programming in machine code and should help overcome some of the more common obstacles encountered by the novice.

There's no substitute for writing your programs in machine code. Programs will run up to 250 per cent faster, and many techniques not appropriate in Basic will be available to you. And arcade action in the real sense is only obtainable using this method.

One of the most frequent areas of confusion concerns the difference between machine code and assembly language, so we'll get this out of the way first.

When you type a program into the computer using Basic, the computer contains a program held in ROM called an interpreter. This does exactly that — it interprets your Basic statements into machine code so the computer carries out your instructions. No matter which language you use, Pascal, Basic, Fortran etc, the only language the computer executes is machine code.

Assembly language is written using a program called an assembler. This is loaded into the computer before you begin programming. The assembler allows you to use instructions called 'mnemonics' which are normally standard, logical names assigned to the various machine code instructions. For example, the Load group of instructions uses the mnemonic 'LD'. The assembler then translates (assembles) these mnemonics into machine code instructions which the computer can understand.

Assembly Language:		LD A,20H
(source program)		LD (HL),A
After Assembly	3E 20	LD A,20H
(object program)	77	LD (HL),A
	↑	
	Machine Code	

Each machine code instruction is in fact a set of binary bits arranged in a certain order which represent a state of 'on' (1) or 'off' (0). The computer recognises this to produce a desired result. The same code in binary would look like this:

00111110	00100000	LD A,20H
	01110111	LD (HL),A

It should be apparent from the above examples that it is easier to recognise errors in hexadecimal than it is with the equivalent binary code.

The hexadecimal numbers in the assembly example are machine code instructions which have been translated from your mnemonics. Two hex digits represent 1 byte in the instruction, and instructions can be one, two, three or four bytes long. Obviously, the more bytes an instruction has the longer it takes the computer to execute — something to bear in mind when considering programming techniques.

In machine language programming such terms as 'One's Complement' and 'Two's Complement' soon appear, and one of the first stumbling blocks the novice comes across is how an 8-bit binary number can sometimes represent 255 decimal and sometimes –127 decimal. To get over these problems requires an elementary knowledge of binary and hexadecimal arithmetic. It's worth spending a bit of time on this subject as it will help overcome the problems encountered in your programming later on.

When we count in decimal, we use the digits 0 up to 9. To carry on counting after 9 we must go back to 0 and carry one into the 'Tens' column and so on. When we write 126 we can also mean $1\times100 + 2\times10 + 6\times1$, or $1+10^2+2\times10^1+6\times10^0$ Remember: any number raised to the power of 0=1). From this it can be seen that 126 actually represents:

10^2	10^1	10^0
1	2	6

The Binary system uses only 0 and 1. When you count in binary the same rules apply as in decimal, but after counting to 1 we go back to 0 and carry 1 into the next column left. The Binary number 0111 can be written as:

$2^2+2^1+2^0=7$ or $2\times2+2+1=7$

In binary each position represents a power of two, not ten.

Given that one byte represents eight digits (bits), and by examining the following diagram of one byte, you can see how easy it is to calculate the equivalent decimal number using positional notation (2^2,2^1,2^0 etc):

	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
	1	1	0	0	0	1	1	1
Bit no:	7	6	5	4	3	2	1	0

This is: $2^7+2^6+2^2+2^1+2^0=$
$128+64+4+2+1=199.$
(2×2 seven times plus 2×2 six times and so on).

It should also be obvious that as you move to the next position left the previous decimal value doubles:

	128	64	32	16	8	4	2	1
Bit no:	7	6	5	4	3	2	1	0

Binary addition is quite a simple matter. There are only two digits,

0+0=0 : 0+1=1 : 1+1=10

so that: 15 = 1111
6 = 0110

21 = 10101

Hence multiplication in binary creates no serious problem. Whatever number base you use, multiplication really consists of adding a number to itself a set number of times, *eg* $6\times3=6+6+6=18$. If we examine a binary multiplication, a couple of interesting facts emerge.

Multiplicand	1010=10
Multiplier	0110= 6
	0000
Partial answer.....	1010
	1010
	0000
	0111100=60

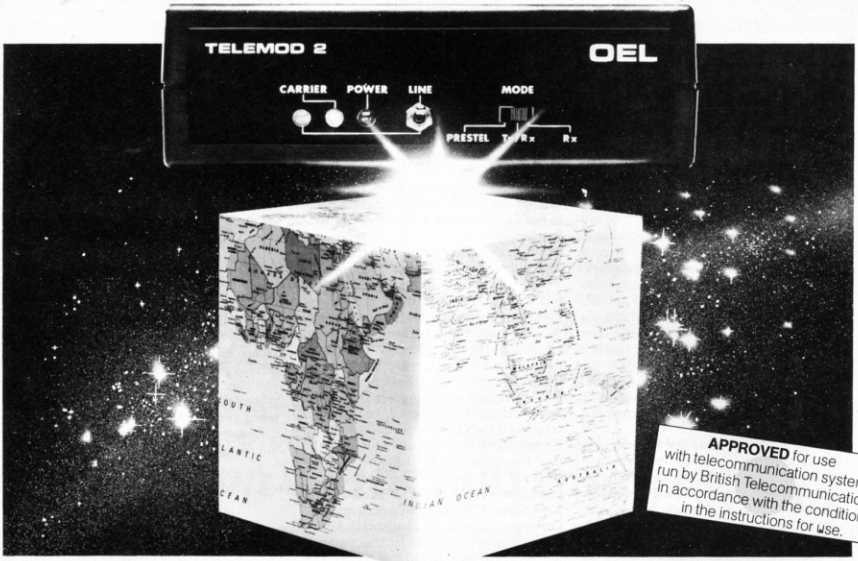
● Whenever a 1 appears in the multiplier, the multiplicand is copied into the partial answer column. If a 0 appears in the multiplier, the multiplicand is not copied.
● On each step, the partial answer is shifted one place left, even if the multiplier contains a 0, giving an easy wasy of multiplying in steps of 2:
00000010=2 : 2×2=4 shift binary 2 left once =00000100=4.

Binary division is also easy because you can see at a glance if one number will divide into another. Division can also be accomplished by successive subtraction until a negative remainder is reached. As division is the inverse of multiplication, an easy way of dividing in multiples of 2 is by shifting one place to the right, *eg* 8/4=2,
8=00001000 00000100=4 00000010=2.
You can see that shifting right twice is the same as dividing by four because $4=2^2$. It follows that since $8=2^3$ shift right three times to divide by eight. Although you may not realise the significance of these observations now, rest assured they play an important part in future programming.

Binary subtraction by normal decimal means is a long-winded affair, but we can deal with this problem in another way. However, we must first understand the way computers deal with numbers.

As there are only eight bits to a byte and 00000000=0, while 11111111=255 in normal binary representation, there is no room for negative or signed numbers, *eg* −3, −4, +2. To get round this, the computer uses the seventh bit as the sign bit. If the seventh bit is 0 the number is positive. If the last bit (seventh) is 1 the number is negative. This is where the

25▶



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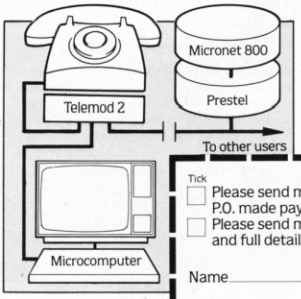

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◀23 machine language programmers must know which they are dealing with, *eg* positive integers 0 — 255 or signed numbers. From the example above we could mistakenly assume that if the positive value of a number is 16 decimal then changing the seventh bit to a 1 would make it −16; this would be wrong. When the computer deals with negative numbers, it uses the two's complement of the positive number.

There is nothing mysterious about two's complement, and it's easy to calculate. Just obtain the one's complement and then add 1. To obtain the one's complement you change all the 0s in the original positive number to 1s and all the 1s to 0s.

```
                    + 16 = 00010000
        One's complement = 11101111
        add 1                   1
                         ---------
−16     Two's complement =  1111000
                    (which is in fact 240)
```

This may seem strange, but using the two's complement simplifies subtraction and addition with signed numbers. Using our first example of just changing the seventh bit to 1 to obtain the negative number would not give the correct results in all cases. Don't be too worried about the complements of numbers because the Z80 CPU has the instruction NEG, which automatically changes the positive integer to its equivalent two's complement negative number.

One final point on signed numbers. The maximum range of numbers obtainable using the seventh bit as the sign is + 0 to + 127 to −128. This is because, in two's complement, −0 does not exist — instead −128 takes its place. If you wonder why you should bother with this subject, when you start single-stepping through your programs to find the elusive bug you must know whether you are dealing with signed or unsigned numbers, and how they are represented.

Once you have mastered binary, hexadecimal is easy. In hexadecimal the digits start as in decimal, 0 up to 9, and as we are now working to base 16 the numbers 10 up to 15 are replaced by letters A,B,C,D,E,F. The decimal number 13 now becomes ODH, where H tells you it is an hexadecimal number. 255 becomes FFH.

$16^5\ 16^4\ 16^3\ 16^2\ 16^1\ 16^0$

$$FF = (15\times16\times1)+(15\times1)=255$$

$$FFF = (15\times16\times16)+(15\times16\times1)+(15\times1) = 4095$$

Two hexadecimal digits make up one byte, and one hexadecimal digit makes up four bits, which we call a nybble. Bearing this in mind, you can easily translate from binary to hex or the reverse by treating every four bits as a separate binary number:

```
255 = 1111 1111
      1111   = 15 : 15 = F Hex.
      1111   = 15 : 15 = F Hex.
      255 = FF Hex.

224 = 1110 0000
      1110 = 14 : 14 = E Hex.
      0000 =  0 :  0 = 0 Hex.
      224 = EO Hex.
```

All this may seem a little strange at first, but you soon get the hang of it, and once mastered you'll find working in binary or hexadecimal is significantly easier than working in decimal. You will have also overcome the major obstacle in machine language programming.

Decimal	Binary	Hexadecimal
00	00000000	00
01	00000001	01
02	00000010	02
03	00000011	03
04	00000100	04
05	00000101	05
06	00000110	06
07	00000111	07
08	00001000	08
09	00001001	09
10	00001010	0A
11	00001011	0B
12	00001100	0C
13	00001101	0D
14	00001110	0E
15	00001111	0F
16	00010000	10

The next part of this series will appear in two weeks' time in *PCN* Issue 59.

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A portable in the hand's worth any number in the office — at least, that's how it seems.

On the move

True portability in micros could mean spectacular changes in the way we work. It should make it possible to carry a fair sized chunk of our work around with us, if not the main.

The technology is just about here, though the price may have to ease a little before its use becomes really widepread.

The problems are two-fold. First, there'll always be another one along in a minute, and second, until the price of CMOS chips comes down we're not going to see portables achieving anything like the level of use they deserve.

But even now it's possible to see the way things are liable to go. You carry your Tandy, NEC, Olivetti, Epson or whatever around with you so you can work on trains, at home or in the bath (the HX20's apparent failure to replace the rubber duck is inexplicable). Then, when you get into the office your portable has a natter with the Incredibly Big Machine on your desk, and you carry on working as normal.

Strange that the information technology revolution seems to be encouraging us to work more instead of less . . .

So what *PCN* has done is to get a group of notorious portable users, plus one sceptical aficionado of the reporter's notebook, to survey lap held portables in use. We've arranged the necessary technology for them to talk to other micros, so let's take a look at the future, and find out if it works.

Alastair Taylor

If you don't mind being stared at, it's an attractive idea. One book-sized micro allows you to write on the move, take notes whenever you have an idea, and store your diary dates and telephone numbers conveniently. I'm not too impressed by this 'book-sized' nonsense — the grotesquely oversized manual is one of the few books you'll ever see this size.

Still, if it doesn't change you life, it'll change your luggage. Picture, if you will, the typical journalist presented with a Tandy Model 100. The nerve centre of his life — well OK, my life — is an A4 shoulder bag containing notebook, walkman, flat hat, gloves, six tapes of software to be reviewed by last week, 15 unopened bank statements and three threatening letters from the Inland Revenue.

'You could just slip it in there John . .'

I ran into trouble almost straight away — working on the train is alright if it's a proper train, but the underground doesn't allow you enough elbow room.

But there appear to be other advantages. There's not exactly a shortage of tools of the trade back at the typical journalist's ancestral home — two typewriters, a Tasword 2 plus proper keyboard Spectrum system, and a small offset litho printer (which is another story).

Despite this, or perhaps because of this, a typical journalist would much rather spend his time having another cup of coffee or watching the telly than acutally working. So it comes as something of a shock for him when he finds himself writing through breakfast one Saturday morning. This continued through the weekend, with me just picking up the Tandy whenever an idea occurred to me.

A major problem is that it's so painless that you're liable to run short of memory pretty fast.

The only way round this I can see is to confine yourself to important phone number only, which is hardly a perfect solution. The problems here were exacerbated by the fact that the machine really needs a decent formatting program, and one this was knocked up there was even less memory available.

As a consequence of this I found myself saving to tape lot more frequently than I'd have liked. Saving was OK, but I had real problems loading back on the test machine, which limited its effectiveness.

Still, the advantages outweigh the disadvantages, and I've now just about nerved myself up to popping down to the Tandy store (or should it be NEC?) to deposit an arm and a leg. To make it worthwhile I reckon the machine would have to be at least 32K, and ultimately it would need to have a disk system or to be able to communicate with a machine with a disk system. Sure, it'll cost a fortune, but can I afford to do without it?

John Lettice

Anyone who is a compulsive hacker will know the frustration of having to wait until you can get to your machine before trying out that 'great new idea'. Portable micros provide the answer, but create a new problem. Using the NEC I can get quite a bit more work done or rather I could, if it wasn't for the driven urge to have a quick hack now and then.

Initially I found the memory layout quite absorbing — especially the menu system. The file names are stored in memory starting at location 63567. Each file begins with a byte that identifies its type: 176 for a machine code system file, 192 for a document file and 128 for a Basic file. Following this identifier are two bytes that specify the start location of the file in low — high byte format. After these come the eight character file name, including a two letter file type specification (DO, BA, etc).

Having found out the above details I then started messing around with them, just to see what would happen. One of the things that is virtually guaranteed to happen at this stage is for the machine to crash. This is usually because you think that something will work all right but the machine says that it won't. This occurred a few times, but with true perseverence I discovered that I could pull all sorts of stunts with the menu. Such things as hidden files and turning Basic files into editable document files are now no trouble.

Other bits and pieces are found in the oddest places. While sitting on the tube with my NEC on my lap, on the way to work, I decided to have a root through the memory, just to see what was there. There

31 ▶

5
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The BBC Microcomputer System.

Designed, produced and distributed by Acorn Computers Limited.

are what appear to be a number of undocumented commands and devices, most of which seem to be for future expansion.

As far as commands go there is a FORMAT, presumably for disks, a COLOUR command, perhaps to go with the CRT mentioned above, plus a few more — but I hate to spoil the fun for other hackers, so I won't mention them. It is possible, of course, that these commands are leftovers from an earlier version of the Basic, though I'd like to think that they really are for future expansion.

I do spend a lot of my time programming and generally hacking around with my portable, but I use it for serious things as well. I use it to take notes, send out letters, remind me of momentous events, doodle, play tunes, waste time, write programs, turns out copy, and so on. All in all I don't know what I'd do without it — it has become a compulsive toy.

Kenn Garroch

I find the NEC really comes into its own when you're writing short documents such as letters, new stories and short articles, which you don't always have time to do at work. It's also a boon when articles have to be rewritten.

Since discovering word processing I refuse to use a typewriter, and with the NEC I can write when travelling to work on the train or at home. It's then a simple task to move paragraphs around, rewrite sections or whatever is necessary. It's also useful for taking notes at press conferences, making memos and so on.

In the office the NEC's handy when all the 'proper' micros are in use. Besides, it's quicker to use for short bits of text — the time taken to open a file, edit, then save and print is vastly reduced when it's all in RAM.

If a document is too large for memory (horrors if this happens on a Saturday), it's a simply matter to upload what I've written to a disk file on the Torch in the office. I can even load directly into a Wordstar document (even if it's an excruciatingly slow process at 75 baud) for later editing, spelling checks and final formatting.

It's in the area of word processing that you come up against one of the drawbacks of a small screen (40×8 characters). I sometimes find it difficult to keep track of what has gone before in a long piece of text. On a larger screen it's more like having the document in front of you and the risk of repeating yourself is reduced. I suspect that this is a psychological problem and, just as I got used to using the relatively small window of a TV or monitor screen (small when compared with several sheets of prose), I'll probably adapt to the limited window of the NEC. It may even encourage me to be more careful in my use of words.

Finally, I use the NEC for leisure — mainly programming. It has a very good Basic and, apart from liking to keep my hand in, I've always loved hacking. I spent several hours rediscovering trigonometry — even on the tiny screen (240×64 pixels) you get interesting graphics.

The NEC has made me find out more about telecommunications. The mysteries of communications protocols, handshaking, stop bits and other exotic terms quickly become harsh realities when you have to get one machine talking to another.

On the more serious side, I've been writing several necessary utilities.

There may be some justification for labelling the presently available lap portables as rather expensive toys, but I'm finding mine of increasing use at work and at home. Besides, it's good fun and reawakens the initial excitement of discovering microcomputers.

Bryan Skinner

I have to admit to an unashamed and unadulterated infatuation with my NEC PC-8201A.

I have used it to write in almost every location you would have thought possible — and a few you wouldn't. I find that, though the telecommunications facilities are very useful for sending stories over the phone line to *PCN*, and the Basic is good for checking programs in Microsoft Basic, the machine, for me, is mainly a dedicated word processor.

But what a word processor! You know those ads where the pin-striped city gent is carefully poring over the tiny screen of his portable while flying at 20,000 feet? I've tried that — and it's not quite what it's cut out to be. Although I wasn't wearing a pin-striped suit at the time, I did try to get some work done on my NEC while flying from London to Vancouver, Canada.

The big problem — having enough elbow-room to type properly without spilling my complimentary drink all over my complimentary magazine and onto my not-so-complimentary micro — wasn't the computer's fault. The other problem was related to the steward. It seemed he had heard some horror story about the frequencies from a 10Mb Kaypro causing one of the engines to bomb out on a PanAm jet. He suspected my little NEC of harbouring the same ambitions. However, a subsequent chat with the pilot allayed the suspicions of the rather nervous steward.

Another thing to watch when plane-processing is the X-ray machine. An aquaintance of mine recently found, when returning from America, that a trip through the airport X-ray scan had irretrievably corrupted the RAM files in his portable. This must vary from place to place, however, as I can personally assure you that the X-ray scans at Paris' Charles De Gaulle airport didn't do anything to a Tandy Model 100 last October.

I digress. You know those other ads where this hirsute geezer tries to use a portable in the bathtub? I will blushingly admit to having tried that as well though I was possessed by a mortal fear of electrocution that prevented me from doing any work while splashing about. (A dumb idea really anyway.)

On the Number 8 bus, however, feel free to use your NEC. There is so much room inside the bus (particularly on the top deck) that if you can get a seat to yourself (remembering the need for elbow room) it's an ideal place for putting the finishing touches to that novel you've always wanted to write. The thing to watch is the bus stops — they're very easy to miss when you're hunkered over your portable in full flow.

Geof Wheelwright

Machine	Price	Extra Memory	RAMpack	Disk drive
Tandy Model 100	£649 for 24K RAM	Up to 32K 8K expansion £79.95	No	£599 for drive and 80 column interface
NEC 8201A	£546 for 16K RAM	Up to 64K 8K expansion	32K for £207	No

All prices above include VAT. Apart from the memory expansion facilities, the salient difference between the two machines is that the Tandy 100 has an address and a schedule file in ROM, while the NEC does not. This is as much a disadvantage as an advantage for the Tandy, as they take up valuable memory space.

The NEC's RAMpack facility is valuable, but too expensive to make it a practical alternative to disk storage. The Tandy disk system, which *PCN* will review shortly, is fairly low capacity and, oddly enough, is 5¼in rather than the more portable 3in.

The Tandy has a numeric keypad facility, and arguably a slightly better Basic, but loses out because of its 32K memory limit.

PCN PRE-TEST PERIPHERALS

A table for your Spectrum — dual disk drive power backs it up.

SPECTRUM SPIN

John Lettice is impressed by a prototype Spectrum disk system.

Disk systems for the Spectrum are finally taking off, though the most interesting, from ITL and Morex, are still only at prototype stage — both these are due to arrive in the shops at the end of April. *PCN* inspected a Morex drive and very interesting it looks too.

The system we looked at was, as far as styling is concerned, decidedly provisional. The interface itself was uncased, but the works seemed to be sufficiently firmed up to make them worth looking at.

It consists of interface, cable, PSU, system disk and a single 200K, 400K or 800K drive. It supports up to four drives altogether, so you could spend from £286 for a single drive with 200K to £1,913 for a total of 3.2Mb. This makes it pricey, but the system itself is much classier, and much better value, than the Viscount disk drive at £245.

Disk versions of Tasword 2, Masterfile and Omnicalc also come bundled with the system, so it'll now be possible to get a credible business system working on the Spectrum. The disk interface works with most drives. Those used by the test system were twin 5¼in 800K Mitsubishis, but which drives will be sold with the setup hasn't been decided yet. Hitachis or Sonys are unlikely as, according to Morex's Dimitri Koveos, the company doesn't have the capital to deal with large numbers of these.

