PERSONAL
COMPUTER NEWS
THE COMPLETE COMPUTING WEEKLY
WEEK ENDING APRIL 29th 1983
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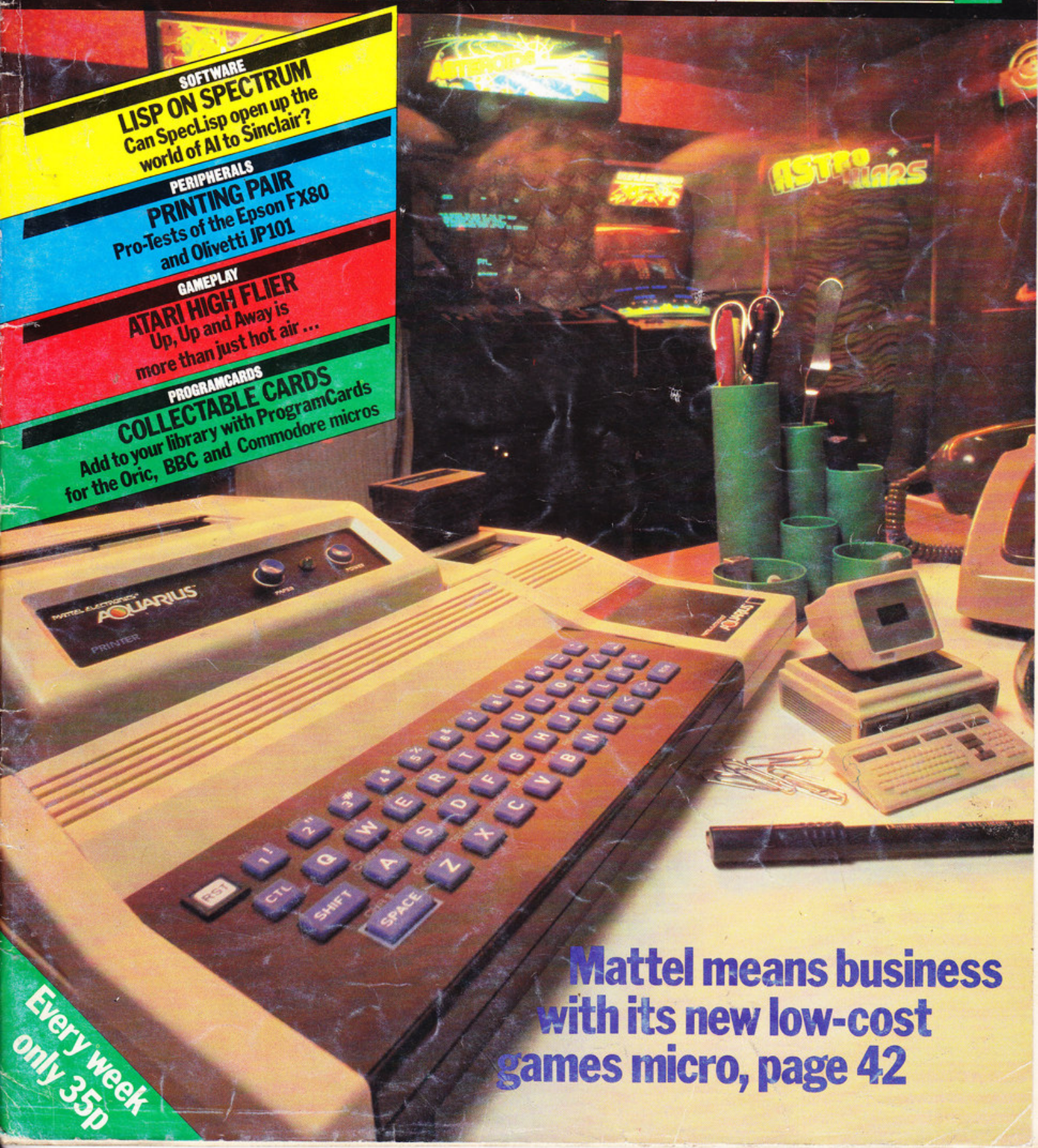

SOFTWARE
LISP ON SPECTRUM
Can SpecLisp open up the world of AI to Sinclair?

PERIPHERALS
PRINTING PAIR
Pro-Tests of the Epson FX80 and Olivetti JP101

GAMEPLAY
ATARI HIGH FLIER
Up, Up and Away is more than just hot air ...

PROGRAMCARDS
COLLECTABLE CARDS
Add to your library with ProgramCards for the Oric, BBC and Commodore micros

Mattel means business with its new low-cost games micro, page 42

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**InfoWorld*, p. 44, Oct. 25, 1982. (While the differential listed will not be the same for all benchmark programs, we feel it is a good indication of the quality of our compiler.)