However, Morex is currently negotiating a form of financing/manufacturing deal, and the outcome of these negotiations could well considerably influence the final product.

In use

Power up the Spectrum and drives, put a system disk in drive 1, press the reset button and the system is up and running. This is so quick that if you're lazy you will often find yourself hitting reset rather than tidying up after some operations. During testing the maximum access time was around four seconds.

For the user, the nicest thing about the Morex interface is it's use of existing Spectrum syntax, prefaced by PRINT#4. This acts as a software switch, and means there's little extra to learn. The interface also supports Microdrive commands such as CAT and FORMAT; MOVE will have been implemented by the time it is in the shops.

MOVE provides a rename and copy facility. for example, MOVE "f1","f2": PRINT 1 alters the name f1 to f2. MOVE can also be used to rename whole diskettes, and copying — protection permitting — is similarly straightforward.

Morex has, by force of circumstance, a growing interest in protection. The company's printer interface has been copied twice, which is bad enough, but failure to protect disk software could be the kiss of death for the system. To succeed, Morex clearly has to stimulate the development of decent business software, and this isn't going to happen if cloning disks is dead simple.

One example of this is the way the Microdrive MERGE command has been doctored so the program can auto-run, which means that classic Spectrum auto-run stopper is no longer available. That aside, any file called AUTO and stored with a line number will auto-run. The operating system tends not to leave things lying around to be investigated by prying eyes.

A number of other improvements have been made to commands. The ERASE command doesn't in fact erase (it does on the Microdrives) but follows the more efficient disk practice of simply freeing the 'erased' file's space. You can also use a wild card to erase more than one file at a time. ERASE 'a'', for example, erases all two-letter files beginning with 'a'.

The CAT command operates just as with the Microdrive — simply specify a drive number and you get the disk directory. The drives, incidentally, are numbered 1-4 in the same way as Microdrives are numbered: again this means you can use the commands already learned.

Software

Morex eventually intends to offer a full applications package with the drives, but the current disk versions of Tasword, Masterfile and Omnicalc are well worth having. Serious Spectrum software has always been limited by cassette storage, and Tasword and Masterfile in particular come into their own on disk. However, the complexities of Tasword have forced Morex to use a 'Minidos' for it rather than the full DOS, though it doesn't seem to limit it significantly. In any event, it's good to see lower profile software companies willing to license their products.

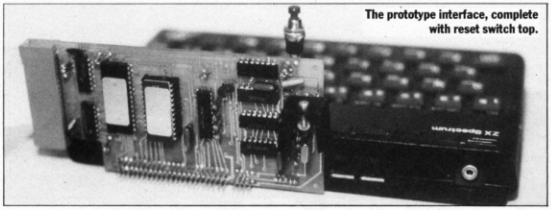
The ultimate success of the drives will, of course, depend on more programs being written for the system, but Morex's bundled software should be enough to keep users happy for a fair while.

Verdict

It's quite possible that this system is the best, and certainly the friendliest so far for the Spectrum.

The end of April arrival date may spark off an interesting conflict, as it's also ITL Kathmill's deadline for implementing its Byte Drive 500 on the Spectrum. Should this match ITL's previous efforts, there will be two good disk systems for the Spectrum.

One postscript — Morex is already accepting cheques for the disk system, but the company assures us that it won't be cashing the cheques until the drives are ready to be sent out. Apparently a large pile of firm orders with cheques attached is a persuasive tool when negotiating financial backing. PCN



The prototype interface, complete with reset switch top.

Product Morex Disk Drive Interface **Manufacturer** Morex Peripherals, Reading (0734) 584238 **System 1** One 200K drive, £286 **System 2** One 400K drive, £366 **System 3** One 800K drive, £539 (Additional drives 200K £228, 400K £309, 800K £458).

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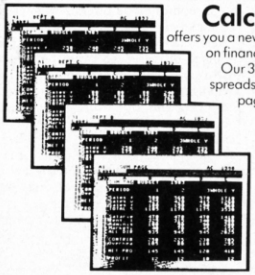

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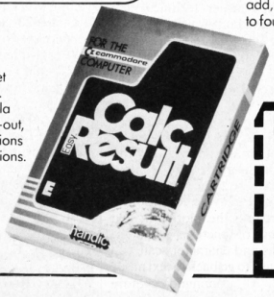

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Thinking ahead

FOUR-PEN POWER

Piers Letcher plugs in the 1020 colour printer/plotter from Atari.

Following leads by Tandy, Commodore, Oric and Sharp, Atari is the latest company to put its own name on a printer/plotter made by another company. The 1020 has four colours (black, red, green and blue), 3 cpi (characters per inch), settings (five, ten and 20), two modes of use (text and graphics) and one type of paper (4½in roll). The printer costs £199.99 inc VAT.

First impressions

The package includes the plotter, a standard Atari data lead, a power pack, a spare set of pens, a warranty card and a glossy A4 manual.

The 1020 is very small (7.5in by 4.5in by 2in) and can fit onto a hand. It looks robust, and for the most part it is, but the lid has weak points on either side of the slot from which the paper emerges. On the printer reviewed this was already broken, probably because when the lid is lifted the pressure tends towards the weak slot edges.

With four cassette-type buttons on the front and slotted bevelled edges, the printer looks like the Atari Program Recorder, except for the smoked perspex lid.

Documentation

The documentation is as lavish as normal, and includes test programs. However, on examining the programs closely we found no internal documentation — a drastic omission, since the instructions to the printer need explanation.

Setting up

Setting up starts simply. The manual contains numbered photographs to follow as you plug in the leads. The difficulty increases as you load the four coloured pens (small slices of biro). This is a bit fiddly, but once they're loaded you should get a test print of four coloured squares. I only got two so I checked that the pens were in properly. Taking them out, shaking them, running them across a sheet of paper and replacing them did the trick and the four squares appeared.

In use

The plotter is an interesting combination of reward and frustration — many of the special effects are great to look at but hard to achieve, needing quite a lot of extra programming.

You have to 'open' the plotter with the command OPEN£N,8,0,"P", where N can be from 1 to 7. Whenever you send something to the plotter you then use the same value for n, which presumably allows you to address other devices from within one program. It's rather technical and therefore a pity a default wasn't included for those using the plotter only — it becomes very tiresome to have to type '£N' every time.

The latter is selected with a rather clumsy command: PR.£2;"ESC ESC CTRL G". If this is within a program and you list it back you only get PR.£2;"" which isn't much help. Several other commands use the same format, with embedded control characters, so it's wise to document your program thoroughly to avoid confusion.

It is easiest to use the plotter in text mode, as the range of functions is smaller. Character widths and character scale can be set, but you have to go back to text mode (with a PR.£2,"A" command) before printing. International character sets are available as an alternative to English rather than an addition.

Graphics mode offers a wide choice of things to do, and is quite powerful. It takes a great deal of effort to learn how to use the device properly, so could be offputting. Dotted lines, continuous lines, colour changes, drawing, relative drawing, axis drawing and alpha rotate are selectable, but you have to write a program for utilities like triangle or square.

The plotter doesn't seem capable of drawing proper curves, so a circle could be written only as a series of short straight lines. The illusion this creates is quite good, but slow to write and to use and, as a result, inflexible.

Verdict

The plotter falls short in several important areas. First is price, since an almost identical printer from Oric costs £170, and another is part of the Sharp MZ731 deal (along with keyboard, cassette, 64K RAM etc) at £420. So £200 for the Atari version seems expensive.

It is also harder to use than it need be, and would be enhanced by more friendly commands and a couple of utilities, such as the square. On quality it's fine, though the biros tend to smudge if they are used a lot.

When fast, cheap and high quality dot matrix printers arrive later this year, capable of full screen dumps, it may make people question whether the benefits of three extra coloured biros are worth the cost.

Product Atari 1020 Colour Printer/Plotter
Manufacturer Atari International, Atari House, Railway Terrace, Slough, Berks SL2 5BZ Tel: 0753 33344 **Price** £199.99 inc VAT **Outlets** Retail.

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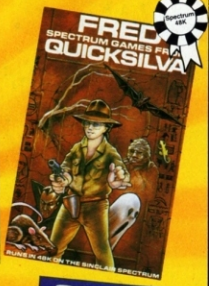

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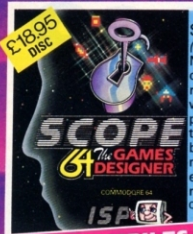

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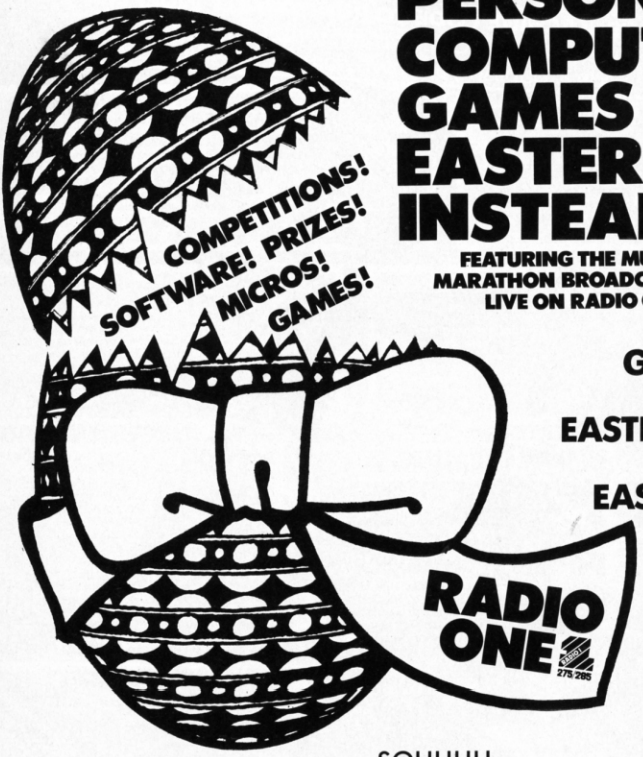

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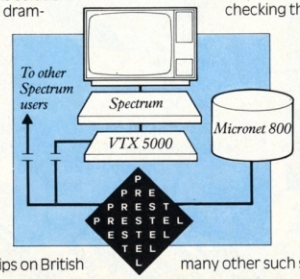

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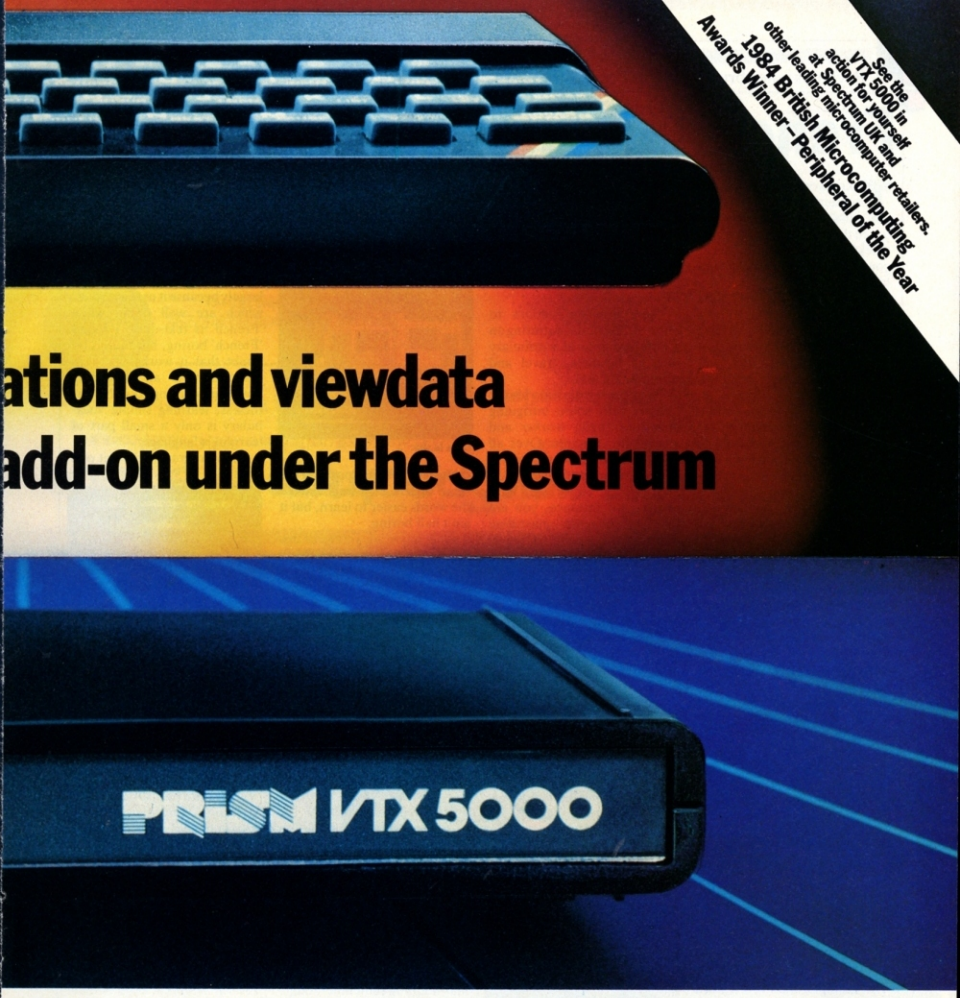

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Bryan Skinner brushes up his French with a Spectrum and an Oric.

French language lesson

Taking your hols abroad this summer? Whether you'll miss your micro, or be glad to see the back it for a couple of weeks, between now and then it could help you learn a foreign language.

Several packages are now available to help you learn a foreign tongue. There are many aspects to language, but Tansoft's 'French' and CDS Microsystems' 'French is Fun' both concentrate on vocabulary.

Now, it's one thing to learn a few words, but to claim this is adequate to 'understand and be understood' (Tansoft) in a foreign language is pushing things a bit far. More realistic is CDS's aim to present the French language in a stimulating way.

Theory

'French' makes use of the Gruneberg Linkword system for vocabulary learning. *Linkword* is the brainchild of Dr Michael Gruneberg of University College, Swansea. Its basis is that visual association is a powerful mnemonic tool. Some famous mnemonists used techniques of remembering things by imagining them in places they were familiar with. To recall the information, they'd take an imaginary walk around the location, noting the things they'd 'left' there.

This is a effective way to memorise bits of apparently unrelated information and the Linkword system exploits this psychological fact by suggesting situations to imagine which link an English word with a French one.

In use

For example, the French word for cat is 'chat' which sounds like Shah (as in Iran), so you're asked to visualise 'The late *shah* of Iran with a cat on his lap', to help you recall the French equivalent for the English word.

Au bord de la mer.

Some of the 'linking' phrases used are strange, to say the least. How about 'Imagine driving your *chevi* to the levi with a goat in the back'? This is supposed to help you remember that the French for goat is *chevre*.

There are ten sections to 'French', each concentrating on a different area of vocabulary such as business, travel and restaurants.

There is a fair glossary for the tourist, with some intriguing inclusions: *ugly*, *worker* and *mouse*, for example. Over all you get some 350 words, and 'a basic grammar'. Basic is an appropriate adjective. With gender, for instance, you are told to imagine masculine nouns associated with a boxer, and feminine nouns with perfume, *eg* 'Imagine pouring a bottle of perfume over a goat to stop the smell'. Apart from the blatant sexism, the former is not useful because the subject of the masculine mnemonic is always the boxer, not the item itself.

CDS also takes the pictorial route, but doesn't ask you to do the imaging. Making use of the Spectrum's graphics, 'French is Fun' builds up pictures, labelling items with the corresponding English and French words appearing at the top of the screen.

Quelle heure est-il?

There's a main menu to which you can return during any of the sub-sections by pressing Enter. This allows you to swap about *eg* Seaside to Cafe, quickly and easily.

Each situation can be run in four modes:

- Picture display with corresponding words.
- Test of spelling/translation.
- Phrases.
- 1 & 3 together.

The main problem is that the words are displayed at the top of the screen for only three seconds — hardly long enough to get a good look at them, let alone memorise spellings, so it would have been nice to have had control over this. Whenever you select a picture, the

Dans la rue.

things in it always appear in the same order. This might make the words easier to learn, but it ain't half boring.

One major advantage of this program over Tansoft's is that it has phrases, 15 per section. One nicely done section tells the time: you enter a time in standard 12hr notation, and the program writes up the time in French, then depicts it on a clockface.

One of the best features of 'French is Fun' is that you don't ever press Enter. The program clearly isn't using INPUT (which Tansoft's does) and in test mode even buzzes if you try to enter an incorrect spelling. It also keeps a tally of your mistakes, unlike 'French'.

In Tansoft's favour is that you get spoken words to listen to on the tape, but 'The pronunciation given in the course is only approximate'. And indeed, the words are not spoken by a native French speaker. Mind you they're not bad, and quite clear.

While the Linkword system may help you remember roughly what a word sounds like, it's unlikely either to help you understand or be understood, unless you spend some considerable time practising listening and pronunciation.

Verdict

I preferred 'French is Fun', largely because it uses graphics, which are well done, while 'French' is text-only. I found 'French' boring, but there's no doubt that it works. Pictorial association is an extremely powerful learning tool. Nevertheless, learning simple vocabulary is only a small part of learning a language.

Both programs are a bit of a

Herisson (hedgehog) = hairy son . . .

gimmick, just using a micro for the sake of it. A good text book gives you more pictures and phrases, where you also get details of grammar as well as important cultural information.

A modern phrase book offers far more than either of these programs and at more or less the same cost. Better still, with a record or cassette-based course you could learn to say useful French phrases.

However, the programs would be ideal for second or third year pupils because learning word lists is one of the hardest and dullest parts of French at school. Both of them will make the task easier and more fun.

Rating (/5)	Linkword	F is Fun
Usefulness	■■	■■
Features	■■	■■■
Performance	■■■	■■■■
Documentation	■■	■■
Overall value	■■■	■■■

Name French is Fun **Price** £5.95 **System** Any Spectrum **Other versions** German is Fun **Publisher** CDS Microsystem 10, Westfield Close, Tickhill, Doncaster, South Yorks. (0302) 744129.
Name Linkword **Price** £12.95 **System** Oric 48K **Other versions** German, Italian, Spanish **Publisher** Tansoft, Units 1 & 2, Techno Park, Newmarket Road, Cambridge (02205) 2261/2/3/4. Also for Spectrum 48K, Silversoft, London House, 271-273 King St London W6 (01) 748 4125.

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Vol 20 Part 3

PULL OUT AND KEEP

YOUR GUIDE TO SERVICES
COMMUNICATIONS OVERSEAS
PULL-OUT COMPARISON CHART

COMMUNICATIONS

MICROS AND MODEMS

WHO, WHERE AN

NAME	DUPLEX (F/H)	PARITY (E,O,N,I)	STOP BITS	DATA BITS	TELEMESSAGE	TELEX	E-MAIL	STANDING CHARGES
Comet	F	N	I	8	No	Yes	Yes	£30/mon
Telecom Gold	F	I	I	7	Yes	Yes	Yes	£10/mon
One to One	F	I	I	7	Yes	Yes	Yes	None
Prestel	F	I	I	7	No	Yes	Yes	£1.69/mon
Compu Serve	F	O	I	7	No	No	Yes	N/A
The Source	F	O	I	7	No	No	Yes	N/A
Micronet	F	I	I	7	No	Yes	Yes	£4.30/mon
Distel	F	I	I	7	No	No	No	None
Rewtel	F	I	I	7	No	No	No	None
Maptel	F	I	I	7	No	No	No	None
CBBS London	F	I	I	7	No	No	Yes	None
Forum-80 London	F	I	I	7	No	No	Yes	None
Computer Answers	F	I	I	7	No	No	Yes	None
Southern BBS	F	I	I	7	No	No	Yes	None

RINGING UP REWTEL

Bulletin Boards are very much a coming craze in the UK at the moment. Not surprisingly, many of the services are run by enthusiasts for enthusiasts and often the computer and the telephone systems are used for other things besides acting as an electronic bulletin board.

It's not unknown for you to have to ring the bulletin number twice. The first time you simply let it ring once, ring back immediately and find yourself on the system. This is to enable the phone to be used for other purposes. An innocent caller is likely to be extremely confused when confronted by a carrier tone.

Bulletin Boards are designed to be easy to use since, by their nature, they attract casual users. One communications hobbyist may browse through a number of boards and continually try out any number of others. It would be nice if there were a standard set of commands, but there isn't.

After a little practice you do come to expect the things to work in certain ways. As with applications programs there is a certain commonality, but just enough variation to catch you out.

For instance, to leave the system, an important command for the first-time-logger, wouldn't a standard command have been welcome? Unfortunately commands like QUIT, EXIT, END, BYE and LEAVE are used interchangeably by various systems.

Rewtel is a good example of a bulletin board service. You ring the number and end up in a restricted public section where you can browse through the system.

Rewtel offers a sort of 'introductory offer' of eight minutes' time on the system to non-subscribers. This system is reasonably easy to use. Information can be accessed either by keying a page number next to the prompt line, or putting in keywords. This is a fairly hit and miss method however, as even those keywords you'd expect to have something under them return you another prompt.

Shopping for computer items on the system could be a fruitful exercise. Obviously bulletin board users are the ideal target market for companies trying to sell communications and micro equipment.

Rewtel has a system called Rewshop through which you can order goods through another specialist in these matters, Ambit International. The all-important question of payment is handled by credit card (you can't do anything without a credit card these days).