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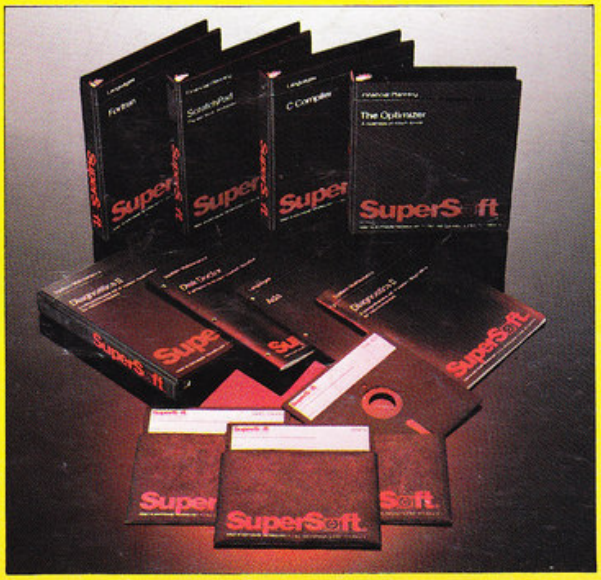

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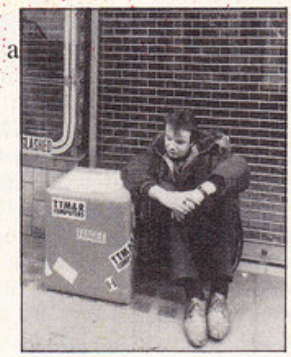
Buyer beware 23

You won't be DOSsing outside a closed-up shopfront if you follow David Guest's advice.



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Custom chip GTIA takes you into three more unknown colour modes on your Atari. Richard Hawes takes command.

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Program artificial intelligence into the Spectrum with SpecList — plus assembly language programming for Vic 20 buffs

page 33, and graphs without graft with a Victor/Sirius disk package *page 34*.

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Can the Epson FX80 printer live up to the image of its predecessor, the MX80? Reviewer Barry Miles is impressed. And Drew Athol likes the noiseless speed of the Olivetti JP101 ink-jet printer *page 38*.

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Dawning of a new age for toy-making giant Mattel? Richard King gets to the Aquarius first.

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Make waves, make money. Every computing idea we publish gets a £5 feedback.

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PCN's lighthearted way of signing off.

Cover photography of the Mattel Aquarius by Ian McKinnell

Micropaedia Graphics Part 2

More pixel-probing in the second of our five-part series focusing on the half-dozen most popular micros.

Acorn shies off

Frustration is growing among dealers and users of the BBC micro over the inability of Acorn to deliver the goods on hardware and software support.

The outlook is not hopeful and you will have to be prepared for a wait of up to three months to obtain the add-ons you want. The only bright sign is that shops that are not part of the official dealer network may be able to provide a speedier service than Acorn itself.

Part of the problem is that dealers are having just as much difficulty as users in getting any kind of response from Acorn. Letters have gone unanswered, the telephone appears to be permanently engaged and telexes have had no effect.

Latest instances of delays include disk interfaces and manuals for Forth and Lisp.

Deliveries of the disk interface are being held up because of a shortage of the 8271 controller chip. Disk drives are also in short supply.

'We have never had a disk drive in the shop,' one dealer said. 'We asked for them but none have been delivered. We now sell Cannon and Cumana drives — they are cheaper and available'.

The company, which is not part of the official dealer network, admitted that it has taken to photocopying the BBC disk system manual to overcome the problems of Acorn's refusal to provide the manual unless the user buys the BBC drives.

The dealer also said that while he had been able to obtain disk interfaces fairly promptly he knew of one official dealer who had only just taken delivery of an order placed with Acorn in December.

Acornsoft admits there are delays with the manuals for Lisp and Forth. But it is prepared to supply a photocopy of the Lisp glossary to anyone who requests it. The full manual won't be available until 'late June'.

These latest supply problems will add to the growing list of complaints levelled against Acorn. Yet users seem resigned to their fate.

With the non-appearance of the Teletext adaptor, second processor and the much vaunted Tube, waiting for Acorn is becoming a way of life it seems.

Atari out of print

The Atari thermal printer is no more.

Atari has withdrawn its £199 printer for the Atari 800 computer in favour of a soon-to-be-released modern job — expected to be of the dot-matrix variety.

But the new one won't be available in this country for at least three months, so until then you'll have to be content with Epson or Centronics-type printers hooked up through the Atari interface module.

An Atari spokeswoman could give few details on the price, release date or specifications of the new printer. 'Three months is probably closer to the mark than six (for the machine's release date), she said.

Although the printer won't be available for a while, Atari is bringing out its new Atariwriter word processing package — which looks to be a less comprehensive version of the existing Atari word processing package.

No guarantee of price cuts in tariff move

UK micro-makers battling bureaucracy have won a small victory — but you shouldn't celebrate yet.

The campaign by the British Microcomputer Manufacturers Group (BMMG) for a reduction in the tariff on imported components is unlikely to result in major price cuts for home-grown micros.

The BMMG has won support from the Department of Industry for its cause and Government officials are now canvassing opinion on a cut in the tax on imported chips from 17 per cent to 11 per cent.

The BMMG gripe is that imported components have a 17 per cent tax on them but assembled micros carry only a five per cent tax. It claims that as a result British micros are unable to compete fairly with companies which manufacture abroad.

Even with Government support it could take a couple of years to get the tariff changed. The levies are laid down by the EEC and the Brussels bureaucracy is slow.

But with material costs forming less than a quarter of the price of a machine, the benefit to micro buyers would still be less than two per cent.

BOXING CLEVER — The Fuller Box is a neat unit which attaches to the rear of the Spectrum. It tidies up some of the Spectrum's shortcomings by providing a joystick controller, bleep amplifier and more reliable cassette interface. The joystick controller is port-mapped at 127 and will accept joysticks from Atari and Commodore. These will control all the games from Imagine. The bleep amplifier amplifies the Spectrum bleeps under a volume control and the cassette interface is claimed to eliminate the problems often encountered saving programs when mic and ear jacks are in at the same time. The Fuller Box costs £29.95 plus 80p p&p. Fuller can be contacted on 051-236-6109.

Oric debugged

A debugged version of the Oric is on the way.

An Oric spokesman confirmed that a new ROM Basic chip was in the pipeline but declined to give details. It remains to be seen what will be done for those with the existing one.

The ROM itself is thought to have been changed to include a new Verify command and other features.

The new chip also tackles the Oric's trembling screen. The old screen's modulator caused screen-ripple, but now it has been re-aligned so that it works much better with the PAL colour system for screens used in this country.

Also, the Basic IF . . . THEN . . . ELSE construct has been rectified. In the first systems IF . . . THEN worked but IF . . . THEN . . . ELSE didn't unless the first statement in the ELSE clause was a PRINT statement.

An added bonus of the new chip is that you can now get a circle instead of an oval in graphics work.

The improved version should be in the shops in weeks.

Texan enters IBM stakes

There was only one new runner in the IBM-compatible portable stakes last week, but it looks as though it has the qualities to stay the distance.

The Compaq, from Compaq Computer Corporation of Texas, boasts complete compatibility — disks, peripherals and software are all interchangeable between it and the IBM PC.

But the system is unlikely to be here in quantity much before the end of the year. Compaq's Ben Rosen told *PCN* from Texas that US demand already looked like outstripping production.

The standard system, which sells in the US for $2,985, has 128K of user memory, a 320K floppy, one parallel printer port, and the built-in 9in monochrome screen which gives 25 lines of 80 columns and which offers high-resolution graphics.

The Compaq goes up to 512K of RAM, and can support twin 320K floppies. It has three expansion slots, a typewriter-like keyboard, and it weighs 28lb.

Compaq is some way from appointing UK dealers.

Hand-helds vie at German fair

By Max Phillips in Hanover

Microcomputing is about small computers. But it's no longer about small business. All the big companies were limbering up at the Hanover Fair, showing new products that weren't quite ready and moving the European market the American way.

The Japanese were there too, still apparently uncommitted to the European market. Panasonic had a different home computer along with its still shy JR100 system.

The JR100 is a baby Spectrum with an MN1800 processor, 16K RAM, and an 8K Basic. There is no rush to launch the machine here.

Fujitsu showed its new Micro 7, a low-cost home/business system based on the 6809. It features 320 × 160 eight-colour graphics, 64K RAM and floppy disks under FLEX or, with an optional Z80, CP/M.

The Micro 16S is Fujitsu's slice of the IBM cake. It's a dual processor system with Z80, 8086, 128K-1Mb of RAM, CP/M,CP/M-86, MS-DOS etc.

Portables and IMBables were very much the order of the day, portable IBMables being the real growth area. Corona Data had its IBM PC both in desk-top and portable versions. The system has slightly improved graphics as standard, up to 512K on the board and four free IBM slots.

The Corona passes the real compatibility test by being able to run the Flight Simulator. But the company admits that the portable was something of a prototype. Production begins early in May.

A machine worth looking for was hidden away at the back of the Tandy stand. The new Model 100 looks a little bit like an Epson HX20. A preliminary specification includes a Z80 with 64K RAM/ROM, a full keyboard, 8 × 40 LCD display with Basic, word processing and a diary program in ROM.

If it does everything it is rumoured to, and for a price of around £500 it could become a standard briefcase computer. It's certainly the first of a generation of machines that will make the Sharp and Casio hand-helds look antique.