Bulletin boards are often run by computer clubs or user groups, and a few have now been set up by various microcomputing magazines.

MICRONET MESSAGES

Mention communications and most people will think of Micronet. Launched in a blaze of publicity just over a year ago it transformed the previously moribund Prestel.

Micronet operates as a closed user group on Prestel with over 40,000 pages of information and 8,000 members.

The chief selling point of Micronet is the promise of 100 free programs for particular micros. So far the BBC, Spectrum, Commodore, Apple and TRS-80 are included. A selection of top-selling commercial programs are available at a charge.

The software is downloaded from the Micronet database over the telephone and from the user's point of view has the advantage of ready access and quick delivery.

For the commercial software, the purchase price is added to your telephone bill. Useful for the software publisher but potentially expensive should you get carried away.

Micronet also runs a news service with around five news stories added daily. These cover all manner of items of interest to the micro user including news of product launches. Some of these stories are extended into longer reviews.

Where the articles are machine specific they are also accessible through a database specific to that micro. Therefore you can access, say, the BBC index and find out what is happening in the hardware and software fields.

You can also talk to other Micronet members via a mailbox facility. The service is available to subscribers on the Enterprise computer in London and is gradually being extended to other Prestel computers. Unlike some other services you can't talk direct. You send a message to someone's mailbox and they are notified that a message awaits them.

Micronet is in many ways like an electronic magazine with several sections devoted to particular subjects. There are sections with letters from users, user groups and computer clubs, help with technical problems, a swapshop and others.

Micronet also sublets some of its pages to other companies including micro magazine publishers and micro manufacturers.

The service is not without its drawbacks, the main one being cost. To gain access to most of its more interesting pages you have to be a member of both Micronet and Prestel (total annual cost £52). While you are logged-on to the service you pay the usual local telephone call charges plus an additional 5p a minute during business hours on any day except Sunday.

A possible bonus to some users is that as a Micronet member you have access to all the other public pages of Prestel. But beware, some of those pages carry a frame charge of anything from 1p to 50p per frame (screenful) of information.

ONE TO ONE, ONE TO MANY

One To One is run by Datacom and adds a full set of 'old technology' options to the conventional mail-box facilities, which, let's face it, only enables you to communicate with other users of the same system.

The prime features of the One To One service are its One to One Letter and One to One Telex facilities.

The Telex service has the potential to save those who need Telex facilities a lot of money as it frees the microcomputer user from the necessity of hiring a dedicated Telex machine. An added advantage is that you can receive as well as send telexes. So it is in fact a viable alternative to the telex machine which can cost up to about £1,000 per year to run. What you don't get, however, is instant access to the telexes as they come through. You have to dial in and check the status of your incoming telex box at least once a day to stay on top of the situation. If it's an urgent telex, however, this is unlikely to cause too much of a problem as these are often prefixed by a telephone call in any case.

The letter service is probably even more attractive for those of us who can never get around to actually printing out a letter, inserting it into the envelope, sealing and applying a stamp to the envelope and delivering it to a letter box, but have absolutely no trouble writing one. You simply address your mail and send it off to the system, the company does all the rest and claims the letter will be delivered by the next morning.

This facility would be equally useful to companies with large volume mailing requirements. The cost is 75p for the first page (rated at 1000 characters) and 16p per page thereafter. Not cheap when compared to doing it yourself, but as a time-saver and convenience factor it should find a lot of enthusiastic users.

The pricing structure of these services is fairly strict. It costs you £2 to change your password and you are penalised for not collecting electronic mail messages.

IBM, Sirius and CP/M computer users are being catered for by a series of terminal programs on offer from One To One for what seems the rather princely sum of £150 a shot. When you consider that connect time is 10p a minute on top of the telephone charges, it's not an entirely comfortable sensation.

Even if a set rate does seem rather high you do tend to amble about on the system to your heart's content and get your money's worth.

However, this sort of system is targeted specifically at the small business user rather than the hobbyist.

SEND A NOTE BY COMET

Comet is a new service for the UK being started by Istel. Like Telecom Gold, it is primarily a business communications tool, but it is structured in a more competitive way for the small or infrequent user.

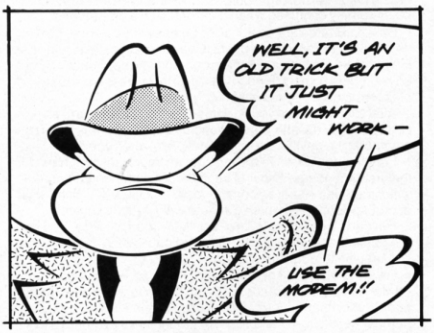
The subscriber service has a fixed unit cost per mail box per month with no extras except, of course, telephone charges. Comet's user-interface is very easy to use. You log on to the system with your name and password. Each user has a 'mailbox' on the system.

Comet's charges actually make the mailbox viable as a file-backup facility, you simply upload a file as a message to your own mailbox. Charges are presently fixed at £30 per month, and it doesn't matter how much storage space you use on the system or how often you log-on.

Using Comet as a storage system does give you a comparatively slow access speed. At first logging-on is a tedious and time-consuming business equalled only in frustration by a cassette tape system. However, a hardwired modem and a push-button telephone make the process fairly speedy with a little practice.

Here on *PCN* we use the system extensively in conjunction with lap-held portables and acoustic modems. Articles can be up-loaded to the mailbox from home or out of town (on occasions out of the country) and later retrieved by one of the office desk-top machines. They are then read into a standard word processing program.

Obviously this is hardly likely to be a common application for a system like Comet, but there are undoubtedly a lot of similar

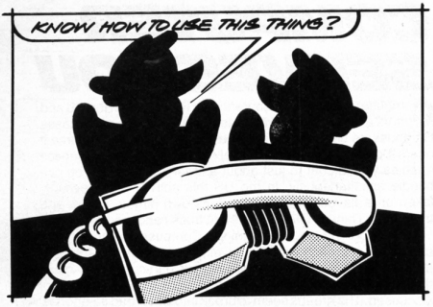


tasks which can benefit by the same treatment.

The main use for the mail-box it to leave messages for use for other subscribers. Probably the main application is information exchange between individuals or departments within a company, perhaps due to a necessity for sending data in from remote or changing locations.

Commands on the system include 'Answer', which automatically generates a return address and reference when you send material to another mail-box. You can also 'Display' files or distribution lists.

There are various editing facilities which enable you to Locate, Erase, Insert text from other messages or cut and paste from within the message on the system. You can even add comments to a received message and 'Forward' it to other mail-box users.



TELECOM'S GOLD MINE

Telecom Gold is British Telecom's implementation of the US-developed Dialcom service. The pricing structure puts it more within the scope of the business user rather than the hobbyist. As you would expect, Telecom Gold concentrates on communication between dispersed subscribers rather than the communication of information held on the host system as with Prestel.

As it's a Dialcom service one of its main advantages is its ability to send messages internationally to compatible services in many other countries — especially, of course, the US. A telemessage for distribution to international users of Dialcom costs £1.25 for each message, plus of course, the carrier telephone charges involved.

Telecom Gold also handles outgoing telexes and international mail — mail sent to the US, for instance, costs 30p for the first 2K unit and 15p for each unit thereafter.

You can also use Telecom Gold for back-up storage, though this does work out as rather expensive. British Telecom charges on units of storage used per month. A unit is 2K and you pay 20p per month for each unit until you arrive at 2500 units when it drops to 15p — you're paying £500 per month for the storage of 5Mb before you reach the first rate drop, so you can see the system is aimed at businesses rather than individual users.

Telecom Gold offers free training and free 'on-going support'. Each registered user is supposed to have what's called a system manager whose task it is to be the contact for BTG and generally take responsibility for the smooth running of the service.

Although it isn't the chief service of Telecom Gold, a large database is offered. You can type in the name of a product you want to buy, how much you are willing to pay for it, and how many units you want to buy. There is also a bulletin board with standard buy and sell messages for computers, cars and other items.

Putting messages on the bulletin board doesn't cost extra, and the messages can be anything from the buy-and-sell type mentioned previously to a simple plea for help with some technical difficulty. Replies to your bulletin board messages are made through your mail-box.

The extent of the service is a source of pride to its operators; they claim, for example, that new subscribers can be connected within an hour. The strength of US competition means it may have to live up to these promises.

DIAL INTO PRESTEL

Prestel is probably the most useful of the services available in terms of breadth of information. In practical, physical terms the system places a lot of stress on colour graphics which are sent as block graphics characters. Some machines obviously don't have the facilities to deal with these (especially if they're not colour) and will spend a lot of time printing out seemingly meaningless strings of characters on the screen.

Prestel was originally designed to work on the 1200/75 baud rate — slow to send information but quick to receive it. In normal circumstances this works perfectly well - you send two or three characters and Prestel sends you a screenload in about a second. However, the modems necessary to deal with this standard tend to be a bit more expensive than the more usual 300/300 baud variety.

This problem has been part-solved with the introduction of a 300/300 baud service on Prestel, but it must be said that the operation speed drops by a quarter, and those graphics characters slowly printing themselves out can seem especially galling.

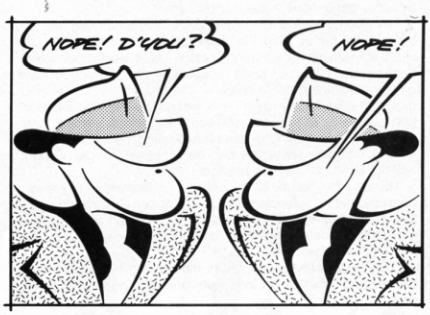
Prestel provides a wide range of information. A lot of it can be the electronic equivalent of junk mail as it's 'put up' on the system by what are called information providers — companies that hire system space on Prestel for their own purposes.

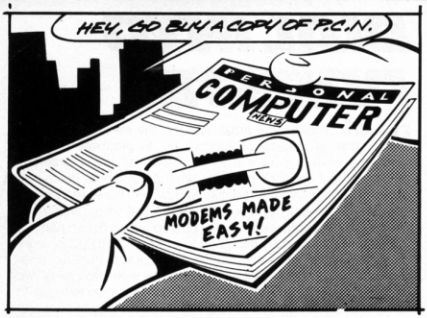
Some of the information providers offer a free service and some provide commercial pay and view facilities. A number in the corner of the screen tells you the pence cost of the screen. Many screens are free, including the directory screens. As well as regular charges (see chart) you will have to pay for the jack socket connection (if you are using a hardwired modem). British Telecom (which runs Prestel) likes to charge a minimum £18 installation charge.

Some interesting facets of Prestel include a home banking service where you can do a certain number of transactions. Other options include booking services for airline flights or packaged holidays. There are also mail-box and telex-sending facilities.

The interactive services are accessed by the subscribers through what are known as response frames. These are put up on the system by the information providers and enable them to get information on the prospective customer — name, address and telephone number.

One of Prestel's strengths is its ease of use, and the range of facilities is very broad.





TAP INTO THE SOURCE

In the US a slightly different approach has been developed. Possibly due to the way the quasi-private enterprise telephone companies are organised, there is no equivalent to Britain's Prestel system.

But in 1979, at about the same time that Prestel was getting off the ground here, a communications facility called the Source was launched specifically for micro-users. So far the pick-up curve of subscribers has been a little disappointing. For UK users it's also obviously a little expensive to place calls to the US, but during off-peak low-rate times the cost drops from outrageous to merely painful.

One of the prime features of the Source seems to be its Chat function. This is the computer-user's version of CB radio and, as the name implies, two users track each other down on the system and indulge in a two-way conversation through the keyboard. As you can imagine, conversation with a total stranger can be fairly banal — a lot of money can be spent merely determining that it's day in one place and night in another, but it is a bit of a novelty.

This sort of activity is extended on the Source into a conferencing facility where an indeterminate number of participants can read and add comments to a discussion topic.

The Source also has an interesting bulletin-board which can be searched by keyword — it tends to have a lot of diverse material on it. The Source also has a user-publishing area where subscribers can achieve immortality by putting up their own material, observations, jokes and so on.

The Source makes extensive use of keyword searches for information rather than the page-jumping tree-structure UK users are familiar with through Prestel. There are strengths and weaknesses to both systems, though the keyword method does have the advantage of saving you time and money. You're also making more effective use of the special powers of the computer, and using a keyword search you can unexpectedly stumble over information you might not have found using the tree structure. This is because keywprds can be cross-referenced without having to follow strict pathways.

The Source also has an educational section where users can take courses on subjects like foreign languages and mathematics. It also has the UPI news service so you can go straight to more than 40 categories of news with extra spice added by the keyword searches.

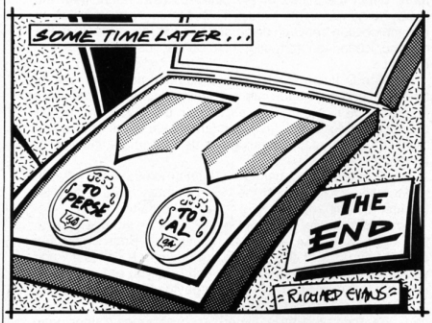
Like Prestel, services such as home banking, home shopping, cinema and restaurant guides, batch mailing and so on are also on offer.

COMPUTER SERVES YOU

Compuserve is the main contender to the Source in the US and offers a fairly similar array of services, though in many cases Compuserve seems to offer better facilities. Like the Source it offers a 'chat show' — this one's called CB simulator. This service enables you to chat to just about as many people as you can handle simultaneously. In the US this activity has inevitably taken on a flavour of its own with its own jargon, mores and traditions . Think of CB radio without trucks and you're close.

On the conferencing side of things, Compuserve offers a fairly structured approach with the development of SIGs — Special Interest Groups. Here aficionados of a particular topic leave their thoughts lying about on the system to be added to or discussed. The groups seem to break into two broad categories. The first concerns broad interest topics like photography, sports and even golf. The second concerns itself exclusively with personal computing, usually by being machine-specific.

There is also a National Bulletin Board where information and advertisements may be left. As a variation there's a 'Public Access' facility — a place for people to leave free software or scout out software left there by other users. Compuserve has a functioning home banking service where users can execute transactions and keep their accounts up to date.



A Compuserve feature is its magazine section. Here many of the US magazines in the computer and electronics field publish computerised versions of their products.

Interactive games are also on-line. These are usually of the epic adventure type which attract a host of competing enthusiasts.

News is also a big feature. Compuserve seems less reliant on the keyword search method, instead the system uses a menu-like structure familiar to Prestel users.

Another US service is called Dialog — this is very much an up-market system in terms of cost. It is also a very specialised system in terms of the information that's held on it. In other words it tends to have commercially valuable information that companies are prepared to pay for to have at hand.

The on-line charges are expensive, and to make the most of the system takes a fair amount of practice, training or both if you are to get your money's worth.

The good news, however, is that Dialog has recently come to an arrangement with British Telecom. UK subscribers can now make the link through a special Packet Switching Service which works out at about $10 per hour.

D HOW

Here is a list of several major teletext systems and billboards with (hopefully) all the information you will need to get through to them and use them. Hang it up in a convenient place for quick and easy reference when you need it.

ONLINE CHARGES	STANDARD (CCITT/BELL)	HOURS	FEE	BAUD RATE	FEATURES	NUMBER
None	CCITT	7-22	None	300	*Unlimited storage, monthly rate*	0527-28515 (o)
10.5p/m	CCITT	All	£100	300 1200/75 1200/1200	*BT's own system. Uses packet-switching facilities.*	01 403-6777 (o)
10p/m	CCITT	All	£50	300	*A new private service based on per/use charges*	01 730-1155
10.5p/m	CCITT	All	None	300 1200/75	*Primarily a vast Viewdata service*	Freefone 2296 (o)
N/A	Bell	All	N/A	300	*One of the biggest N/A US Micro-based phone information services*	N/A
N/A	Bell	All	N/A	300	*Time/Life's US information system*	N/A
10.5p/m	CCITT	All	£50	300 1200/75	*A private service on Prestel. Offers special rates on modems*	01 837-3699 (o)
None	CCITT	All	None	300	*A commercial service to allow ordering of equipment from Display Electronics*	01 679-1888
None	CCITT	All	None	300	*Radio and Electronics World's bulletin board*	0277 232628
None	CCITT	All	None	300	*Maplin Electronics' board for ordering Maplin equipment*	0702 552941
None	CCITT	Sun 17-22	None	300	*A free enthusiasts' board*	01 399-2136
None	CCITT	Weekdays 17-22 Weekends 12-22	None	300	*Has own program library and mail*	01 902-2546
None	CCITT	Most	None	300	*Our sister mag*	01 631-3076
None	CCITT	20-2	None	300	*Messages and program downloading*	0243 511077

NATIONAL INTEREST

Micro-based telecommunications are catching on quicker in the UK than in the US.

The UK has a number of thriving bulletin board services as well as useful facilities such as Prestel, Telecom Gold, Comet and Micronet. Prestel and Telecom Gold have met with success partly because they're more or less owned (though privatization is in the wind and BT Gold is a separate company) by the government.

British Telecom's long-held virtual monopoly on telephone services in the UK has helped it greatly to establish a huge database and national network like Prestel. Though it is still sometimes criticised for being under-subscribed and not useful enough, Prestel does have more than a quarter of a million pages of information and has been operating successfully for a couple of years.

By contrast, the Telidon system in Canada — which uses graphics that have the potential to be a good deal more detailed than Prestel's — is still being field-tested (as it has been for two years.) The problem is that though the phone companies in Canada and the US are largely owned by private monopolies, all those private companies still have to get round the natural hurdles posed by working with one another, getting the agreements of local, regional and national political bodies *and* come to a consensus themselves on what their systems should offer.

Telidon started out in the hope of being adopted as the North American Viewdata standard but soon found trying to get provincial governments in Canada, US and Canadian telephone companies and the US state and federal governments to agree on anything approaching a standard was a Herculean task. Two years on, there is still no Viewdata standard.

Prestel too has tried to make inroads in North America and has been greeted with less than overwhelming enthusiasm, while Telidon is still struggling. The conclusion must be that it is the British Telecom monopoly on the phone system in the UK and the power of the UK government that has encouraged any kind of consensus.

There are private services, of course, such as The Source and Compuserve but they are believed to be far more undersubscribed than Prestel (particularly when the population of the US is taken into consideration). The only companies that seem to have taken off in any significant way are those offering electronic mail, for which the business community is slowly finding a use.

NEXT WEEK

We begin a two-week games special, with loads of reviews of new games for the popular micros including the Atari computers, the Commodore 64, the Sinclair Spectrum, the BBC Micro and the Electron.

Micropaedia Editor: Geof Wheelwright
Design: Nigel Wingrove and Paul Charlton

DIAL-TEXT 50

TYPEWRITER TO TYPEWRITER COMMUNICATION

DIAL-TEXT 50 is a simple to use electronic typewriter (ETT) to electronic typewriter communications device. It is plug-compatible with the OCTET 10 and HERMIT 2 ranges of Data Modems. Duplex and can also be used without any RS232 device such as a microcomputer or printer.

Simple to install

Installation is easy and no special wiring is required - communication is achieved by simple cable connection or through any acoustic coupler. For instance, the user can connect DIAL-TEXT 50 to his own acoustic coupler between an OCTET 10 or HERMIT 2) typewriter and a standard telephone handset for transmission of ERROR FREE letters and documents via telex messages, using DIAL-TEXT 50 and appropriate telex facility - or internationally.

Typical application

The DIAL TEXT 50 unit is ideal for remote offices which might have to use the main office telex facilities. Text can be prepared at the remote office and transmitted to the main office telex for subsequent forward transmission. Incoming telexes for the remote office would receive messages in the reverse manner.

Special Dial-Text 50 features & benefits

1. 30,000 CHARACTER MEMORY. Retains contents when power is off.
2. ERROR free messages through use of automatic ERROR CORRECTION facility.
3. TRANSMISSION SPEED appears 3 times faster than a standard telex machine.
4. MEMO DRIVEN through a 36 character display.
5. OPERATORS CONTROL PANEL for message reviewing and editing.
6. INCOMING/OUTGOING messages automatically differentiated by special character.
7. ABILITY TO PRINT received messages from the DIAL TEXT 50 unit at any time.
8. ABILITY to store messages on standard tape cassette for use on the OCTET or HERMIT Duplex.
9. CONVENIENT ROOM IDENTIAL MESSAGE HANDLING or use can be fully as an operator.
10. PORTABLE lightweight stand alone unit with own 240v power supply which can be shared within the office.
11. DIAL TEXT 50 allows local text processing without the use of a computer.
12. COST of transmission is limited to normal telephone rates.
13. MESSAGE SCRAMBLER facility (optional).

The DUPLEX SUSS-BOX and DUPLEX SUSS-ADAPTOR have been designed to enable the less skilled computer user to have a better understanding of the correct working connection between a computer and a peripheral, such as a printer. This is achieved by using the commonly used signals (wires) of the RS232 serial data interface. Switches a plug-in jumper wires are provided to enable the user to select the signals he wishes to use. Each switch or the easy of two incoming signals the user can quickly establish a data connection. The signals are routed into the SUSS-Box by two 25 way D-type connectors, 1 = female, 2 = male. The SUSS-BOX also provides a lamp for each signal to show its conditions when connected in Line- or Right-or Line.