Memo-baby

Memotech, maker of the well known add-ons for the ZX81, is to launch a low-cost colour micro that offers expandability.

The machine will use the Z80A chip and will come with 32K of RAM, 16K video RAM, 16K Basic in ROM and 256 × 192, 16-colour graphics.

In addition to a plug-in expansion bus and games cartridge slot, the micro will have six internal expansion slots.

Further details of the machine will appear in next week's issue of PCN.

DOS 3.3 GAMES — Three new games, Zargs, Grapple and Spider Raid, have been released here for users of 48K Apple II computers with DOS 3.3. Zargs is a four-level space fighting game, while Grapple will enable those of you with power complexes to play at being a prison warder in charge of nasty inmates, including Deviloids, Robotesques and Horrible Hoppers. Spider Raid turns you into Hero Maximus, the mighty, starving spider in search of a flyburger. Made by Insoft, USA, they each retail for £19.95 plus VAT. The distributor, Pete & Pam, can be reached on 0706-227011.

Speak softly to Chatterbox

Currah's Chatterbox can now reply to commands entered in English from the keyboard.

The upgrade involved the development of algorithms, enabling you to dispense with the tedious entry of phonemes.

It is all done with software. Users will have a choice of ROM cartridge or cassette and Currah (on 0429 72996) says the price will be under £10. The upgrade will be available in two-three weeks.

More micros count 1-2-3

Lotus Development Corporation's 1-2-3 package has branched out from its number one host, the IBM personal computer, onto the Texas Instruments Professional and the Sirius.

At present, the package combines a spreadsheet, database management system, and graphics (*PCN, April 15*). Extra database and word processing will be added.

The TI version should be available through distributors in May, and the Victor/Sirius version in June/July.

PCN Charts

PCN Charts follows the rise and fall of the UK's best-selling micros. This fortnightly top-of-the-shops list tells you what's selling best over the counter; it does not take account of mail order and does not count deposit-only orders. This week's figures show the number of machines sold in the two-week period ending one week before publication date (in this case April 22), so these charts tell the story in high streets between April 1 and April 15.

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

Top Twenty up to £1,000

		MODEL	PRICE	DISTRIBUTOR
►	1 (1)	Sinclair Spectrum	£125	(SI)
▲	2 (3)	BBC Model B	£399	(AC)
▼	3 (2)	Sinclair ZX81	£50	(SI)
►	4 (4)	Dragon 32	£200	(DR)
▲	5 (8)	Atari 400	£160	(AT)
▲	6 (7)	Lynx 48	£225	(CA)
▼	7 (5)	Commodore Vic 20	£170	(CO)
▼	8 (6)	Oric 1 48K	£170	(OR)
►	9 (9)	Sharp PC 1500	£170	(SH)
▲	10 (12)	Texas TI99	£150	(TE)
▲	11 (13)	New Brain A	£228	(GR)
▼	12 (10)	Commodore 64	£345	(CO)
▲	13 (15)	Sharp PC 1251	£80	(SH)
▼	14 (11)	Atari 800	£400	(AT)
▲	15 (17)	Apple II	£776	(AP)
►	16 (16)	Jupiter Ace	£90	(JU)
▼	17 (14)	Acorn Atom	£174	(AC)
▲	18 (19)	Epson HX20	£472	(EP)
▲	19 (18)	Colour Genie	£224	(LO)
▲	20 (—)	HP 75	£883	(HP)

Top Ten over £1,000

►	1 (1)	Sirius 1	£2,754	(ACT)
►	2 (2)	Osbourne 1	£1,581	(OS)
►	3 (3)	Olivetti M20	£2,754	(OL)
▲	4 (5)	HP 86A	£1,541	(HP)
▲	5 (6)	IBM PC	£2,392	(IBM)
▼	6 (4)	Commodore 8032	£1,029	(CO)
▲	7 (9)	Apple III	£2,780	(AP)
►	8 (8)	Micro-Mimi 803	£1,720	(BM)
▼	9 (7)	Sanyo MBC 1000	£1,195	(SA)
►	10 (10)	Xerox 820	£2,415	(RX)

AC Acorn Computers. **ACT** ACT Sirius. **AP** — Apple Computers. **AT** — Atari International. **BM** — British Micro. **CA** — Camputers. **CO** — Commodore. **DR** — Dragon Data. **EP** — Epson. **GR** — Grundy Business. **HP** — Hewlett-Packard. **IC** — Icarus Computers. **JU** — Jupiter Ace. **IBM** — IBM. **LO** — Lowe Electronics. **OL** — Olivetti. **OR** — Oric. **OS** — Osborne Computers Corporation. **RX** — Ranx Xerox. **SA** — Sanyo Marubeni. **SH** — Sharp. **SI** — Sinclair. **TA** — Tandy. **TE** — Texas Instruments.

VIEW FROM CANADA

Canada's bid as the home of the free

From Steve McClure

Can you imagine getting something for nothing from British Telecom? No, the idea belongs to the realms of fantasy.

But in Canada things are slightly different. Where other countries talk about a micro in every school or a micro on every desk, Canada is talking about a micro in every home — free.

The Canadian Telidon system, an interactive computer database system similar to Prestel, is trying to sell Canadian phone companies on the idea that it would be cheaper to give everyone a micro than print new phone books every year.

Telidon says that micros (which would give you full access to a Telidon data bank of telephone numbers through a modem) would pay for themselves very quickly.

Telidon officials estimate that by the time you add in savings on printing phone books, the reduction in directory inquiries (because the telephone number data base would be updated constantly) and the extra ad revenue that could be generated from full colour 'yellow pages' on screen, the system would return a profit within five years.

The system currently being tested in Vancouver and other major Canadian cities allows you to use a keypad no bigger than the size of a hand-held calculator to get screens of information stored on video 'pages' similar to the Prestel system.

Details of what the home Telidon micro might look like are not yet available, but the field test is proving the kind of computing power it could have to bring to the great uncalculated.

Vancouverites curious about Telidon need only go to Vancouver City Hall, the main branch of the public library, or any one of more than 100 public Telidon terminals to view a variety of sample Telidon programs. Each program features an opportunity for Telidon viewers to give their opinion on some aspect of the program, by coding in messages at the appropriate times. These messages are then stored in the phone company's central computer terminal, where they can be retrieved later on.

For example, the city of Vancouver is now using the Telidon system to poll citizens on what kind of economic future they think the city has. While these pieces of 'feedback' haven't the status of plebiscites, they do help city officials to get a picture of what Vancouverites are thinking about their city's future.

Until the telephone scheme becomes a reality Canadians have to pay about $2,000 (Cnd) for a home Telidon terminal. If they live in eastern Canada, however, they will soon be able to lease a terminal for as little as $50 a month.

As well, RCA and Pansonic have just announced plant to come out with a Telidon-compatible television set later this year. This new generation of TV sets will be able to pick up Telidon signals broadcast through the air much like Britain's Teletext TV signals.

Home Telidon users will attach a decoding device to their sets in order to receive the Telidon signal, which will be capable of carrying more information per unit of time than a phone cable.

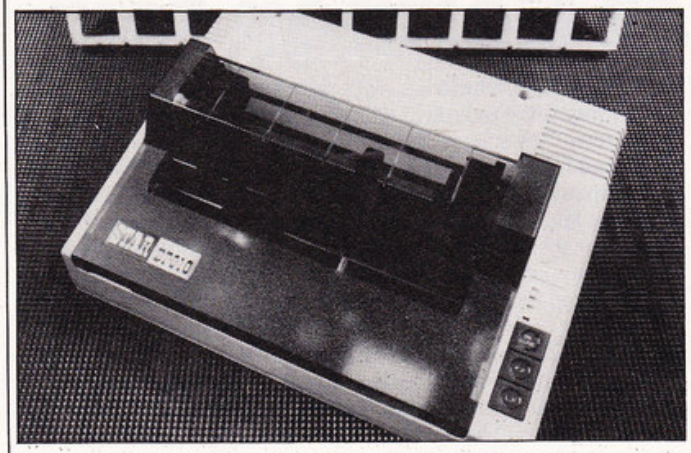
It all adds up to an exciting next few years for both the Canadian computer industry and Canadian computer users.

Beyond getting Telidon accepted by Canadian home computer buffs and the general public, Don Christensen, a Vancouver computer consultant, says a more long-term aim of the Canadian Telidon industry is to have the system accepted as the world's standard.

Mr Christensen claims that one system or another will eventually have to be named the standard, if only to avoid the confusion that reigns in the world of video technology, where competing video formats vie for the consumer's attention.

And, he adds with a more than a hint of nationalistic pride, the Canadian system should win out in the end because of what he claims are the higher quality graphics produced by Canadian Telidon technology.

Star rising



If you run one of the less pricey micros and are looking for a similarly priced printer, a Japanese supplier has come up with a couple of options.

There are two printers in the Star range, the DP510 and the DP515, and they will be available in the UK from Micro Peripherals (0256-3232).

The DP510 has a 10in carriage and can handle the conventional 80 columns, while the DP515 boasts a 15in carriage with 136 columns.

Standard features include bidirectional printing and a 9×9 matrix with true descenders. It is also claimed that the inclusion of friction, tractor and roll feed as standard will prove attractive to many users as conventionally it is necessary to add extra feed apparatus later at considerable cost.

Print speed for both models is claimed to be 100 cps and further features include a 2.3K buffer, italics, high resolution and block graphics.