SUSS ADAPTOR

When the user has reviewed the correct Pin-out between a micro computer and a printer the DUPLEX SUSS ADAPTOR should be used as a permanent means of connection. This is done by transposing the wires within the SUSS ADAPTOR to the correct configuration. The SUSS BOX can be used to prove the SUSS ADAPTOR and then removing the SUSS ADAPTOR in between the computer and printer.

SUSS BOOK (2nd edition)

A 64 page specially written manual to connect a microcomputer to the OCTET or HERMIT typewriter/ printer. Also refers to DUPLEX SUSS BOOK for details on various microcomputer make Pin outs.

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Signed ..... *Date* ..... PCN 3

8th Seminar on Cadcam Graphics
16th APRIL — LONDON
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Personal or Professional— THE EPSON DX-100 DAISY WHEEL Does it All

The DX-100 Daisy Wheel Printer from Epson is a perfect printer for use in both home and office word processing. The DX-100 ensures high quality correspondence copies, at a really keen price.

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The DX-100 is compatible with Diablo® printer operation, making it compatible with Wordstar®and most other word processing software packages in use today. For personal or professional use, the DX-100 gives you almost everything you need.

The DX-100 features a big 5K RAM buffer.

By inputting a simple programme from your computer, the DX-100 can be operated as a typewriter, printing out each character as you enter it from your computer keyboard.

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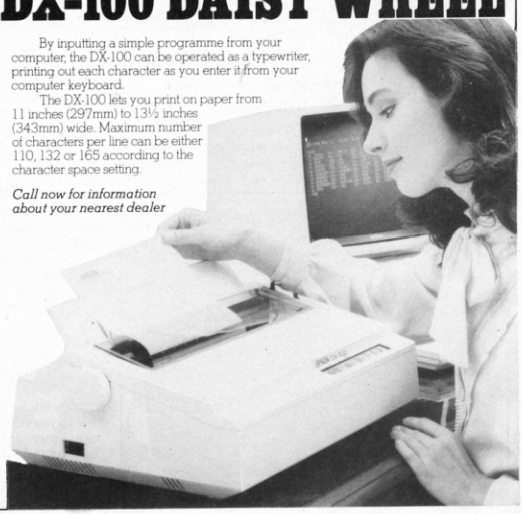

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DRAGON

Plane speaking

Name Air Traffic Control **System** Dragon, joystick **Price** £8 **Publisher** Microdeal, 41 Truro Road, St Austell, Cornwall **Format** Cassette **Language** Machine code **Other versions** BBC **Outlets** Mail order retail

Air Traffic Control is another Microdeal import from the American software house of Tom Mix, by the author of the successful *Space Shuttle* and *The King*.

Objectives

You control two runways, from which you must successfully guide the take-off and landing of numerous planes: two inbound and one outbound for each of the five difficulty levels *ie* ten inbound and five outbound on the hardest level.

In Play

The cursor is used to pick up and guide a particular plane. Thankfully, all planes are Remotely Piloted Vehicles, the inbound already circling at the start, the outbound queueing up at the right of the screen. You can alter the plane's bearing, its velocity or its height, within certain parameters. The outbound planes are automatically placed on the runway you've chosen (through picking the N, S, NW or SE bearing.) The alterations are easily made using the joystick to increase/decrease settings, and the fire-button to lock them in.

Before beginning, the program very sensibly asks if your machine can handle the double-speed poke, but even though my own Dragon can't, the action was quick and smooth enough for me, the graphics matching the *Space Shuttle* standard.

Everything takes place on the one screen, across the top of which is the wind speed (increases according to skill level), the direction it's blowing from, a clock showing number of minutes elapsed (bonus points for speed), and a space for error messages, which is the worst aspect of the program as these flash up only briefly, leaving you to wonder why your plane has suddenly disappeared mysteriously with not so much as a puff of smoke.

The controls were easier to master than the average flight simulator, and I soon enjoyed trying to bring a succession of planes safely down. Once on the runway, control switches to a smaller graphics panel at the foot of the screen, the Glide Slope: you must bring your plane down here, keeping a careful eye on another panel to the right showing drift and rate of descent. The BBC version has a separate landing sequence for this part.

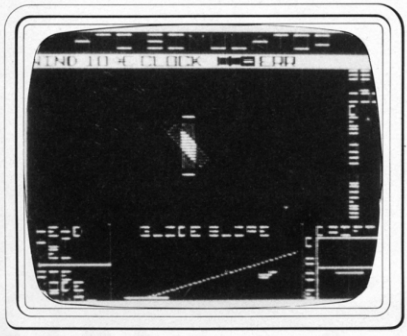
Verdict

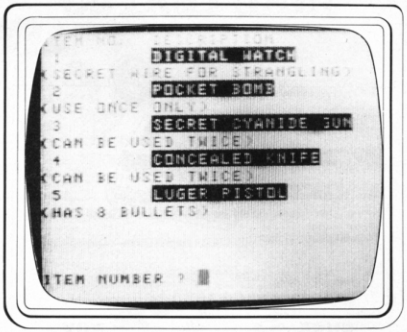
Yet another piece of first-class Dragon software from Microdeal. Add it to the shopping list.

Mike Gerrard

RATING (/5)

Lasting appeal	
Playability	
Use of machine	
Overall value	





Bond's away

Name Super Spy **System** Dragon 32 **Price** £6.50 **Publisher** Richard Shepherd Software, Elm House, 23/25 Elmshott Avenue, Chippenham, Slough **Format** Cassette **Language** Basic **Other versions** Spectrum 48K **Outlets** Mail order/retail.

Super Spy gave me the impression it was an all action James Bond type adventure game. To my dismay, I found it was more a series of mazes.

Objectives

Your mission is to seek out the evil Doctor Death, who is holding the world to ransom with a captured atomic missile. Once you've found him, all you do is defuse the missile and save the world — I think I've seen this at the pictures recently.

However, before the world is forever in your debt, you need to track down the evil Doc, and before you grab your passport and sun tan oil, you need some protection. The choice of weapons is rather dull — you get the choice of a bomb, a knife, guns or a digital watch with a secret wire. Only three of the five could be picked. Using a variety of the weapons, I found there was no difference between them apart from the fact some weapons could be used more than once.

So having tooled up, it's travel time. A screenful of destinations are printed, from which you take your pick. You can enter any location you want and you'll either get a clue or end up in a dodgy situation. When presented with food which was supposedly poisoned, I typed 'Examine Food' rather than 'shoot the waiter', my first reaction. To my surprise, I received a message in code from London, with directions.

Part two on Death's island is also text only. Unfortunately I found this stage lacking in atmosphere: you can only give directions or attack when confronted. The locations are mostly similar, differing only in the number of exits available. However, retracing my steps did not seem to lead back to the same places.

There's no returning to London if you run out of weapons and your strength dwindles with each attack you make. Fortunately, hidden somewhere on the island is a secret cache of energy pills which revitalise you. At one stage it seemed even the humble mountain goat was an enemy. You must use fists and feet, though I don't recall James Bond having to head-butt tarantulas. If you run away from trouble, or in sheer frustration try swearing at marauding wild natives, you'll get a severe ticking off.

If you make it through to stage three, you're in a 100 room maze. The graphics are limited to an overall plan of the building and a 3D view of each room. The plan is available only briefly and you can have only three looks altogether.

In the end, a rather disappointing game, but one saving feature — it's different every time.

Jim Ballard

RATING (/5)

Lasting appeal	
Playability	
Use of machine	
Overall value	

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GYROPOD

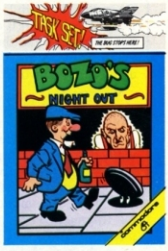
NEW

The complete deep space saga. A radical joystick action can bring inspired flexibility and a horrific kill-rate. The outstanding graphics include highly detailed craft and lots more than eight sprites at once. A full music and effects sound track accompanies the action. All these features combine with player options and a top 20 hi-score table to set new standards in hi-tech slaughter.

BOZO'S NIGHT OUT

NEW

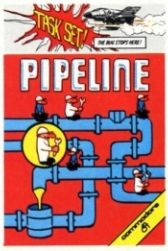
A brand new character game. Poor old Bozo, all he has to do is to get home after a night out with the lads. That's easy until a wobble becomes a lurch and a stagger. Later into the night, all rules go out of the window as he disbelieves what's happening in front of his blood-shot eyes. An epic journey with ultra-smooth graphics and sprites which run rings round normal games.



All available now on cassette or disk.

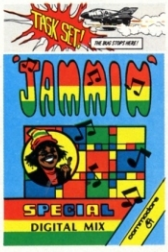
SUPER PIPELINE

Keep the pipeline open. Foreman Fred and Plumber Pete have their work cut out. The evil ladderman drops metal wedges to plug the pipeline – and only Pete can fix 'em. Pete trusts Fred to defend him against the six-legged Venusian pipe spiders and the hard case lobster while he knocks out the plugs and restores the flow. Full accompanying music and effects, options and hi-score table.



JAMMIN'

Unlike anything else, a totally musical game yet highly colourful. Guide Rankin' Rodney through the top 20 mazes – each with an interactive rock sound track. Gather the instruments and make a band but watch out for bum-notes, dischord and that most deadly effect – distortion. If you've never heard the full music capabilities of the 64, grab an instrument and join the band.



COSMIC CONVOY

Just surviving is not good enough in this giant convoy. Control three fighters at once, to defend the huge transporters as they ply between the planets. Only those transports reaching planetfall will gain galactic credits, and no-one expects promotion for losing the entire fleet. Which freighters must be sacrificed to get most cargo to the next planet. Full sound options and hi-score table complete the arcade package.

TASKSET LTD – *The Specialists*

Naturally, everything we've written for the 64 is available on either cassette or disk.

Selected titles available from: W H Smith, Boots, Menzies and all good computer stores.

Major distributors include Microdealer UK, Websters, Centresoft and P.C.S.

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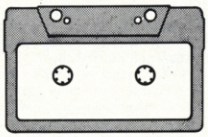
cassette



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COMMODORE 64

Aqua marine

Name Neptune's daughters **System** Commodore 64 **Price** £9.95 **Publisher** English Software **Format** Cassette **Language** Machine code **Other versions** None **Outlets** Retail

Rescuing beautiful maidens from dragons' lairs is one thing but diving down to the ocean's floor on a mercy mission is quite a different kettle of crabs.

Objectives

Down at the bottom of the ocean lives a sea serpent whose main pastime is capturing the fair daughters of Neptune and carting them off to his slimy lair. To the rescue comes our intrepid frogman. With only a harpoon for protection, he must swim through the underwater caverns, overcoming many perils along the way.

In play

You'll need a joystick as there's no keyboard option.

It's a multi-screen game, each showing one part of the water kingdom. Aquaman must paddle safely from one side of the screen to the other, when the entire display will slide smoothly to the left, revealing a completely new scene. Starting on a new screen is particularly tough — the enemy is right beside you from the word go.

Aquaman's progress is not to be compared with a swim in the local Lido. He is pursued from the outset by a winking octopus. Disposing of it with the harpoon offers only temporary relief — a brother octopus soon appears to take up the chase. Luckily, Aquaman has an unlimited supply of harpoons. The caverns are rather claustrophobic in places and one touch against a wall costs Aquaman one of his five lives.

Exits and tight passages are blocked by gently waving sucker plants — they are not friendly and must be harpooned. The supply of oxygen, represented by a changing bar at the bottom of the screen, is limited. To replenish it, Aquaman must top up by dessicating swarms of killer amoeba and collecting the bubbles of air consequently released by them.

The sea serpent is bound to be a mite peckish by the time Aquaman arrives, so he'd best harpoon a monster crab. The crab must then be transported through a ruined city to reach and feed the hungry warder. The serpent is voracious — it needs five of these crabs before it will decide to have its Sunday afternoon nap. If you manage to get this far, — you can release the first of Neptune's female kin.

Verdict

The game has very crisp graphics, some of which are quite spectacular. The action is fast yet smooth and the challenge never short of demanding.

Bob Chappell

RATING (/5)

Lasting appeal	
Playability	
Use of machine	
Overall value	

China Syndrome

Name China Miner **System** Commodore 64 **Price** £7 **Publisher** Interceptor **Format** Cassette **Language** Machine code **Other versions** None **Outlets** Retail

Just when you've conquered all the screens in Manic Miner and it's time to come up for fresh air, along comes China Miner, a new game with a similar plot, to keep you chained to the keyboard.

Objectives

The hero must journey unscathed through 30 screens, each of which contains a series of differently configured platforms, ladders and miscellaneous constructions.

On every screen a lamp, candle, pickaxe, emerald and key have to be collected, this being the only way of progressing to the next screen.

In play

The game is set in the jade mines of China at the time of the Pong dynasty. The hero is a Chinaman complete with coolie-style hat, but he has the unoriental but nudge-nudge name of Miner Wally.

The game a bounds with references to other games, more than you'll find anywhere else except perhaps in an index. Some of the strange screens that Miner Wally overcomes include Piemania, Attack of the Mutant Hovver Mowers, Loony Jetman, Wally Kong, The Yobbit, Fort Apuckerlips and Horace Goes Walkabout.

Wally starts at the bottom of the right on screen 1, can walk left and right, and can jump and climb up and down. Scattered about the platform are the objects he must acquire if he is to ever leave this screen. You might think, as it's only the first level, it will be an easy one, just to break you in. Dead wrong. It took me ages to conquer just this first screen and I never completed the second.

There are two difficulties. First, you have to experiment to find the best route around the obstacles (on the first screen moving monsters, dissolving platforms and apparently unreachable treasures). Secondly, the game is so tightly designed that there is very little margin for error on your part. You can do it — but by not much more than a hair's breadth. It's a real toughie.

The graphics and screen layouts are very good, colourful and imaginative. There are no sound effects other than continuous music which bears a remarkable yet appropriate resemblance to the theme music from 'The Sting' which can't be switched off.

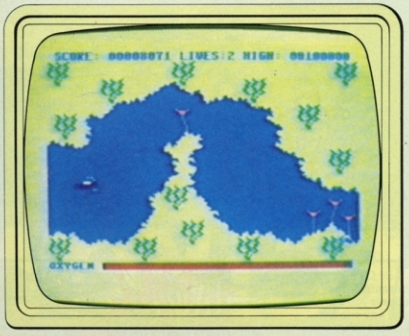
Verdict

Although similar in concept to Manic Miner, China Miner offers a whole new set of challenges. The references to other games keep the exercise humourous. You'll need that, since this game is extremely challenging throughout and you're likely to be emitting howls of frustration more than gales of laughter.

Bob Chappell

RATING (/5)

Lasting appeal	
Playability	
Use of machine	
Overall value	



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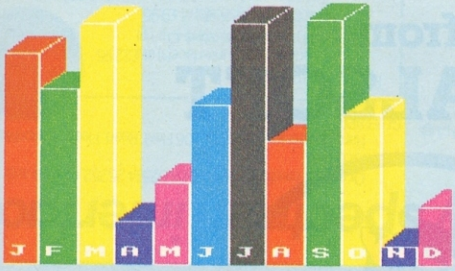

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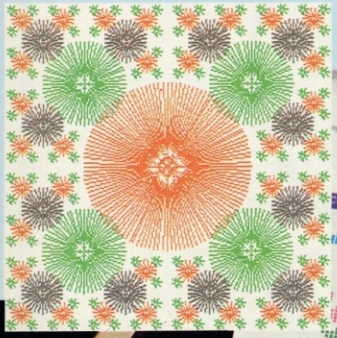

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No FT, no comment?

The *Financial Times* is behind this IBM PC package: Neville Ash gives it a run for its money.

FT Moneywise is a financial modelling package for the IBM PC and ACT Sirius. It is easy to use and constitutes a strong challenge to combined graphics/spreadsheet packages such as Lotus 1-2-3.

FT Moneywise is aimed largely at users who find existing spreadsheets and query language modelling programs too complex to use in daily practice.

You've got three main choices when looking for a money modeller: Visicalc, an all-in-one like 1-2-3 or a modeller. However, since Lotus 1-2-3 is perhaps the most widely known such package, it's useful as a yardstick.

Features

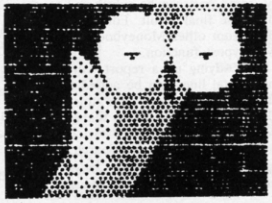
The program presents itself in a novel way, offering a financially oriented Moneybook. While spreadsheets and modellers produce reports which can be uncomfortably massive, Moneywise can produce custom reports individually tailored to your needs. Also, unlike most comparable packages, the logic (however complex) used to calculate a figure is explained in detail.

In use

There are four disks, two for the program, a tutorial and a rolling demo. You also get a reasonable manual together with installation and keyboard guides.

To start up you must put the main disk in drive B, which some may find a little odd and hard to get used to. Then you have to open a Moneybook.

If you get lost at any point, press the Help key, and for as long as you hold it down, an explanation of the required operation is displayed.



Throughout the program, the prompt 'Which Service Please' appears in the top left-hand corner of the screen until you've made a decision.

The Moneybook has different types of pages, comprising pages for modelling, summaries, presentation and graphics. There is also a Bookmark (what else?) which you can use to mark specific pages so you can return to them quickly using the IBM's special function keys. You can use the Macro commands in Lotus 1-2-3 to do more or less the same thing but, typically, you have to do the programming yourself — not something the business executive necessarily wants to have to do.

Having opened a Moneybook, the next thing to do is name a file and select the numbering sequence required, be it sequential, weekly, monthly, quarterly or yearly.

The next stage brings up a screen with six columns labelled A to F. You must fill this in with the display factor, the title and the units being used before data can be entered.

Each page of your Moneybook naturally has two sides. One shows the results of calculations, the other how the answer was arrived at. This ability to display the logic behind a complex sequence of operations is a distinct advantage over packages like Lotus 1-2-3.

Other FT Moneywise choices include tax options, allowing for losses and profits — not available under Lotus 1-2-3.

Generally speaking, Moneywise is far easier to use than any other spreadsheet I've tackled. You can come back to a model and make changes to it quickly and easily.

On the graphics side you might be able to get almost instantaneous graphs from Lotus 1-2-3 but under Moneywise this may take a few seconds. Lotus 1-2-3 offers six lines for line graphs, compared to Moneywise's three, but with Pie and Bar charts, the two packages are very similar.

The Moneybook has a maximum of 67 pages. Each page can display up to six columns by 167 rows. These three figures are multiplied to give the maximum number of 'cells' in a Moneybook, so in practice we're talking about over 67,000 cells. Lotus 1-2-3 offers a spreadsheet of 256 columns by 2048 rows — but not all of these are necessarily usable. Even with Lotus 1-2-3 on a 512K PC you can only realistically expect to get about 20,000 cells. Lotus 1-2-3 does let you link spreadsheets, but if you use complex expressions you reduce the number of cells available.

These differences are mainly due to the fact that FT Moneywise makes use of virtual memory, the disk drive being treated as an extension RAM. Lotus 1-2-3, on the other hand, is memory dependent.

One of the major problems with most spreadsheets is the time taken for recalculations. You'll want to see the differences made to your model if you make any changes, and most programs will recalculate all cells. This can take a long time, particularly if the model is large. Using FT Moneywise on a standard 256K PC, I recalculated a 20,000 cell model in two minutes. Increasing the RAM to 512K reduced this to a mere 33 seconds. It's claimed that more conventional pack-

M07a	UK DISCOUNTED CASH FLOW AT COST-OF-CAPITAL RATE	=present value of M08e discounted at 12 %per 1 intervals =compound - with M07a at - %
M07b	UK NET PRESENT VALUE AT COST OF CAPITAL RATE	
M07c	UK DISCOUNTED CASH FLOW AT TARGET RATE	=present value of M08e discounted at 15 %per 1 intervals =compound - with M07c at - %
M07d	UK NET PRESENT VALUE AT TARGET RATE OF RETURN	
M07e	UK RETURN ON JOINT VENTURE PROJECT	=if M12a is more than 0 use M14b otherwise M12a
M07f	UK AVERAGE RATE OF RETURN ON PROJECT	=if M12a is more than 0 use M14c otherwise M12a
[illegible]	US PARTNERS MANUFACTURING PROFIT	[illegible] M08c M08e

M10a	US PTRS DCF AT COST-OF-CAPITAL RATE	=present value of M09e discounted at 10 %per 1 intervals =compound - with M10a at - %
M10b	US PTRS NPV AT COST-OF-CAPITAL RATE	
M10c	US PTRS DCF AT TARGET RATE	=present value of M09e discounted at 13 %per 1 intervals =compound - with M10c at - %
M10d	US PTRS NPV AT TARGET RATE OF RETURN	
M10e	US PTRS RETURN ON JOINT VENTURE PROJECT	=if M12d is more than 0 use M14e otherwise M12d
M10f	US AVERAGE RATE OF RETURN ON PROJECT	=if M12d is more than 0 use M14f otherwise M12d
M11a	US PARTNERS TOTAL PROFIT	=divide [illegible] M01c

Sample printout of the 'key' for a Moneybook, showing the logic behind the calculations. The left-hand column is the row reference, the middle column shows the 'title' given to each entry and the right-hand column gives the relationship between cells in the model.

ages would take some 20 minutes to do the same task, but unfortunately I couldn't check this. One reason for FT Moneywise's speed is that it uses an intelligent algorithm which ensures that only those cells affected by changes elsewhere are recalculated. Clearly a lot of effort has gone into the overall design of the package and the programming of this 26,000 line combination of Fortran and Assembler.

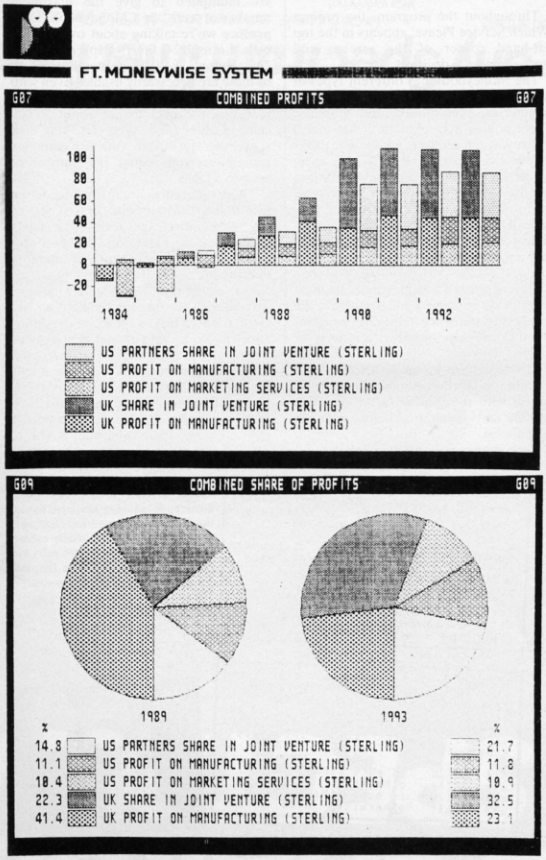
Moneywise really excels in its report generation facilities. Using Moneywise terminology, this is dealt with in the Presentation stage. Each page of a report can have up to 71 rows by 28 columns, the equivalent of an A4 page. With Lotus 1-2-3 you're concerned with the spreadsheet and the report at the same time, but FT Moneywise lets you deal with a report when all the other work has been done and you can have variable column width and free formatting of text.

If you need replication or duplication of data in cells, Moneywise offers the Keep command which means forms for reports can be produced with just the data to be dropped in to complete them. By simply changing the date a completely new report can be displayed and printed. A whole model or any part of a model can be included in a new report. Similarly, some part can be subtracted to produce the final result. For consolidating data from other Moneybooks, there's a Moneypost function.

For tidying up a report, vertical and horizontal lines can be added to give a finishing touch. It's just this sort of flexibility and ease of use that will make Moneywise dear to the heart of many.

There's an invaluable Search function which displays 'matches' and you simply select the one required.

Two graph results pages from a Moneybook. The other side of the page, the working side, allows the user to define the shading and type of graph, while axes are automatically scaled. Graph pages like these can be included in a 'Moneyprint'.



Usability

FT Moneywise uses conventional English terms and the menus are clear, the selected option being shown highlighted. Combining these factors with the Help facility and the 'Next Option Please' prompt makes the program far more friendly than most. It's little details such as these that help make it easier to use and more accessible to inexperienced users than many of its competitors.

Reliability

My review copy loaded first time every time, and didn't crash whatever tricks I tried. Back-up disks are available when the guarantee is returned and there's even a special hot-line phone service available for those who feel they might need detailed problem-solving, albeit at extra cost.

Documentation

The manual is thick, contains lots of screen shots to aid explanation and is written much less technically than most of its type. In addition there are the installation guide and a quick reference card.

Verdict

Strictly speaking, there's no real competition for FT Moneywise. There are similar types of program: spreadsheets, all-in-ones and modelling systems, but these are essentially general purpose packages. Where FT Moneywise really scores is in its financial dedication. Of course, this makes it unsuitable for many of the purposes which users may have in mind.

Lotus 1-2-3 compares well, but falls down when it comes to detailed comparisons of the Moneybook, Report facilities and the Find function.

One major criticism for the more up-market user is that unlike Lotus 1-2-3 there's no version which uses the Hercules Card for colour graphics. Nevertheless, the graphs produced on a standard Sirius monitor or on an IBM with colour card and monitor are very good indeed and a Hercules version is under development.

PCN

RATING (/5)

Features	4
Usefulness	4
Documentation	3
Performance	4
Reliability	4
Overall value	4

Name FT Moneywise **System** IBM PC (256K) **Price** £395 (Moneywise support service £145 pa) **Publisher** Moneywise Software, 226 Sheen Lane, London SW14 8LD 01-878 8585 **Format** Disk **Other versions** ACT Sirius, (Apricot soon) **Outlets** direct selected dealers.

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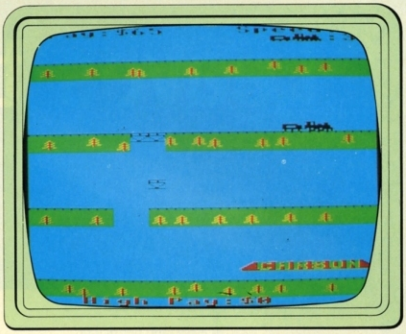

Trainiac is an exciting game of speed and manual dexterity from Simon Williams of Beaworthy in Devon. Instead of controlling the usual angrily animated aliens and hyper-electric laser booster shooters, you play the part of the railroad company's bridge building chief engineer. Your assignment is to repair damage to the railway line, before the oncoming express is derailed.

Each level of the game consists of four screens, each one showing four strips of the line between Tombstone and Carson City. By moving a bridge-shaped cursor around the screen and using it to lay down new sections of bridge, gaps in the line may be closed so that the train can pass safely. If the train successfully completes its journey, you receive a bonus and move onto the next level, where the train thunders across the prairies and deserts at yet greater speed.

Title: *Traniac*
Machine: *BBC-B Electron*
Language: *BBC Basic*
Application: *Game*
Author: *Simon Williams*

On page 71 you'll find another of *PCN*'s utility programs. Each week a routine or program will be listed at the end of the main programs section. If you have any routines that you think will be of use to other readers, why not send them in for publication? Just send your routine on cassette together with some notes on what the routine does and how it does it to:
Kenn Garroch PCN Programs Evelyn House 62 Oxford Street London W1A 2HG

Remember, though, it must be your own work, not previously published elsewhere.

All contributions will be returned as soon as possible after I have had time to look them over.

50-100	Set up the user defined characters, initialise the variables and display the playing instructions.
110-130	Redefine the colour palette and remove the cursor.
140-150	Outer control loop, this sets up the start screen and plays the tune.
160-280	Inner control loop, this runs the game until three trains have crashed. The loop is exited if a new game is not requested.
290-320	Reset the machine to normal, MODE, the key repeats etc.

```
  10 REM            TRAINIAC
  20 REM       (c)1982 S.Williams
  30 REM        For BBC Micro 32K
  40 REM
  50MODE 6
  60PROCinitialise
  70VDU19,0,2;0;19,1,0;0;
  80VDU23;8202;0;0;0;
  90PROCinstructions
 100MODE 5
 110VDU19,0,6;0;19,1,0;0;
 120VDU19,2,2;0;19,3,1;0;
 130VDU23;8202;0;0;0;
 140REPEAT
 150PROCscreen:PROCtune(1460,28)
 160REPEAT
 170IF SCREEN%=4 AND TV%=28 AND TH%>15
PROCpay:PROCnewtrain
 180IF TV%=28 AND TH%>15 SCREEN%=SCREEN
%+1:PROCpay:PROCscreen
 190IF TH%>15 PRINT TAB(TH%,TV%)"     ":
PROCpay:TV%=TV%+8:TH%=0:PRINT TAB(TH%,TV
%)T2$
 200PROCbridge
 210IF ABS(POINT(64*(TH%+3.5),990-TV%*3
2))=0 PROCcrash
 220IF TRAINS%>0 TH%=TH%+1:PRINT TAB(TH
%,TV%)T1$
 230FOR N%=1 TO DELAY%:NEXT
 240PROCbridge
 250IF TRAINS%>0 PRINT TAB(TH%,TV%)T2$
 260FOR N%=1 TO DELAY%:NEXT
 270SOUND 0,-10,4,2
 280UNTIL TRAINS%=0:PROCnewgame
 290UNTIL ENTRY=78
 300MODE 7
 310*FX12,0
 320END
 330
 340DEF PROCinitialise
 350VDU23,224,0,0,15,15,12,15,15,4
 360VDU23,225,3,1,225,251,59,251,254,14
4
 370VDU23,226,224,161,173,255,255,255,1
87,238
 380VDU23,227,0,128,128,192,192,224,240
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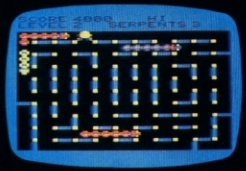

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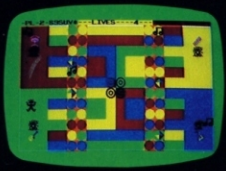

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TRAINIAC

◀ 59 340-590 Define the user defined characters and strings. Set the auto repeat and initialise variables.

610-740 Display instructions in Mode 6, using animated display.

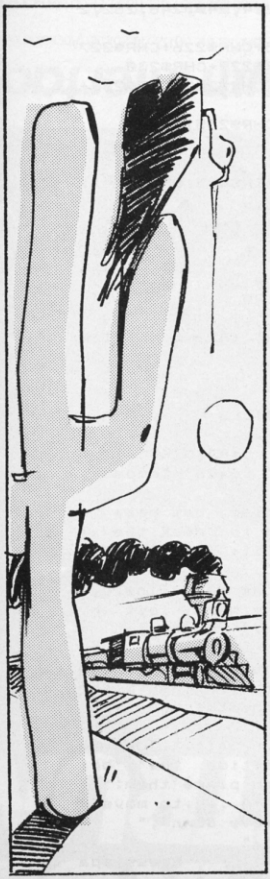
760-790 Pause execution for a predefined period.

```
,160
  390VDU23,228,0,0,254,255,195,255,255,7
3
  400VDU23,229,62,26,26,191,191,191,235,
14
  410VDU23,230,0,24,216,252,252,254,191,
234
  420VDU23,231,0,3,14,29,59,31,14,5
  430VDU23,232,192,240,241,251,239,147,6
6,3
  440VDU23,233,32,112,200,144,224,248,25
1,255
  450VDU23,234,126,63,46,60,14,4,0;
  460VDU23,235,255,136,0;0;0;
  470VDU23,236,255,136,255,129,66,36,24,
255
  480VDU23,237,16,56,84,56,84,56,214,16
  490VDU23,238,1,3,7,15,31,63,127,63
  500VDU23,239,128,192,224,240,248,252,2
54,252
  510T1$=CHR$224+CHR$225+CHR$226+CHR$227
  520T2$=" "+CHR$228+CHR$229+CHR$230
  530CRASH$=" "+CHR$231+CHR$232+CHR$233+
CHR$8+CHR$10+CHR$234
  540TRACK$=STRING$(20,CHR$235)
  550B$=CHR$236
  560FIR$=CHR$237
  570PAY%=0:HIPAY%=0:TRAINS%=3:SPEED%=1:
SCREEN%=1
  580*FX11,10
  590ENDPROC
  600
  610DEF PROCinstructions
  620COLOUR129:CLS:COLOUR0
  630FOR M%=0 TO 22:READ L$
  640FOR N%=0 TO 39:PRINT TAB(N%,M%)MID$
(L$,N%+1,1);T2$
  650PROCpause(1)
  660NEXT,
  670REPEAT UNTIL GET=32:CLS
  680ENDPROC
  690DATA"                    TRAINIAC","","
An agent for The  Stage  Coach  Company,
"
  700DATA"known as Trainiac, has been  s
ystematic-","ally trying to break the  T
ombstone  and","Carson City Railroad Co.
  by  sabotaging"
  710DATA"                the main line.","
Your job is to bridge the gaps  left  by
","Trainiac's  bombs.  If  a  train  g
ets"
  720DATA"through to Carson City,  anoth
er  leaves","Tombstone faster than befor
e. The faster","the train, the more you
earn for  saving"
  730DATA"                      it.","Use th
e following keys to  position  the","bri
dges and the space bar to place them:"
  740DATA"","             A.....to move u
p","          Z...to move down","
      <...to move left","             >.
.to move right","","","          Press spa
```

PCN PROGRAMS: BBC B ELECTRON

TRAINIAC

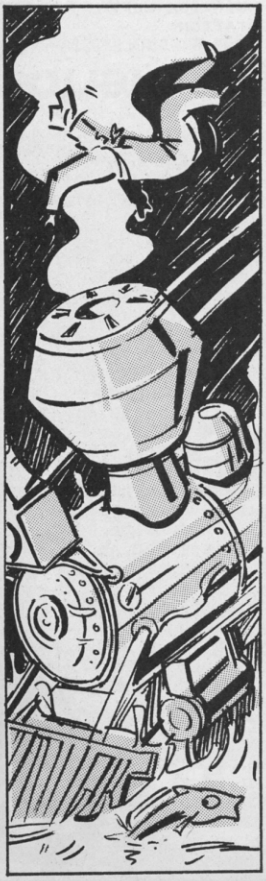
810-950	Draw the game screen with stations, trees, scores etc.
970-1030	Draw the station using name parameter.
1050-1180	Display the bonus at the end of each run, set up a new train and increase the speed etc.
1200-1280	Handle the keyboard input routine and move the bridge cursor accordingly.



```
ce bar to start"
  750
  760DEF PROCpause(T%)
  770TIME=0
  780REPEAT UNTIL TIME>T%
  790ENDPROC
  800
  810DEF PROCscreen
  820COLOUR128:CLS:COLOUR1
  830PRINT TAB(1,1)"Pay:$";PAY% TAB(12,1
)"Speed:";SPEED% TAB(13,2)T2$;":";TRAINS
%
  840COLOUR 3:PRINT TAB(3,31)"High Pay:$
";HIPAY%;
  850FOR M%=5 TO 29 STEP 8
  860COLOUR1:COLOUR130
  870PRINT TAB(0,M%)TRACK$;SPC(20);:COLO
UR128
  880VDU5:GCOL1,3:FOR N%=0 TO 1088 STEP
128:MOVEN%+RND(128),988+RND(24)-32*M%:PR
INT FIR$:NEXT:VDU4
  890IF SCREEN%<4 AND M%>5 OR SCREEN%=4
AND M%>5 AND M%<28 P%=RND(12)+4:W%=RND(3
):PRINT TAB(P%,M%)SPC(W%) TAB(P%,M%+1)SP
C(W%)
  900NEXT M%
  910IF SCREEN%=1 PROCstation(0,3,"TOMBS
TONE")
  920IF SCREEN%=4 PROCstation(12,27,"CAR
SON")
  930COLOUR1:TH%=0:TV%=4:PRINT TAB(TH%,T
V%)T2$:BH%=9:BV%=16
  940DELAY%=185-37*SPEED%
  950ENDPROC
  960
  970DEF PROCstation(H%,V%,NAME$)
  980COLOUR3
  990PRINT TAB(H%,V%) CHR$238 TAB(H%+LEN
(NAME$)+1,V%)CHR$239
 1000COLOUR2:COLOUR131
 1010PRINT TAB(H%+1,V%)NAME$
 1020COLOUR128
 1030ENDPROC
 1040
 1050DEF PROCnewtrain
 1060FOR N%=0 TO 6
 1070PRINT TAB(5,3)"BONUS-$";SPEED%*100
 1080SOUND 2,-15,100,5
 1090PROCpause(30)
 1100PRINT TAB(5,3)SPC(10)
 1110PROCpause(30)
 1120NEXT:PAY%=PAY%+SPEED%*100
 1130IF SPEED%<5 SPEED%=SPEED%+1
 1140SCREEN%=1:CLS
 1150PRINT TAB(2,15)"Next train ready"
 1160PROCpause(500)
 1170PROCscreen
 1180ENDPROC
 1190
 1200DEF PROCbridge
 1210I%=INKEY(0)
 1220*FX15,1
 1230BLR%=(I%=90)-(I%=88)
```

TRAINIAC

1300-1360 Display the crashed train.
1380-1490 Play the start and finish tunes from the note data held in the data statements.
1610-1710 Handle the end of game and start a fresh game if required.
1730-1770 Update the display of the pay (score) on the screen.



```
 1240BUD%=(I%=58):IF BV%<30 BUD%=BUD%-(I
%=47)
 1250IF POINT(64*(BH%+BLR%),992-32*(BV%+
BUD%))=0 PRINT TAB(BH%,BV%)" ":BH%=BH%+B
LR%:BV%=BV%+BUD%:PRINT TAB(BH%,BV%)B$
 1260IF I%=32 AND (BV%=13 OR BV%=21 OR B
V%=29) PRINT TAB(BH%,BV%)B$:BH%=BH%+1:IF
 POINT(64*BH%,992-32*BV%)<>0 BH%=BH%-1:B
V%=BV%+1
 1270IF I%=32 PRINT TAB(BH%,BV%)B$
 1280ENDPROC
 1290
 1300DEF PROCcrash
 1310PRINT TAB(TH%,TV%)CRASH$
 1320FOR N%=-30 TO -16:SOUND 0,N% DIV 2,
4,1:NEXT
 1330FOR N%=0 TO 30:SOUND 0,-RND(15),4,2
:NEXT
 1340TRAINS%=TRAINS%-1
 1350IF TRAINS%>0 SCREEN%=1:PROCscreen
 1360ENDPROC
 1370
 1380DEF PROCtune(POINTER,NoNOTES)
 1390RESTORE POINTER
 1400FOR N%=1 TO NoNOTES
 1410READ FREQ,DUR,REST
 1420SOUND 2,-15,FREQ,DUR
 1430SOUND 2,0,0,REST
 1440NEXT
 1450ENDPROC
 1460DATA 81,2,2,101,3,3,101,2,2,101,3,3
,109,2,2,117,3,3,117,2,2,117,2,2,109,1,1
,101,2,2,81,6,6,129,2,0,121,4,0,129,6,6
 1470DATA 81,2,2,101,3,3,101,2,2,101,3,3
,109,2,2,117,3,3,117,2,2,117,2,2,109,1,1
,101,2,2,129,6,6,129,2,0,121,4,0,129,6,6
 1480DATA 117,2,2,129,3,3,129,2,2,129,3,
3,117,2,2,121,3,3,121,2,2,121,3,3,109,2,
2,117,3,3,117,2,2,117,2,2,109,1,1,101,2,
2,109,4,3,97,2,2,81,4,1
 1490DATA 97,1,1,109,2,2,129,6,4,81,6,4,
109,6,4,81,6,4,101,8,0
 1500
 1510DEF PROCnewgame
 1520CLS:PRINT TAB(1,1)"Pay:$";PAY% TAB(
12,1)"Speed:";SPEED%
 1530COLOUR3:PRINT TAB(5,15)"GAME OVER"
TAB(3,31)"High Pay:$";HIPAY%;
 1540PROCtune(1480,24)
 1550PROCpause(200)
 1560COLOUR1:PRINT TAB(1,17)"Another? (Y
or N)"
 1570*FX15,1
 1580REPEAT ENTRY=GET:UNTIL ENTRY=78 OR
ENTRY=89
 1590IF HIPAY%<PAY% HIPAY%=PAY%
 1600PAY%=0:SPEED%=1:SCREEN%=1:TRAINS%=3
 1610ENDPROC
 1620
 1630DEF PROCpay
 1640PAY%=PAY%+SPEED%*5
 1650PRINT TAB(6,1);PAY%
 1660ENDPROC
```

PCN PROGRAMS: BBC B ELECTRON

ORIC SCROLL

PCN UTILITIES: ORIC-1 16/48K

Title: *Oric Scroll*
Machine: *Oric-1 16/48K*
Language: *6502 Machine Code*
Application: *Utility*
Author: *M D Barratt*

The following program is a Basic loader for a series of screen manipulation routines written in machine code. Four of these are used as direct Basic commands, to move the entire screen one place sideways (with the column that falls off the edge either being lost, or reappearing at the other side, as required). Two others are interrupt driven routines that cause the screen to rotate slowly without interfering with the running of the Basic program.

All the routines are fully usable from Basic. To call a routine, assign the appropriate function to a dummy variable, *eg*:

```
500 FOR N=1 TO 10
510 HK=&(3)
520 NEXT N
```

will shift the screen display ten places to the left, putting spaces in the new columns appearing on the right.

```
500 J=&(4)
```

will initialise the interrupt driven rotation to the right, which will continue until

```
600 J=&(6)
```

is executed.

A full list of the functions available appears in the listing. After running the Basic (assuming the prompt 'OK' has appeared) the loader can be NEWed without damaging the keyboard routines.