Pricing seems good: the 80—column DP510 will cost £349 plus VAT, and the 136 column version, the DP515, is £479.

Northbound communication

You can now tune into a new computerised bulletin board — CBBS North-East. The service is completely free and runs from 7pm to 8am every night and all day Sunday.

All you will need is a telephone, a 300 baud modem and a software package to make your micro into a dumb terminal. Several are already available from dealers, but Malcolm Piper, who runs the service with Trevor Smith from their respective homes, stressed that these packs are easier and cheaper to get from user groups.

You can upload and download programs on the service and swap information, and CBBS is offering a free software package enabling you to use the service on CP/M systems.

The service is accessible on 0207-43555 and 0207-32447, and it handles only two users at a time.

Enquiries about the service itself should be directed to Trevor Smith in Tyne & Wear on 0207-43555 between 9am and 2.30pm only.

Commodore talking

Commodore 64 calling — through a speech module to be available in June.

The module plugs into the cartridge slot, but will have the slot replicated, so you will be able to stack other devices, and can leave the speech capability in place.

More than 200 words come with the box, spoken at selected speeds, by a female of mid-atlantic accent.

The module will permit you to access additional words from special disks which Commodore will supply, and customised cartridges will be available.

Words can be assigned to variables, and sentences constructed. The new Basic keyword SAY will cause the word or variable to be spoken.

Big link-up

For £125 per micro, you can now lay your hands on a communications package to link virtually any pair of popular machines you like.

The package is called Semaphore, and it comes from Albetros, a small communications specialist company in Basingstoke. It's available to run on CP/M, MS-DOS, and CP/M-86 micros, and you can also get more expensive modules — selling at £465 a time — to run on minis and mainframes.

Semaphore is one of the closest approaches yet to the universal communications package. With it, you can transfer both ASCII text files and binary data files of any size in both directions between your chosen pair of machines, and the Semaphore software will cope with any differences between the machines' communications protocols.

Semaphore runs as a user application program on each machine, taking up about 35K of memory, so it isn't suitable for use on machines with less than 64K at minimum. It will work happily with the cheapest and nastiest acoustic coupler and over the crackliest telephone line, since, if the software detects an error in the data sent, it will keep re-transmitting it until that block of data arrives intact.

Hugh Griffiths, Albetros's sales manager, says that although at present, you can only link the micro of your choice with another micro or with IBM, DEC, Prime or Eclipse minis and mainframes, other machines are also in the pipeline. 'The next larger machines we'll be adding to the range will probably be from Perkin-Elmer and Hewlett-Packard,' he said.

'We've designed Semaphore to be used for file transfer between machines, but it could also be a way for micro owners to access bureau services,' says Griffiths. The company is on Basingstoke (0256) 57551.

Disk drive on the flip side

Users of Atari, Apple and Commodore disk drives can now use both sides of their floppy disks.

A new product from Link Marketing of Seattle offers easy access to the flip side of your disks. Looking like an embossing machine, it nips out another slot so that write-protection is disabled. The design ensures alignment of the new slot.

Many people already do this surgery with the aid of scalpels, razor blades etc, but this $9.95 device is suitable for those who find this too risky, too fiddly, or too error-prone.

If you are worried about the effect of reversing the direction of rotation, fearing that the dust-catching sleeve will fail to work, the trick appears to be to use both sides from the start so that the disk does not get 'set' in one direction — a relatively simple precaution.

Micros talk to mainframes

By the end of the year data processing managers will have a new, and devious, weapon in their rearguard action against the spread of personal computers.

VisiCorp and Informatics General have announced two related products that will allow IBM PCs to extract information from any database on an IBM mainframe computer.

VisiAnswer sits in the PC and communicates with the mainframe. The data is extracted in a form that can be readily understood by VisiCalc and other Visi packages. Answer/DB resides on the mainframe and does the donkey work of searching the databases to find the required information.

Deadline

PCN's offer of a crisp one pound note in return for three Threebies coupons closes on May 2. Any arriving at Dept 101, 55 Frith Street, London W1A 2HG, after that date will not qualify.

Fair play for 10,000

Tony Sleep

More than 10,000 people packed into Central Hall, Westminster, last week for the Fourth London Computer Fair.

Organiser of the fair, the Amateur London Computer Club, claims a big success — especially the 'Bring and Buy' day where people flocked to buy and sell goods.

There was something for boffins and hobbyists, with stands displaying add-ons, micros and software. In particular, there was a flood of new Oric software from two companies.

Computasolve unveiled four packages — Oric Flight, Zodiac, and Games Tape at £7.95, and Oric Base at £9.99.

Tangerine Users Group has produced two games and two utilities packages: Othello at £6.50, Awari at £5.50, Key Trainer at £5.50 and Design Aid, which enables you to design your own graphics and character set, at £5.50.

The user group has several other Oric utilities on the way.

In addition, a company called Novasoft was displaying some new software for the Vic 20.

Priced at £5.95 each the three utilities programs can enhance your Vic in several ways. By using Juggernaut, Novasoft claims you will be able to smash the memory barrier of your machine, by moving blocks of memory from one location to another.

Buccaneer will enable you to make back-up copies of software packages and Mirage will allow you to set your Vic to any memory configuration without unplugging cartridges.

A neat little add-on for ZX81 users wanting to get the feel of a real push button keyboard made its debut at the Fair. Buttonset works by pressing the membrane keyboard itself with specially moulded dimples underneath. It costs £10 and is available from Fox Electronics on 0256-20671.

The Computer Junk Shop which specialises in secondhand computer parts is expanding. Manager George Couzens hopes to start up a second shop in Birmingham in the near future, from humble beginnings in Widnes, Cheshire. The two-year-old business sells components, power supplies and peripherals, among other things. The shop can be reached on 051-420-4590.

Business mastered on the Commodore 8032

The trend towards business software controlled by a single master program has spread to Commodore systems.

A Chorley, Lancs, software house, Reprodesign, has taken up the cudgels on behalf of new and inexperienced users by producing Superclerk, a suite of programs intended to handle the information needs of an average small business.

Superclerk runs on the Commodore 8032 and a further version is planned for the 8096.

The idea of the suite is similar to the approaches of Apple with the Lisa, and Torch with its Torch Cell (*PCN, April 15*) — to make a system easier to use by simplifying the user's role. Superclerk is a modular suite of programs, and you pick those bits which appeal to you most, adding to your package as time goes on. The main activities in the standard version are word processing, calculation, and random access file handling.

This may not sound too exciting, but the most important feature is that you can run all these things at the same time, so that you can leave your word processor to look up something in your files, and then incorporate the information in the letter, pausing to carry out a calculation, and to examine the account of the customer to whom you are writing.

The crux of the software lies in the Editor. This has been devised to create a new Business Basic which enables much work to be handled very easily. Business Basic will be available separately in due course.

You can access your own files through Superclerk and the addition of a single line of code to Basic progams will permit you the comfort of the main menu of Superclerk.

Superclerk exists only in a pre-release version at the moment, and for more information you should phone Dr Hicks on 02572 78376.

The basic module costs £395, and the accounting and payroll modules are extra.

Matsushita's re-usable optical disk

Japanese electronics giant Matsushita has shown the world the shape of mass storage to come — and it looks like a record player.

Matsushita has demonstrated in the US what is thought to be the world's first erasable, re-usable optical disk. The model demonstrated was only a prototype, using an 8in disk capable of storing ten to 15Mb, but optical disks so far have offered only the prospect of an inexpensive form of ROM memory.

Erasability will inevitably bring on a clash with magnetic memory storage systems, but Matsushita has emphasised that it doesn't forsee the erasable disk as being affordable yet for personal computer users.

It intends to be marketing the device for business applications within the next 12 months. The price is likely to be around $5,000.

Other companies in the race to supply re-usable optical disk memories include RCA, Sony, Xerox and Philips. NEC and 3M have also announced a non-erasable optical disk, a 12in device that stores up to 20Mb.

In the standard magnetic memory area Sony's research centre has crammed 4Mb on to a 3½in microfloppy, using the perpendicular recording method.

Commodore's Simon waits in the wings

You will have to wait a little longer for the release of Simons Basic on the Commodore 64.

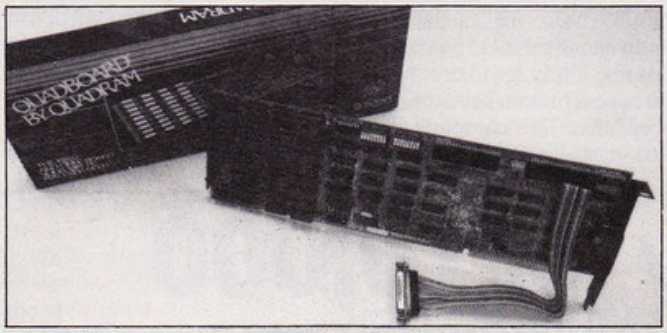
Commodore is keeping the software to itself for the time being, for fear that if it releases it on disk its security will be undermined by code-crackers.

Originally Commodore planned to bring out Simons Basic on a cartridge. But the disk idea gained favour because it would have got the software on to the market more quickly.

Now the plan has been reversed. The disk will not appear in the UK, nor in the US in all probability. The reason is intriguing — as Simons Basic constitutes a programming aid its value would have been reduced if some of the normal protection measures had been used. So you will have to wait for the cartridge.