```
10 REM BASIC LOADER FOR
20 REM SCREEN SCROLLING ROUTINES
30 REM 48K ORIC-1
40 REM
50 REM &(0)=ROTATE 1 PLACE RIGHT
60 REM &(1)=ROTATE 1 PLACE LEFT
70 REM &(2)=SCROLL 1 PLACE RIGHT
80 REM &(3)=SCROLL 1 PLACE LEFT
90 REM &(4)=START ROTATION RIGHT
100 REM &(5)=START ROTATION LEFT
110 REM &(6)=STOP ROTATION
120 REM
130 REM BY M. BARRATT.
140 REM
150 HIMEM #96BD:TL=0
160 A=#96BE:REPEAT
170 READ B$:B=VAL("#"+B$)
180 TL=TL+B:POKE A,B:A=A+1
190 UNTIL B=85
200 IF TL<>34460 THEN PRINT"TYPING ERROR
- RECHECK PROGRAMME":END
210 PRINT"OK":DOKE #2FC,#979E
220 DATA A9,BB,A0,AA,85,01,84,00,A2,1B,
    A0,25,88,B1,00,C8,91,00,88,D0
230 DATA F7,A9,20,91,00,A5,00,18,69,28,
    85,00,A9,00,65,01,85,01,CA,D0
240 DATA E1,60,A9,BB,A0,AA,85,01,84,00,
    A2,1B,A0,00,C8,B1,00,88,91,00
250 DATA C8,C0,25,D0,F5,A9,20,91,00,A5,
    00,18,69,28,85,00,A9,00,65,01
260 DATA 85,01,CA,D0,DF,60,A9,BB,A0,AA,
    85,01,84,00,A2,1B,A0,25,B1,00
270 DATA 48,88,B1,00,C8,91,00,88,D0,F7,
    68,91,00,A9,28,18,65,00,85,00
280 DATA A9,00,65,01,85,01,CA,D0,DF,60,
    A9,BB,A0,AA,85,01,84,00,A2,1B
290 DATA A0,00,B1,00,48,C8,B1,00,88,91,
    00,C8,C0,25,D0,F5,68,91,00,A5
300 DATA 00,18,69,28,85,00,A9,00,65,01,
    85,01,CA,D0,DD,60,C6,02,F0,01
310 DATA 40,78,48,8A,48,98,48,A9,20,85,
    02,20,40,97,68,A8,68,AA,68,40
320 DATA C6,02,F0,01,40,78,48,8A,48,98,
    48,A9,20,85,02,20,14,97,68,A8
330 DATA 68,AA,68,40,20,67,D8,A5,34,F0,
    05,A2,E5,4C,85,C4,A5,33,D0,03
340 DATA 4C,14,97,C9,01,D0,03,4C,40,97,
    C9,02,D0,03,4C,BE,96,C9,03,D0
350 DATA 03,4C,E8,96,C9,04,D0,16,A9,86,
    A0,97,A2,20,86,02,8D,31,02,8C
360 DATA 32,02,A9,4C,78,8D,30,02,58,60,
    C9,05,D0,06,A9,6E,A0,97,D0,E4
370 DATA C9,06,F0,05,A2,E5,4C,85,C4,A9,
    40,78,8D,30,02,58,60,55
```

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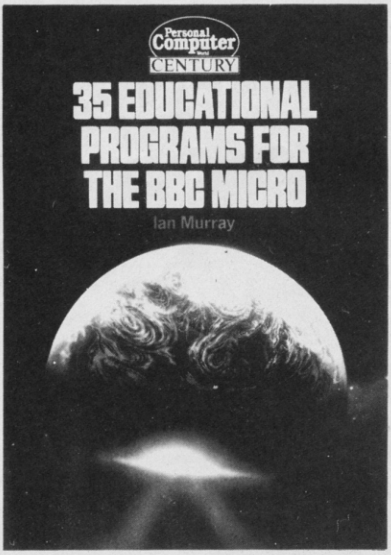

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CENTURY

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

'Microwars on the Commodore 64' by Humphrey Walwyn, published by Century at £5.95 (paperback, 248 pages).

Wargaming using microcomputers has become one of the growth areas in the software market this past 12 months, but aside from the commercial products, users have been rather left to their own devices. This book goes a long way towards remedying that.

Although specifically for the Commodore 64, it includes notes for conversion to the Pet series and, since all of the programs use the bare essentials of Basic, it is a simple task to translate the programs to other machines.

Mr Walwyn is obviously an experienced and enthusiastic wargamer and no mean programmer. The book is well presented and covers the games and programming side of the subject equally well. There are six games listings here covering an ancient strategy game, Waterloo, a naval battle, a World War I dogfight (including the chance to design your own planes) and a simple flight simulator in which you must bomb a warship.

The graphics are confined to the Commodore character set but they are imaginatively used. Adding user-defined graphics and sprites should be a simple exercise. The listings are all dumps to the printer and there are plenty of mid-game screen dumps so you can see what to expect.

The only cirticism I can make is that five of the games require two players. Having to trade places at the keyboard is not the ideal way to play and I suspect that many users would prefer to take on the computer. Perhaps Mr Walwyn could be induced to write a follow-up along these lines.

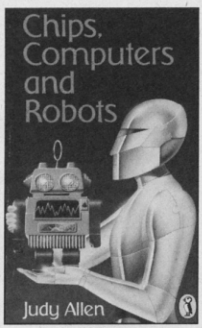
Other than that, it should fill a need for wargaming micro owners and serve as an excellent and inexpensive introduction to the genre for non-enthusiasts.

PW

'Chips, Computers and Robots' by Judy Allen, published by Puffin Books at 95p (paperback, 95 pages).

This book attempts to cover a lot of ground in a small space. To do this the 32 chapters present somewhat sketchy information on, among other subjects, integrated circuits, inside the computer and languages, giving only two or three pages to each. However, this approach may well be useful for the complete novice.

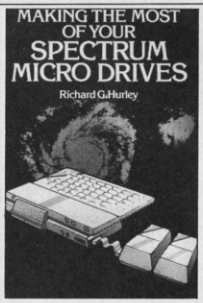
The second half of the book is essentially a list of practical aspects of computing, such as space exploration, chips in health and transport, desk top electronics, and so on. Chapters on robots are illustrated with large pictures that serve little purpose.



The book closes with a glossary of terms 'you may come across in the world of chips, computers and robots', which, like the rest of the book, is brief and sketchy. Not quite the 'invaluable guide to the great revolution of our times' it claims to be but possibly a cheap, very general, introduction to it.

NR

'Making the most of your Spectrum Microdrives' by Richard G Hurley, published by Micro Press at £5.95 (paperback, 152 pages).



'Making the most of . . .' is something of a misnomer here, depending on your view of 'most'. If what you're looking for is a more in-depth guide to the Microdrives than the Sinclair manual provides you'll be disappointed—though some of the explanations are a shade clearer here, that isn't really what this book's about.

What Mr Hurley does do is provide applications and games programs that use the Microdrives, starting with files and data processing in chapter three — surely enough to kill the book stone dead on the bookstands — and producing an address book and an electronic diary in fairly short order. The program notes are sketchier than I'd have liked, but at least the book is providing much needed software for the drives.

After the filing section, the programs become endearingly whimsical. I'm not sure of the utililty of the English/French translator, but just as soon as I've rounded up 63 people and 63 Interface 1s I'll get cracking on the Adventure program. That's right, Mr Hurley has produced a networked adventure game for up to 63 players.

The Slide Show program is also a handy idea, and shows what the Microdrives are capable of. The fast loading time means you can store a number of screens on cartridge and call them up when you need them. The book winds up with a quick look at Interface 2, complete with a Very Long Arcade Game.

JL

'Book of Adventure' by Keith Campbell, published by Melbourne House at £5.95 (paperback, 137 pages).

You are sitting at your computer, the choices are: play your favourite arcade game, update your accounts, or pick up Keith Campbell's book of adventure and create your own fantasy world. Be warned, take the final choice and you've taken on a real challenge.

The first few chapters are devoted to describing adventure games in general and briefly outline some adventure games currently on sale. Then you get down to planning your own game.

Once you have decided on your theme, objects to help or hinder and the treasure, the book shows you how to make a map of the area and from this how to work out a table of locations, exit codes and their associated destinations.

Next you draw up an object table giving the location of each object and flags indicating whether objects are fixed or movable. Mr Campbell then shows how this information can be entered as data statements.

With this data in your computer, he goes on to detail how to handle strings and set up arrays and gives a clear explanation of conditional statements, all of which are essential for interpreting input instruction.

There's also a chapter which tells you how to present the results on the screen, but these are a bit of a struggle and it is suggested you check each stage step by step.

Having produced a skeleton, you can put the 'flesh on the bone'. In Campbell's sample program this comprises doors concealed by wallpaper, swinging ropes, and a life-saving umbrella.

The sample program is written on a TRS-80 but there are listings for the Spectrum, Commodore 64 and the BBC.

NR

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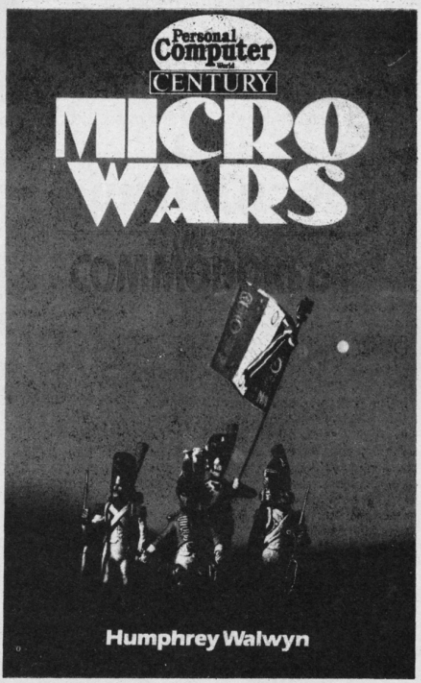

HUMPHREY WALWYN

A stunning collection of programs both substantial and challenging, with detailed documentation and historical notes. These are games which exploit the graphic capabilities of the Commodore 64 to the limits, while at the same time offering readers intricate strategies and exciting simulations to fire the imagination and tax the wits.

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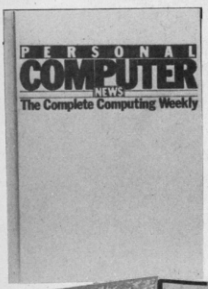

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Commodore 64 C2N cassette programmers reference guide and other books and games, tapes. All for £200 ono. Only recently bought. Tel: 01-531 2746 (White).

ZX 48K Spectrum ZX Printer plus four rolls paper, manuals, £110 ono. Tel: 01-993 5661 (eves). (Wiggins).

BBC model B new with disk interface with leads etc and the BBC micro book, £425 ono. Tel: 01-340 2586 (North London, Eric).

Texas TI99/4A joysticks, Football module, Flight Simulator, Introduction to Basic cassette, leads, £60 only. Tel: Sheffield 645444.

Oric-1 software for sale, including Hobbit, Flight, Zodiac. SAE for list, Gibson, 79A, Vaughan Road, Harrow. Tel: 01-422 0757.

Lynx 48K computer, 10 months old, with parallel printer interface package, 10 tapes (Chess, Snowball, mazeman etc). Excellent condition, £180. Tel: West Drayton 445853.

Atari software. Disks: Arcade Machine, Diskey £17; AE £12; Zork 1 £12; Choplifter £12; Zombies £7; Miner 49er £14. Also 35 hot tapes eg Zeppelin, Caxxon — all at £6! Tel: Steve on 01-723 6795 after 8pm.

Sharp PC 1251 pocket computer with printer and tape drive. Hardly used, cost £175 will sell for £105 ono. Tel: Pill on (0272) 3029 after 7pm.

TI99/4A, 16K, excellent condition, two educational modules, games cassettes, basic manual and programming books, with compatible data recorder £90. Tel: (0865) 3109 (evenings).

Dragon Ghost Attack, (cartridge). S. Huda, 1 Dunclare Heights, Dungannon, Co Tyrone BT71 7RZ or tel. (08687) 22082 after 5pm, ask for Sameer.

Powertran Cortex 64K RAM disk/RS232/cassette interface fitted, £200. Spectrum 48K plus lots of software, £100, buyer collects. Tel: (0235) 26845 or 20064 (Oxford area).

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Atari 2600 Pacman Combat joystick paddles, excellent £50 or swap for Com 64 software, joystick, books etc. Tel: (0705) 476357, ask for Tony.

BBC 'B' including Watford Electronics DFS, View WP ROM, dual disk drive 200K. Much software on disk and cassette, will split, £650. Tel: Madingley 210472.

Disk drive uncased, Burroughs twin 8" drive, good condition, bargain at £140 ono. Also secondhand computer mags for sale, any offers? Tel: Newmarket 741660.

48K Oric and books plus £70 of software and tape recorder for £190. Write to M. Chadwick, 26 The Crescent, Shirley, Solihull, Birmingham B90 2ES.

PCN Bilboard

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Apple II 48K two floppy drives, Visicalc Access Applewriter and games by the score, £800. Tel: 037-881 4159.

Atari Jumbo jet pilot, £20, invitation to programming £17. Assembler editor £30. Tel: 01-850 1574, 5pm-9pm.

BBC B 1.2 OS with hard wired modem and ROM for Prestel Micronet complete with various software and books, £400. Tel: (0622) 62675 (eves).

Torch Z80 card with Perfect software, BBC Basic (ZAC) and lots of CP/N software, £375. Tel: Medway 377104.

Dragon 32, £100 software, books, Donkey Kong, Android Attack, Defence, etc. Professional joysticks with mags, 5 months old, good condition. £180. Tel: 01-748 3231.

Wanted TI99/4A Parsec cartridge. Will exchange for Hunt the Wumpus cartridge and 4 cassette tapes. Tapes include Planet Destroyer, Arena 3, programming aids, Up Periscope. Tel: 021-788 3705.

48K Spectrum interface, two intelligent joysticks, sound amplifier, two books, much software, £270 wanted or memotech MTX 512, excellent condition. Tel: Oxford (0865) 9873103.

48K Spectrum interface, two intelligent joysticks, sound amplifier, two books, much software, magazines, excellent condition. £270 wanted or Memotech MTX 512. Tel: Oxford (0865) 9873103.

Atari software to sell: Snooker, Billiards, Pool, Donkey Kong and King Arthurs Heir, all £10. All originals. Tel: Robert on (0767) 260 470 (eves after 6.30pm).

BBC software bought/exchanged, write Carmel Delicata 195/1 Tower Rd, Sliema, malta.

Atari games on cassette to sell or swap. Tel: Knarr Cross 262 after 6pm.

Acorn 100K disk drive only, for sale (have upgraded). Price includes cover but not DFS — £130. Tel: Roger on 01-953 2214.

Lynx 48K, boxed and unused, £190, perfect condition, warranty, programs, will deliver London area. Tel: Kidmore End (0734) 722603.

Vic 20 C2n 16K switchable Quickshot joystick, loads of software, Intro Basic part 1, lots of PCN mags. Worth £75, sell for £10 ono. Tel: Bedford 63087 (Claudio).

Spectrum and BBC B software for sale, Jetman, Atic Atal, Manic Miner, Body Snatchas, Rommel's Revenge, lots more. Send sae to 5, Nightingale Close, E. Grinstead, Sussex.

Sharp MZ-80P5 printer and interface card and cable. Sell for £275. Sharp MZ-8051 interface box and Universal interface card and Big Ears. Sell for £150. Tel: (0224) 44579.

Sharp MZ-80K plus £300 of software including Basic, Pascal, Forth, Fortran, Assembler, Wizards Castle — worth over £500, bargain at £275. Tel: (0224) 44579 after 7pm.

CBM-64 and disk drive, disk and cartridge software worth over £300. The lot for £400. Will sell some software separately. Tel: Maidstone (0622) 692020.

Sharp twin disk drive CE331M with interface CE341M, new, boxed, with manual. A bargain at £200. Tel: Strathaven (0357) 20902.

Spectrum 48K, programmable interface, joystick (Quickshot) for sale. £130 the lot ovno. Also 32 software tapes, offers please, all items very little used. Tel: 01-747 0033 after 7pm.

BBC games — on 80t disks, approx 200 games (20 disks), in plastic library cases — £150. Watford DFS with manual — £30: 8271 — 130. Tel: Reading 29058.

BBC B 1.2/OS, Basic-II, with disk drive, Acorn DFS, disk Doctor, Exmon, Beebcalc, Wordwise ROMS, joysticks, 250+ programs, £800. Tel: Reading 29058 (eves).

BBC Model B software, Space Shuttle, new, £6; and four more tapes, £6 each, all for £30. Tel: (0222) 884949 (eves).

Atari 400/800 software to swap (disk and cassette). Tel: 022029 830 (Kevin).

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Oric 1 48K, as new, with manual, book, leads and mags, plus £120 worth software. Boxed, excellent condition, £110 ono. Tel: 061-427 6124.

Mitsubishi disk drive for BBC microcomputer, half-height, double sided, 80-track, (400K). In perfect order, cased, with leads, utility disk and manual, £199. Tel: 01-995 5294.

Oric 16/48K software £5 each; Harrier Attack, Dinky Kong, Galaxians, Ice Giant, Xenon-1, Oric Forth Language, £10. Includes manual. Tel: David on (0702) 553849 after 4pm.

Dragon 32 brand new with cassette recorder, selection of software, including King, Android Attack, Space Shuttle, Two Quickshot joysticks, fully guaranteed, £200. Tel: (0689) 50465.

ZX/Vic 20 printer and cassette based interface. Leads, power supply, instructions, £40. Tel: 01-809 4062 after 6pm, ask for David.

Spectrum 48K plus Currah Speech Unit and over £90 best software. Sell for £170 ono or swap for an Electron. Tel: Barry on 01-317 0905.

Vic 20 plus cassette deck, Introduction to Basic part 1, and £110 worth of software. Still under guarantee, vgc, £110 ono. Tel: Woking 70318.

Spectrum 48K speech synthesiser tape recorder, sound board with joystick interface, £80 software, manuals, magazines, utility programs, sell for £300. Tel: (0672) 40465 eves.

ZX printer with roll, Sharp cassette recorder, Horizons, Test match, Collectors Pack, Football Manager, Fruit Machine software, £30. J. D. Ireland, 106 Warwick Road, Carlisle, Cumbria.

Atari VCS and 25 cartridges for sale, any offers considered. Also swap Spectrum software. Tel: 01-599 3515 and ask for Pete.

BBC Model B 1.2 OS. Perfect working order, hardly used, bargain at £285 ono. Tel: Ingrebourne 41405 after 6pm.

Vic Bits, motherboard, £10; programmers aid, £20; Commodore game cartridges, £5; Choplifter, £13; Skyhawk, Pixel Demon, Matrix, Lazerzone, Boss, Myriad, £3.50 each. Tel: (0268) 696638.

UK 101 32K Basic in EPROM, Gegmon, extended Basic, Toolkit, new Basic 4, 48-32 display, PSG (AY-3-8910), software, manuals, 320 ono. Tel: Tony on (0778) 346646 (eves).

48K Spectrum, cassette recorder, joystick. Software includes Forth, Masterfile, VU-Calc, VU-3D, Flight Simulation, plus games, books, £170 ono. Tel: 01-361 2128.

Electron and BBC software, 7 BBC tapes (5 games — 2 educational), worth £50+. 3 Electron games worth £20 — each £3. Entire, offers? Tel: Clacton 814523.

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PCN back issues for sale, 46 in total. Plus 10 free issues of 'The Home Computer Course', £10 the lot plus postage. Tel: 051 430 6153.

Apple II Europlus with double disk drive, monitor, full printer, £900 ono. Too extensive to number. Tel: 051 625 7767 (eves only please).

Prism VTX 5000 modem for ZX Spectrum, 2 months old, mint condition, £69. Tel: (0744) 51797.

BBC Model B, leads, manuals, programs. Only 3 months old, must sell, bargain at £275 ono. Tel: (0594) 563558 (Miller, Forest of Dean).

Apricot computer software wanted. Business programs only. What have you got? Please contact Peter Hodgkinson, 86 Langdale Rd, Leyland, Lancs. Tel: Leyland 23221 after 7pm.

Mattel Intellivision, 20 cartridges for sale including 3 for Intellivoice and 2 Imagic, 75% off each. Also Intellivoice module, £20. Tel: Eric on 01-578 7906.

Wanted books, software, games for PET 4032. Tel: 091 85167.

Spectrum 48K Quickshot, + interface, £200 software, Hobbit, manik Miner, Valhalla, Fighter Pilot, Flight Simulation, magazines. All yours for £250 ono. Tel: 01-669 0622.

For Apple — Wilcard £68, dBase II, Visicalc, Applewriter, plus many games, utilities and other business software. SAE list, J. Davey, 44 Hazelmere Rd, Stevenage, Herts.

Twindrive 5¼" 40 track singlesided, both with power supply, suitable BBC/TRS, £200. Tel: Hundon (044086) 434.

Wanted Spectrum 48K, must be in good condition, prefer under guarantee. Tel: 01-500 0866.

Intellivision video game plus 18 cartridges, voice synthesisers, 3 voice cartridges at throwaway price of £200. Contact Ajmel, 7 Holly Rd, Northampton NN1 4QL, Northants.

ZX81 with 16K RAM Fuller keyboard and over £100 of recorder and new software in perfect condition. Boxed. Good starter computer, £80 ono. Tel: (0767) 260 624).

Dragon 32 software including Storm Quest, Flight Simulation, Dragon, Mountain Attack, Nightflight, Evictor, Drone, Volcanic Dungeon, etc. Most half price, excellent condition. Tel: Kingswinford 277549.

ITT 2020 Apple II). 48K RAM, 10K Paloff Basic (001 2B), monitor in ROM. TV mmodulator board. Disk II interface board. Very good condition. £300. Tel: Keir (0268) 43079, after 4.30pm or weekends.

Dragon 32 six months old, plus joysticks and over £200 of software inc the King Danger Ranger, Chuckie Egg, £225 ono. Tel: (0603) 484130 (eves).

TRS-80 colour computer, 32K with joysticks, CGP-115 printer/plotter, boxed with Scripsit, Edtasm+, Nebula, cartridges, software, manuals and mags, only £200. Tel: Tadworth 2601.

Seikosha GP100A printer, prints text and graphics. Brand new, with warranty. £175 ono. Also address manager for Spectrum, £5. Tel: York 763875.

Dragon 32 books and software, still under guarantee, £105. Also cassette recorder, £25. Tel: Highcliffe 6144.

Memotech MTX 500 for sale and new computer, only 7 weeks old, genuine reason for sale. Only £250 or £265 with cassette recorder. Tel: 01-794 9655 (eves, after 6pm).

BBC B 1.20/S (7 months), programming books, worth £40, joysticks, software worth £300 (all original). Total value, £770. Sell for £475 ono. Will sell software separately. Tel: 021-459 7933 (Birmingham) after 6pm.

Atari new 1010 cassette recorder, £40. Hardly used, with box etc. Also Atari Star Raiders, £15, brand new, hardly used. Tel: (0279) 443837.

CBM 64. Would you like to exchange software? Send a list of your programs to: Richard Banning, Tallstigen 7 181 62 Lidinge, Sweden.

Dragon, excellent condition, with nine tapes. Lightpen, two joysticks, many mags, together with over £300 — a bargain at £190 ono. Tel: 01-485 6986 (eves).

Commodore 64 software, Easy Script, Easy Spell, Easy Stock, Future Finance; games as well, owner buying Sinclair QL. Tel: 01-206 0969.

Microdrive, interface 1 and 48K Spectrum, all brand new, with two cartridges and £70 cassettes, offers of £260 or over. Tel: Stowmarket 615581 after 6pm.

Osborne with dual d/d disc drive, plus monitor, retails at £1,375, plus software CP/M Wordstar, Supercalc, M/Basic, C/Basic worth £600+, unused bargain — £975. Tel: Bedford (0234) 214274.

Sharp MZ-80K for sale with built-in monitor and cassette recorder. Complete with £200 worth of software, £250. Tel: Tamworth 872863 after 4pm.

BBC B 5 months old with box and packing etc. Advanced user guide and 3 other books, plus many mags, lots of software, only £350 wanted. Tel: 01-639 8484.

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Sharp MZ-80K 48K hardly used, manuals and some software, £180. Tel: Dave on (0782) 413915 (days).

ZX81+16K DKTronics keyboard, Osave loading aid, manual, books, 30+ games, motherboard cost over £200. Asking £90 ono. Tel: 01- 743 6232.

Oric-1 48K £85; Oric printer £100; software neg. Video Genie 16K, printer cable £70; TRS-80 printer interface £15. S. Barrett, 01-741 9551 (day), 01-651 4249 (eves) Croydon.

Lynx 48K excellent condition, plus eight cassettes, NILUG membership and user mags. Still under guarantee, sell for £155. C. White, 58 Ayresome St., Middlesbrough, Cleveland. Tel: 812995.

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Atari software for sale; Airstrike II, Firefleet, Zaxxon, Preppie II, Diamonds, Krazy KOpter, Time Warp, Leggit, Frogger, Mickey Mouse, £4 each. Tel: Nigel (0269) 4810.

New BBC word processor package, £45; or exchange ROMs desk diary, Philosophers Quest, Painting and other programs/books. Sale/exchange. Tel: (02216) 4432 (eves).

Wanted for Newbrain. Beginners manual, business software, w/p printer, up to £150. Details to J. Martin, 27 Stanton Rd, Ensbury Park, Bournemouth, Dorset BH10 5DS.

Daisy wheel printer plus automatic sheet feeder. Tec-Starwriter 40 chars/second, very little used, 15 months old. Will demonstrate if required, £1,270 ono. Tel: Brighton 556184.

Sharp MZ80K 48K languages Basic, Forth, Pascal, Machine Code, over 50 programs, manuals, books, user notes, excellent condition, £280. Tel: Luton (0582) 592758 (eves).

Vic 20 32K Super expander, cassette unit, Basic parts one and two, lots of books and software, £200 ono. Tel: West Drayton 444101 (Middx), after 6pm.

Atari 400/800 games Blue Max, Miner 2049er, £12 each. Tel: Ashford (Kent) 33968.

Spectrum 16K with manuals, leads, etc. As new, £60. Tel: 01-341 4931 (eves).

Spectrum 48K, Fuller keyboard, Protek joystick interface, software including games, Designer, Kong, Penetrator, Manic Miner. Also books. Excellent condition, £150. Tel: Desmond on 01-286 8133 (eves).

Spectrum 48K, excellent condition, 4 months old. Software includes Hunter Killer, Paras, Vu calc, Racing Manager. Plus many more. Cost £170+, accept £120. Tel: 01-646 5641 (S. London).

BBC Model B 1.2 OS Wordwise, hardly used, as new, immaculate condition, more than £100 software, £25 worth books, £375. Tel: 01-552 2847.

Vic 20 cassette deck, Vic 1575 printer, Programmers, Reference Guide, cartridges, 6 tapes. Will not accept anything under £200. Tel: 01-405 3934 after 6pm.

Vic 20 games programs for sale. From £2.50 (½ price) eg. Arcadia, Paratrooper, Abductor. All little used. Tel: Blackpool (0253) 869108 for list.

BBC B 1.20S, issue 3, Basic 3, DFS, Wordwise, Beebcalc ROMS, compatible cassette recorder, software, books, mags, 8 months old. Worth £795—price £699. Tel: Keith on 01-883 6951 (mornings only).

Dragon 32, dustcover and leads, excellent condition, £130. Also Dragon software, many leading titles, £4, including Planet Invasion, Ninja and Champions. Tel: Mulbarton (0508) 78406 after 6pm.

BBC B, immaculate condition, tons of software, BBC data recorder, Microvoc sound system, Computer Concepts graphics ROM, Voltmace joystick, all for £399 ono. Tel: (0978) 355044.

Apricot user wants to contact other business Apricot users. lancs, Yorks, Midlands, regarding business software. Please contact Peter Hodgkinson, 86 Langdale Rd, Leyland, Lancs.

Wanted BBC Model B. Leads, everything and some games (software) around £200. Also sell Spectrum 16K, many games (about 21). Tel: Rick on (0325) 333100 (weekdays after 6pm).

BBC dual drives, TEAC FD55e, slimline, SS/400K, 40/80 TRK, switchable, PSU cable, 40 disks, still under guarantee, £499. Tel: Keith on 01-883 6951 (mornings only).

Atari 400 16K including cassette recorder, two joysticks and many games including Astro Chase and Airstrike II, £175 ono. Tel: Woking 67454 (eves).

Atari VCS with games: Pacman, ET, Asteroids, Space Invaders, Combat; all for £85. Chris Simpson, 7 Bairstow Rd, Towcester, Northants. (Buyer collects.)

32K Colour Genie, £125, joysticks, £25. Both as new; also software, variety of prices, all cheap. Tel: Newmarket (0638) 750182 (eves).

BBC 32K, lots of software, books, mags, leads etc, 7 months old. Sell at £325 ono to buy hi-fi. Tel: CT on 01-907 7182 after 5pm.

Tandy 16K extended colour computer, 4 cartridge program packs, joysticks, manuals etc for £170. Tel: Haywards Heath (04447) 6146.

Oric 48K with software including Hobbit, Zorgons Revenge, Dinky Kong, Flight and Reverse. PCN 60 programs for the Oric-1 as well. All £100. Tel: 01-771 3893.

48K Spectrum (new), tape recorder, software worth £175, total value £324, sell for £50. Tel: Esher 66272.

Sharp PC1500 computer, cassette interface/printer, RAMpack, case, all issues Stasis 1500 User magazine. Full details of machine code. £150. Tel: 051 489 9842.

Atari 400 16K includes cassette, 2 joysticks, Basic, software. Ideal starter pack, bargain at £140, 9 months old. Tel: John on 01-968 3012 (6pm-9pm).

Memotech MTX512 64K+16K video RAM. Complete boxed, 2 games, demo tape, manual etc, £255. Tel: 051 342 4246 (Wirral).

Wanted printer for Atari 800. Must be excellent condition and ready to go. Also required: 410 program recorder. Cash available. Tel: (0803) 311453.

Commodore 8032-SK with green 12" monitor, Commodore 8024 printer, all cables included, both £950 ono. Tel: 01-952 3854.

Oric-1: Hopper £3; Games Compendium 01 £2; Games for your Oric (Virgin) £1; the Oric-1 by Ian Sinclair £2. Tel: Kevin on 01-533 0627.

Apple IIe 80 col, 128K, disk drive, monitor III, Epson FX80, Grappler, Applewriter IIe, various utilities and games, manuals and books. All £1,650. Tel: 01-267 (eves).

Newbrain AD 32K with 64K expansion, Sanyo hi-res monitor, tapes, books, 6 months old, guaranteed, owner leaving country, £550, will split. Tel: 021-354 3721 (eves).

Two printers Seikosha GP-80A, 30cps, approx 1000 sheets paper, one BBC, one Video Genie interface. Dot matrix, vgc, £175 ono. Tel: 01-947 2988 (eves).

Atari VCS 2600 with Pacman and Decathlon. Unwanted gift, vgc. All for £60 ono. Tel: 01-947 2988 (eves).

Spectrum software valued at £600 plus Kempston joystick and interface together with 6 books. Bargain at £40. Tel: 061 740 5478.

Computer Concepts graphics ROM with manual and demo disk, £25. Acornsoft BCPL ROM, manual and disk, £60 ono. Acorn DFS 0.9H chip with manual, £20. Tel: Canterbury 750600.

Acorn Electron, brand new and unused, offers? BBC model B, brand new, full guarantee, £375 delivered. Also Microvitec monitor, full guarantee, £230, delivered. Tel: Canterbury 750600.

BBC Wordwise and graphics extension ROMS, £26 each or £48 for both. Tel: Andy on 031-332 8709.

BBC software: Monsters, Rocket Raid, Meteors, Invaders, Graphs and Charts, all originals, £4.50 each or £20 the lot. Tel: 01-200 6238 (after 7pm).

Swap Spectrum and BBC software, many titles available. Send large sae for details to: J. McLauchlan, 61 Craigpark Drive, Dennistoun, Glasgow G31 2NW.

Jupiter Ace complete, 16K Pacer RAMpack, 3 copies Ace User, Lex monitor and keyboard bleep, £80. Tel: Exeter 33380 (after 6pm or weekends).

Spectrum 16K brand new, boxed, £100+ of software, also books mags, cassette recorder of required, sensible offers considered. Tel: 021-357 9900.

Wanted Spectrum 48K plus accessories, good price given. Tel: 01-903 4137 (eves).

Sharp MZ80, 48K RAM, with Basic and Pascal. Excellent condition, £150. Tel: Orpington 20527 (eves/weekends).

Atari 400 16K, 15 months guarantee, tape recorder, Basic, joystick, software includes Donkey Kong, Dig-Dug, QIX. £150. Tel: Mark on (0865) 242375 (after 4.30).

Commodore Pet Basic 4.00 with cassette recorder, Toolkit, assembler and disassembler, reset switch, games, manuals, all in very good condition, £300. Tel: (0992) 44640.

Kienzle visual record computers, two 6000 series for sale with software. Ex business use, first sensible offer accepted. For details ring Ron on 01-520 5263.

Newbrain-AD handbook, Beginners Guide, Newbrain Disected manual, Zen assembler and manual, Tycoon, Palesman, Sumer (3 games), all leads including monitor lead. Worth oger £300 — accept £190. Tel: 01-699 4830.

Airstrike II for Atari computers, as new, £4. Tel: (0793) 750620.

AGF joystick interface and joystick (Atari style), only £15, (original price £23.49). Perfect condition with demo program, casing, etc. Tel: (0232) 662694 (weekends).

Atari software, Donkey Kong £15; Pole Position £17.50; Diamonds £4; Airstrike 2 £5; Leggit £3; Mission Impossible £10. Tel: 01-642 6553.

Atari 600XL, excellent condition, hardly used, complete with all manuals etc, £100 ono. Tel: 01-642 6553.

Newbrain AD 32K microcomputer, as new, complete with leads, manual and recorder, £220. Tel: 01-802 8942 (anytime).

Cheap word processing Dragon plus cassette, Epson printer, telewriter, all cables, manuals, vgc, all for £330. Will split. Tel: 01-677 3845 (eves) London SW16.

Printer for sale Tandy DMP 100 £170 ono, parallel and serial interfaces, most computers for sample, see Dragon User Jan 84, page 55. Contact Adrian on Warwick 0926/497231.

48K Spectrum Microdrive, Interface 1, ZX-printer, 7 rolls paper, Kempston Centronics interface (drives Epson FX-80), fantastic "Tasword" WP program! Spectrum books, programs, leads etc, (cost £400+), £290. Tel: 0895 34704.

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Features: computer chess, Occam parallel processing language, Victor/Sirius function keys.
ProgramCards: Towers of Bramah (Pascal), Biorhythm (Apple II), Roman Year (Apple II), Shape Utility (Apple II).
Gameplay: Darts, Soccer (Atari); Castle of Riddles (BBC Model B); Pimania (Spectrum); Flight Simulator (IBM PC).
Databases: micros and peripherals.

Issue 2, March 18-25.
Pro-Tests: Toshiba T100, Casio PB100, ZX81/Basicare, Vic speech synthesiser, Spectrum spreadsheet, IBM graphics, BBC word processing.
Features: Colecovision, micro backgammon, nursery computing.
Gameplay: Ultima II (Apple), Trader (ZX81), Starquest (Vic 20), Hungry Horace (Spectrum).
ProgramCards: String editor (Spectrum), Analogue Clock (BBC Model B). Chart generator (Spectrum). String extract/replace.
Databases: full software listings.

Issue 3, March 25-April 1.
Pro-Tests: TI Professional, Apple speech synthesiser, Facit 4140 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).
Databases: micros.
Micropedia: Anatomy of the BBC, part 3.

Issue 4, April 1-8.
Pro-Tests: Pied Piper Communicator, Olympia ESW3000 printer, Namal Supertalker, Commodore Calcresult, Spectrum Pascal, Cashbook (BBC).
Gameplay: Dark Crystal (Apple II), St George (Dragon), Wizard War (Dragon).
ProgramCards: Fruit Machine (C64), Tunesmith (Oric), Array Editor.
Databases: peripherals.
Clubnet: Clubs and user groups.
Micropedia: Go Forth, part 1.

Issue 5, April 8-15.
Pro-Tests: Commodore 700, Ikon Hobbit, 1-2-3 (IBM), ZX81 machine code.
Features: speech packs, monitors.
Gameplay: Grand Prix (Dragon), Derby Day (Spectrum), Deadline (Apple).
ProgramCards: Wacky Racers (Oric), Fruit Machine (C64), Parse Integer.
Databases: Software.
Clubnet: full list of user groups.
Micropedia: Go Forth, part 2.

Issue 6, April 15-22.
Pro-Tests: Tycom Microframe, IBM PC, Scorpio Disks, Dragon sound module, ZX81 graphics, Bottom Line Strategist (CP/M), PaperClip word processor.
Features: IBM PC DOS, BBC word processing, PC-1251.
Gameplay: Mined Out (Spectrum), Transylvanian Tower (Spectrum), Lunar Leeper (Apple II), Evolution (Apple II).
ProgramCards: Wacky Racers (Oric), Mortgage Comparison (Sharp MZ80K), Computer Set Up (BBC), Day of Week.
Databases: micros.
Micropedia: Graphics, part 1.

Issue 7, April 22-29.
Pro-Tests: Mattel Aquarius, Epson FX80, Olivetti JP101, Lisp on Spectrum, Vic 20 assembler, Supergrat on Victor/Sirius.
Features: Dealer support, Atari graphics.
Gameplay: Krakit (ZX81), Cruising On Broadway (Spectrum), Kaktus (Vic 20), Fantastic Voyage (ZX81).
ProgramCards: CBM controls, Computer Set Up (BBC), Wacky Racers (Oric), Julian Dates.
Databases: Peripherals.
Micropedia: Graphics part 2.

Issue 8, April 29-May 6.
Pro-Tests: Atari Home Files Manager, Kobra's Vic Stat for the Vic 20, Hestacrest's Accounts for the Spectrum; Epson RX80 printer, NCR's Decision Mate V. Future Computer's FX20.
Features: Micronet, Compact programming on the TI99/4A.
Gameplay: Harvester (Vic 20), Strategic Command (Dragon 32), A first Book of Micro Rhymes (BBC), Telling the Time/Money (Spectrum).
ProgramCards: Program Indexer (BBC B), CBM Database cards 1-4, Sort/Extract.
Databases: software.

Issue 9, May 6-13.
Pro-Tests: Structured Basic on the Apple, Pixel Power on the Vic 20, Star DP510 printer, Dams and Interpod interfaces for Commodore 64; Micro-Professor.
Features: BBC function keys, Atari word-processing part 1.
Gameplay: Dungeons of Intrigue (Oric), The Castle (Oric), Starship Command (BBC B), Dragon Trek, Nowotnik Puzzle (Spectrum).
ProgramCards: Lower case (Dragon 32), CBM database cards 5-6, Monster (Spectrum), Wildcard Search (MBasic).
Databases: hardware.
Micropedia: Graphics, part 4.

Issue 10, May 13-20.
Pro-Tests: Infomast on Commodore 64, Dragon Mace; MC202 and CMU800 music synthesisers (Apple), Prism directly coupled modem; Epson QX10.
Features: ZX81 graphics part 1; Atari word-processing part 2.
Gameplay: Rescue (Spectrum), Dictator (Spectrum), Roman Empire (Spectrum), Choplifter (Vic 20), Skyhawk (Vic 20).
ProgramCards: Union Jack (Lynx), Escape (Spectrum), CBM Database cards 7-9, Evaluate (MBasic), Formula (BBC B).
Databases: peripherals.
Micropedia. Graphics part 5.

Issue 11, May 20-26.
Pro-Tests: BBC Vafile, PFS:File for IBM, Apple Pascal; printer comparison, Pickard Joystick Controller for ZX81 and Spectrum; C9E Computer Board.
Features: ZX81 graphics part 2, Basic on the Sharp MZ80K.
Gameplay: Motor Mania (Commodore 64), Oric Flight, BBC Music Synthesiser, Music Maker (Spectrum), Embassy Assault (Spectrum), Tobor (Spectrum).
ProgramCards: Homeward Bound (ZX81), Connect Four (Dragon 32), CBM Database. cards 10 — end.
Micropedia: Keyboards.

Issue 12, May 27-June 2.
Pro-Tests: Spectrum word processor, PFS:Report on IBM, File Handling for Colour Genie; CTI CP80 type 1 printer, TG Trackball; Sord M5.
Features: Epson Basic. Oric sound part 1. Tandy Colour graphics.
Gameplay: Mad Martha (Spectrum), Frenzy (Spectrum), Headbanger (Spectrum), Oric roundup.
ProgramCards: Election Barchart (Commodore 64), Memory Utility (BBC B), Munch (Spectrum).
Databases: Hardware.
Clubnet: clubs (Cambridge Microcomputer Club special).
Micropedia: Disk Drives, part 1.

Issue 13, June 3-9.
Pro-Tests: Telewriter for Dragon 32, Abersoft Forth for Spectrum, GPS graphics processing system for Apple II+ joysticks, rulers; Ajile.
Features: Dragon meets Tandy, Oric music part 2, transferring Basic for Colour Genie and Genie 1.
Gameplay: Everest Ascent (Spectrum), Colour Genie roundup, Micro Maze (Jupiter Ace), Qix (Atari).
ProgramCards: Cupid (Oric), Alien (Dragon 32), Time Bomb (Atari).
Databases: peripherals.

Issue 14, June 10-June 15.
Pro-Tests: Apple Accelerator II board, Modula-2 (Apple II), Oric-Base, Joystick Control Unit J6, Kempston Centronics Interface. BBC Speech Synthesiser.
Features: Newbrain Basic part 1, Sirius designing.
Gameplay: Ah Diddums (Spectrum), Monopole (Commodore 64), Automonopoli (Spectrum), Dragon dramatics.
ProgramCards: Time Bomb (Atari, cont), Sheep Drive (BBC B).
Databases: Software.
Micropedia: Spectrum, Part 1

Issue 15, June 16-June 22.
Pro-Test: Comx 35, Address Manager (Spectrum), Sysvcs (Commodore 64), MST Database (Epson HX-20), Voice Input Module (Apple II).
Features: Newbrain Basic part 2, Genie scene.
Gameplay: Cleared for Landing, Playing the Ace (Apple II), Vultures, Star Jammer (Dragon 32).
ProgramCards: Mover (BBC B), Sprite Clock (Commodore 64), Pirate Island (Atari, 3 of 9), Micro-mind (Colour Genie), Brickbat (Dragon 32).
Databases: Hardware.
Micropedia: Spectrum. part 2.

Issue 16, June 23-June 29.
Pro-Tests: Atari v Acorn, word processing for the Commodore 64, Simplific (CP/M), MPF-II printer. Z80 Pack for BBC.
Features: ZX81 Maths. US mail order, Atari graphics.
Gameplay: Computer Scrabble (Spectrum), Education (BBC), Horace and Spiders (Spectrum), Catcha Snatcha (Vic 20).
ProgramCards: Video Titler (T199/4A 3 of 6), Bowling (Spectrum), Pirate Island (Atari cont).
Micropedia: Spectrum. part 3.

Issue 17, June 30-July 6.
Pro-Tests: Duet-16, The Organizer (CP/M), Trace and ZX Text (Spectrum), Jaki 6100 daisywheel, Videx Ultra Term (Apple II).
Features: Leasing part 1, Atari screen action.
Gameplay: Oric chess, Grand Master (Commodore 64), Escape from Orion (BBC), Jet Pac (Spectrum), The Ring of Darkness (Dragon 32), Spectrum spectacle.
ProgramCards: Video Titler (T199/4A cont), Pirate Island (Atari cont) Word processor (BBC).
Micropedia: Sound, part 1.

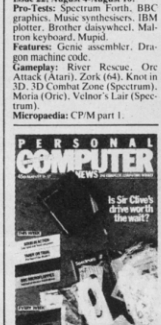
Issue 18, July 7-July 13
Pro-Tests: Tandy 100, RS232 interface (ZX81), ROM pager (Commodore), Interface printer buffer, IBM Personal Basic, Spectrum assembler, Newbrain WP.
Features: Leasing Part 2, Lynx music.
Gameplay: Spectrum Backgammon, BBC Snooker, Commodore 64 round-up, Serpentine (Vic 20), Pssst (Spectrum), Spectrum Safari.
ProgramCards: Word Processor (BBC), Fruit Machine (Spectrum).
Micropedia: Sound Part 2.

Issue 19, July 14-July 20
Pro-Tests: 16-bit chips, Stock control (Epson HX20), Mailplus (Torch), Smith-Corona daisywheel, ZX81 word processing.
Features: Insurance, buying secondhand.
Gameplay: Escape MCP (C64), Escape from Perilous (Atari), Apple round-up, Temple of Apshai (C64), Airline (Spectrum), Heathrow (Spectrum).
ProgramCards: Colour Code (Atari), Wreck (Dragon).
Micropedia: Sound, part 3.

Issue 20, July 21-July 27
Pro-Tests: Rade bareboard, Vic digital tape drive, Seikosha colour printer, Toolkit (Spectrum), Bonus (Pet payroll), Newbrain monitor.
Features: Computer art, Dragon scrolling.
Gameplay: Rabbit Trail (T199/4a), Aztec Challenge (Atari, Vic 20, T199/4a), BBC round-up, Joust (Spectrum), Molar Maul (Spectrum), Print Shop (Spectrum), Time-Lords (BBC).
ProgramCards: Tumbler (Oric), Wreck (Dragon), Atari Errors Speed Race (Vic 20).
Micropedia: Sound, part 4.

Issue 21, July 28-August 3.
Pro-Tests: BBC graphics, Newbrain assembler, BBC turtle, Oric printer, Triumph printer.
Gameplay: Franklin's Tomb (Dragon), Hummer House of Horror (Spectrum), Jumpman (64), Jumping Jack (Spectrum), Fourth Encounter (Vic), Cyclons (64).
ProgramCards: Collection (Vic), Bomber (64), Definer (BBC).
Micropedia: Sound, part 5.

Issue 22, August 4-August 10.
Pro-Tests: Spectrum Forth, BBC graphics, Music synthesisers, IBM plotter, Brother daisywheel, Maltron keyboard, Mupid.
Features: Genie assembler, Dragon machine code.
Gameplay: River Rescue, Orc Attack (Atari), Zork (64), Knot in 3D, 3D Combat Zone (Spectrum), Moria (Oric), Velnor's Lair (Spectrum).
Micropedia: CP/M part 1.



Issue 23, August 11-August 17.
Pro-Tests: Sord Basic-G, Tasword, BBC microfloppies, Microdrive, Tandy Model 4.
Features: Dragon machine code, Atari controllers.
Gameplay: Bridge Master, Styx, Manic Miner (Spectrum), Atari roundup, Candy Floss/Hangman (Oric), Everest (Dragon).
Micropedia: CP/M. part 2.

Issue 24, August 18-August 24.
Pro-Tests: T-Maker III. Spectrum Fifth, daisywheels surveyed, Spectrum digital tracer, Laser.
Features: Videotex, Dragon machine code.
Gameplay: Oric roundup, Cookie, Egg Farm, Xadom (Spectrum), Sea Lord (BBC), Lusitanic (Dragon), The Island (64).
Micropedia: Commodore 64, part 1.

Issue 25, August 25-August 31.
Pro-Tests: Electron, Simons Basic, Oric monitors, Microdrive.
Features: Newbrain mags, Acorn Atom, Dragon machine code.
Gameplay: Suspended (64), Terror Daktils, Tranz AM (Spectrum), Dragon roundup, Jogger (Oric), Frogger (IBM).
Micropedia: Commodore 64.

Issue 26, September 1-September 7.
Pro-Tests: Microtan 65, BCPL, BBC Exceer, 80 column Pet, Oric interfaces.
Gameplay: Magic Mountain, Smugglers Cove (Spectrum), Spectrum roundup, Matrix). (64), Ninja Warrior (Dragon), Dallas, (Oric), Call to Arms (IBM).
Micropedia: Commodore 64.

Issue 27, September 8-September 14.
Pro-Tests: Sharp MZ700, BBC Lisp, Apple editor, IBM mice, ZX81 surgery.
Gameplay: Zip-Zap, Zzoom (Spectrum), Spectrum roundup, Hoover Bower, Bent Spanner, Pssst (64).
Micropedia: Dragon, part 1.

Issue 28, September 15-September 21.
Pro-Tests: Zenith Z100, Snail Logo, Atari Supergraphics, Newbrain CP/M, IBM mice.
Gameplay: The Witness, Super Scramble, Sta (64), Harrier Attack (Oric), Morocco Grand Prix (Dragon), Pharoah's Tomb (Spectrum.
Micropedia: Dragon, part 2.

Issue 29, September 22-September 28
Pro-Tests: Portico Miracle, Dragon editor, BBC toolkit, Dragon drives. Apple light pen.
Features: HX20 disassembles, TI transformations.
Gameplay: Gridder, Glooper, Caliform, Cosmic Rush (64), Oric roundup, Bomb Alley (BBC), Splat, General Election (Spectrum).
Micropedia: Dragon, part 3.

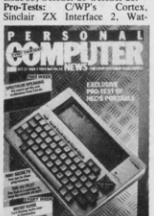
Issue 30, September 29-October 5.
Pro-Tests: NEC's Advanced Personal Computer, Financial Planner (IBM), Kempston v.b.e. Countabout Hot Dog Spotter (Spectrum), Prism VTX5000, Extended Basic (Dragon).
Features: Spectrum machine code.
Gameplay: Halls of Death/Sword of Fargoal (64), 747 Flight Simulator (FBBC), Dragonfly (Dragon 32), Forensic/Note Invaders (BBC).
Programs: Search (ZX81), Composer (Oric).
Databasics: Hardware.
Micropedia: Everything you wanted to know about programming, part 1.
Clubnet: Clubs.

Issue 31, October 6-October 12.
Pro-Tests: Atari 600XL, Condor

Series 20 (IBM), Acacia Non-volatile Diary/Filing system (BBC). ROM extension board (BBC).
Features: Oric sound routines.
Gameplay: Greedy Gulch (Spectrum), Kong (Spectrum), Crazy Kong (64), Cuthbert Goes Walkabout/Movie Producer (Dragon).
Programs: Composer (Oric), 555 (Spectrum), Anagrams (Dragon).
Databases: Peripherals.
Micropaedia: Everything you want to know about programming, part 2.
Clubnet: User Groups.

Issue 32, October 13-October 19.
Pro-Tests: Mattel Computer Adaptor (Intellivision), Sprite-Gen (BBC), Typing Strategy (Apple), MCoder 2 (Spectrum), Cirtech Eprom Programmer (Apple).
Features: Telesoft options, Inside the Genie.
Gameplay: Space Shuttle Frogger (Dragon 32), Atari roundup, Spectadraw 2/Football Pools Program (Spectrum).
Databases: Software.
Clubnet: Clubs.
Programs: Bees Away (BBC), Composer (Oric).
Micropaedia: Everything you wanted to know about programming, part 3.

Issue 33, October 20-October 26.
Pro-Tests: C/WP's Cortex, Sinclair ZX Interface 2, Wat-



ford DFS (BBC), Wordsworth (BBC), Atariwriter.
Features: Oric Operating System.
Gameplay: Dragon roundup, Hustler (64), Cricket/Luna Crabs (Spectrum), Deep Space (BBC).
ProgramCards: Key Utility (Lynx), Bees Away (BBC), French Test Card (Apple).
Databases: Clubnet.
Micropaedia: Everything you wanted to know about programming, part 4.

Issue 34, October 27-November 2.
Pro-Tests: NEC's PC-8201A, Simply File (64), The Forest (Spectrum), Amcom DFS (BBC), Curah Microspeech (Spectrum).
Features: Oric Machine Code.
Gameplay: Fort Apocalypse/Pooyan (Atari), Death Cruise/I Ching (Dragon), Trench/Canyon (BBC), Football Manager/Pool (Spectrum).
Programs: French Test (Apple), Babyfall (ZX81), Count (Vic 20), Men/Arith (Vic 20), Road Hog (BBC).
Databases: Hardware.
Micropaedia: Everything you wanted to know about programming, part 5.

Issue 35, November 3-November 9.
Pro-Tests: Kaypro 10, Stock Control (Spectrum), Educational games (BBC), Brother EP22 electronic typewriter, ADS Centronics Interface (Spectrum, Jupiter Ace).
Features: Tandy Graphics, BBC Operating System.
Gameplay: Valhalla (Spectrum), 64 roundup, Slinky (Atari), Hexpert (64).
Programs: Mini Math (Spectrum), Multi-Square (Oric).
Databases: Peripherals.
Micropaedia: Everything you wanted to know about programming, part 6.

Issue 36, November 10-November 16.
Pro-Tests: Tiger from H/H, ZX81-Forth, Exmon (Oric), Cycle Planner, Growth Tracker/Dieta/Diet Master (Spectrum), U-Com 2 (Apple).
Features: Newbrain sound, BBC FX commands.
Gameplay: Creepers (Vic 20), Exterminator (64), Spectrum roundup, Death Mines of Sirus (Dragon 32).
Programs: Falklands Raid (BBC), Mini Math (Spectrum), Pyramid (Spectrum).
Databases: Software.
Micropaedia: Everything you wanted to know about programming, part 7.

Issue 37, November 17-November 23.
Pro-Tests: Apricot, Paint (Atari), BBC Micro Toolbox, Spectravideo Compumate (Atari VCS 2600), Big Ears.
Features: Flight simulators, Spectrum screening.
Gameplay: Empire/Treasure Tomb, Crystal Chalice, Temple of Zoren (Dragon 32), Cobus Maze/Bewitched (Vic 20), Cosmic Convoy/Planetfall (64), Bugaboo/Gorgon (Spectrum).
Programs: City Defense (Oric), Falklands Raid (BBC), Pyramid (Spectrum), Monitor (64).
Databases: Clubnet.
Micropaedia: Everything you wanted to know about programming, part 8.

Issue 38, November 24-November 30.
Pro-Tests: Coleco's Adam, Small Business Accounts (Spectrum), Masterfile (BBC), Monitor roundup.
Features: Apple programming, NewBrain editor part 1, Dragon action part 1.
Gameplay: Dragon roundup, Zeppelin/Blue Max (Atari), Skramble/Falcon Patrol (64), 737 Flight simulator (BBC).
Programs: Shipment (Spectrum), Monitor (64).
Databases: Hardware.
Micropaedia: Guide to Monitors.

Issue 39, December 1-December 7.
Pro-Tests: Dragon 64, Tandy CGP-220, White Knight II (BBC), Cross Reference Utility (IBM).
Features: NewBrain editor part 2, Dragon Action part 2.
Gameplay: Oric roundup, Haunted Hedges/Corridors of Genon (Spec-

trum), Microbe/One Hundred & Eighty (BBC), Atari roundup.
Programs: Lower CLS (Spectrum), Shipment (Spectrum), Monitor (64), Basic Search (BBC).
Micropaedia: Buyer's Guide to Micros.

Issue 40, December 8-December 14.
Pro-Tests: Timex 2058, Thermal Printer TP-10, Cambridge Computing joystick (Spectrum), Beebsynth/The Synth/Music Processor (BBC), Vizawrite/Vizaspell (64), Education games (Spectrum).
Features: NewBrain editor part 3, Dragon Action part 3.
Gameplay: Pinball Wizard (Vic 20), The Quest of Merravid (64), Wavy Navy/Savage Pond (Atari).
Programs: Link Four (Spectrum), Tilt (Dragon).
Micropaedia: Buyer's Guide to Peripherals.

Issue 41, December 15-December 21.
Pro-Tests: Apple II, Byte Drive 500, INMAC Power Cleaner, Commodore 1701 Colour Monitor, BCBasic (64), Database/MST-Calc (Dragon).
Features: Computerised Psychotherapy (BBC), Spectrum Display.
Gameplay: Micropoly/Pettigrew's Diary (Dragon), 64 roundup, Dimension Destructors/Sheer Panic (Spectrum).
Programs: Colony Invader (Spectrum), Grid Bike (Vic 20).
Micropaedia: Buyer's Guide to Software.

Issue 42, December 22-January 4.
Pro-Tests: Spectrum add-ons (U-Microcomputers system), Oric-1 Filestar, Games Designer (Spectrum).
Features: Micros of 1983, Computer Security, BBC word processing, Dragon Action part 4.
Gameplay: International Football (64), Grouch/Chequered Flag (Spectrum), Way Out/Jet Boot Jack (Atari), Supervaders/Outback (Vic 20), Danger Ranger/Up Periscope (Dragon 32).
Databases: Clubnet.
Micropaedia: Games Special.

Issue 43, January 7.
Pro-Tests: IMB Junior, Grafpad (BBC), Walters WM80 printer Devpac (Spectrum).
Features: Computerspeak, Spectrum Display, Tabs on Oric.
Gameplay: Trace Race/Pinball (Dragon 32), Colour Genie roundup, Hunter Killer/Mr Wimpy (Spectrum), Crazy Caveman/Goodness Gracious (64).
Programs: Jungle Chase (Oric), Screen Dump (BBC).
Databases: Hardware.
Micropaedia: Electron part 1.

Issue 44, January 14.
Pro-Tests: Hitachi MBE-16002, Acorn Teletext (BBC), Integrex Colourjet printer, DTL-Basic (64), Dian/Microprint 42/51/Multifront (Spectrum).
Features: Adventure games, Colour Genie characters.
Gameplay: Devil Assault/Wasps + Dragon Racer (Dragon 32), Siren City/Forbidden Forest (64), Survival/Countdown (Vic 20).
Program: Minefield.
Databases: Peripherals.
Micropaedia: Electron part 2.

Issue 45, January 21.
Pro-Tests: Portables — Commodore SX64, Olivetti M10; Acorn sparkjet printer; Turbo 20 daisywheel; Spectrum educational software; BBC graphics extension ROM.
Features: Bargain buys; Making money with your micro.
Gameplay: Viking and Pub Crawl (Dragon), Traxx and Wild West Hero (Spectrum), Atari/Commodore 64 round-up.
Programs: Battlestar Fighter (Commodore 64).
Databases: Software.
Micropaedia: Electron part 3.

Issue 46, January 28.
Pro-Test: Apple Macintosh; BBC sideways ROM board; IEEE interfaces for Commodore 64; Silver Reed EX44 typewriter/printer; Bridge on Spectrum and Dragon; BBC filing program.
Features: Buying by mail order; programming the Memotech.
Gameplay: Barmy Burgers and Gangsters (Spectrum), Birdie Barrage and Plankwalk (BBC), Blue Moon and Dancing Feats (Commodore 64).
Programs: Caves of Treasure (ZX81).
Clubnet
Micropaedia: Modems and communication.

Issue 47, February 4.
Pro-Tests: Sinclair QL; Atari Touch Tablet; Silver Reed EXP500 daisywheel; IBM Cobol; BBC Spell Check.
Features: Programming the Memotech part 2; Low cost printers.
Gameplay: Mothership and Quintic Warrior (Commodore 64), Two Gun Turtle and Multigames (Oric), Apple adventures, Spectrum round-up.
Programs: Pot Hole (Dragon)
Databases: Hardware.
Micropaedia: A to Z of Atari part 1.

Issue 48, February 11.
Pro-Tests: Spectravideo 328; Atari 800 XL; Dragon 3in disk drives; low cost monitors; Aztec C (Apple); BBC educational software.
Features: Sideways printing on Epson HX20.
Gameplay: Bedlam and Morris Meets the Bikers (Spectrum); Commodore 64 round-up; Zorgon's Kingdom and Flight Zero-One-Five (Vic 20).
Programs: Gridtrap (Lynx).
Databases: Peripherals.
Micropaedia: A to Z of Atari part 2.

Issue 49, February 18.
Pro-Tests: Oric Atmos; tracker ball controllers; Spectrum speech synthesisers; Rainbow Writer (Dragon); Colour Genie assembler; Spectrum educational programs.
Features: Computer jargon; 42-column display on Spectrum.
Gameplay: Quadrant and Jetpac (Vic 20); Crazy Balloon and Supacatchatroopa (Commodore 64).
Programs: Sprite generator (Commodore 64).
Databases: Software.
Micropaedia: A to Z of Atari part 3.

Issue 50, February 25.
Pro-Tests: Sanyo MBC550; Commodore speech synthesiser; BBC real-time control interface; BBC machine code trace; Atari home utilities.
Features: Expanding your Spectrum; introduction to Lisp.
Gameplay: Urban Upstart and Godzilla and the Martians (Spectrum), Shuttlezap and Hooked (Dragon).
Programs: Minescape (Oric).
Clubnet
Micropaedia: Printers part 1.

ORDER FORM

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Ribbon development

It has now been established that a significant number of business crashes, including Osborne, Grundy and Cyril Lord Carpets, have been due to the immoderate use of single pass, multi-strike printer ribbons by thoughtless employees. But all this is set to change.

As our photograph shows, all you need do is place the offender's finger in between the two rollers, then turn the handle. Or alternatively you can use your £85 GDS Ribbon Miser to rewind your ribbons up to four times. Alternatively GDS, on Crafts Hill (0954) 81074, operates a ribbon rewinding service.

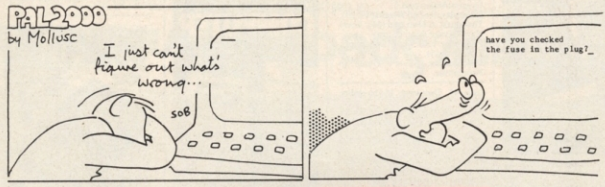
Mind you, we're not out of the woods yet. History has also shown that a major factor in the crashes of Osborne *et al* was the accounts departments' habit of storing £10 notes in waste paper bins. As our photo shows . . .

Novel QL

The 1983/4 Sinclair Prize for Fiction (a princely £5,000) has surprisingly gone to Londoner Edward Fenton for a novel called *Scorched Earth*.

This has astonished many in the literary community who felt that the eagerly awaited Sinclair QL User Manual would have been a far more appropriate winner.

But reliable sources tell us the manual may well have a second chance in next year's competition.



NEXT WEEK

Rabbit Run — PCN *Pro-Tests a domesticated micro called the Wrapbit.*

Driving *— Taking up the slack with a Microdrive, we offer you trouble-free tape transfers.*

Spritely *— A Dragon peripheral tones up your display potential.*

Games Special — PCN *wraps around a pull-out special with reviews of games for the Spectrum, BBC and Commodore 64.*

64 Plus *— Where to look for an extended Basic for Commodore's micro.*

SYNTAX ERRORS

Our account of Imagine's latest moves on the prices front included a comment from Tim Best, who we promoted to director for the occasion. We hope it turns out to be prophetic, Tim.

Last week's attempt to correct the price of Upgrade Technology's Z80 second processor board for the BBC failed miserably. The price is £299 plus VAT.

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
COMPEC WALES	April 10-12	Cardiff University	Reed Exhibitions, 01-643 8040
Computers for Builders Exhibition	April 12	Cavendish Conference Centre, 82 New Cavendish Street, London W1	A4 Publications Ltd., 088-385 2051
Communications and Public Domain Software	April 14	Lancashire Country Council Cricket Club, Old Trafford	Robin Auld, 021-458 2175 (evenings only)
London Computer Fair	April 19, 21, 23	Central Hall, Westminster, SW1	Tim Collins, 01-930 1612
Computers in Instrumentation Exhibition	April 16-18	Earls Court, SW5	Reed Exhibitions, 01-643 8040
Personal Computer Games Show	April 20-22	Solihull Conference Centre, Birmingham	Mike Carroll, 01-636 6890
ZX Microfair	April 28	Alexandra Palace, London N22	Mike Johnson, 01-801 9172
Midland Computer Fair	May 4-7	National Exhibition Centre Birmingham B40 1NT	Reed Exhibitions, 01-643 8040
Linslade Middle School Computer Fair	May 6	Linslade Middle School Mentmore Road Leighton Buzzard	Linslade Middle School Association. Leighton Buzzard 381664

OVERSEAS EVENTS

Event	Dates	Venue	Organisers
Videotex '84	April 16-18	Hyatt Regency, Chicago	Sally Summers, 0101 212 279 8890
Computerised Office Equipment Exhibition	May 1-3	Rosemont, USA	Cahners Exposition Group, 0483 38085
Data Processing, Computer & Automatic Systems Fairs	May 9-12	Lyon, France	Societe d'Eploitation due Parc des Expositions de Lyon. S.E.P.L., BP, 6416 69413 Lyon Cedex 06.

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