It seems that the existence of extremely clever programmers can work against the less sophisticated of us.

Commodore could become known as the industry's most cautious software supplier. Its response to the pirates and code-breakers is becoming more considered and sophisticated, but it does mean that you have to wait for Commodore products.



NEW DECK — To plug into your IBM PC, Quadram Corp of Georgia has produced this multifunction card which can give you an extra 256K RAM. It also has an RS232C port, a Centronics-type printer port, a clock/calendar, RAM disk software, and a spooler. The additional memory comes in plug-in chunks of 64K, and a 64K board costs £425 while the full 256K version is £725. The Quadboard, which will slot into any one of the PC's five expansion slots, is available from Pete and Pam Computers on Rossendale (0706) 212321.

Quicksilva menu grows

Software house Quicksilva is spreading its net by producing games for the BBC Micro, the Vic-20 and the Dragon.

If you run a Sinclair system, Quicksilva will be a familiar name — but in its latest batch of new releases there are three programs for BBC users, and one each for the Vic and the Dragon.

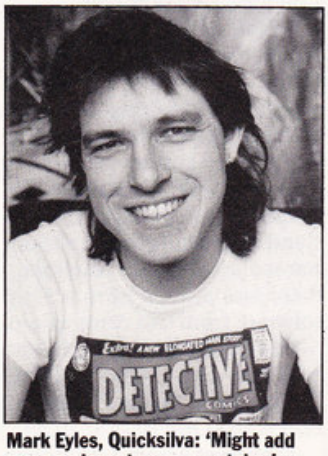
Quicksilva's Mark Eyles said the company might add more systems to its repertoire if the software was good enough. The same applies to the release of business software as opposed to its widely known games programs, he added.

The programs it released last week for the BBC machine are a music processor, Protector, and the Wizard. The music processor was written appropriately enough by one Andy Williams; it comes complete with an instruction booklet and some ready-made music files.

Protector takes you into transetherial space, where you guard Units against attacks from mine-laying UFOs and other bad guys. As the Wizard you save beautiful maidens from more villains, armed only with your magic wand.

For the Vic Quicksilva has put out Skyhawk. In this arcade-type game your jet protects a village against a resourceful enemy. And for the Dragon there is Mined-Out, in which you pick your way through a minefield. At £5.95 this is the cheapest of the bunch — the music processor is the priciest at £14.95.

Quicksilva is on 0703-20169.



Mark Eyles, Quicksilva: 'Might add more systems to our repertoire.'

12▶

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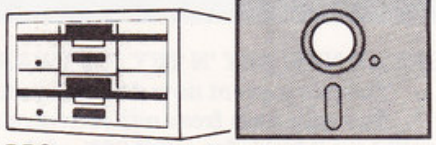

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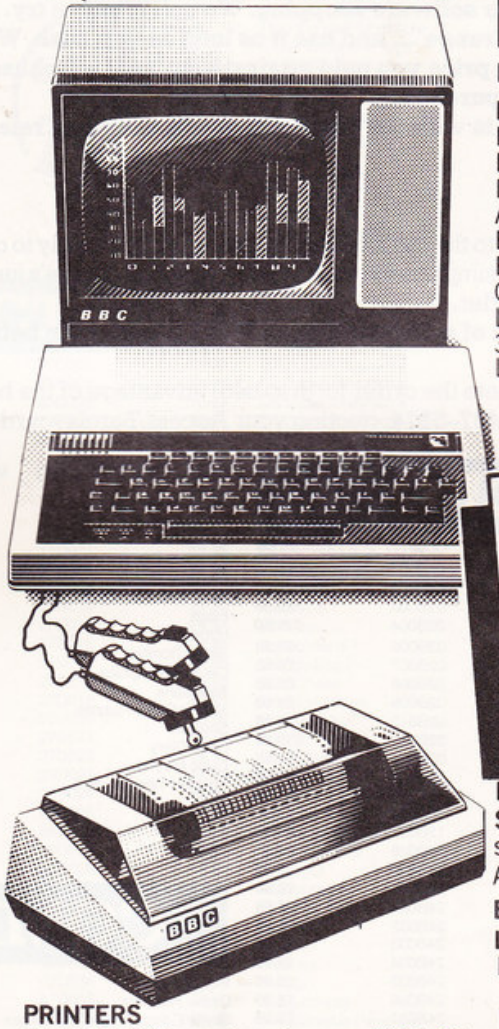

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IBM Pick-a-back

A lookalike version of one of the fastest spreading operating systems, Pick, has now appeared on the IBM PC — but you need an extra chip and £850 to take advantage of it.

The Pick-like system — just call it Revelation, says UK distributor Interactive Data Machines — won't actually replace IBM's own PC-DOS. Instead it sits on top, to give what Interactive describes as a 'very friendly user interface'.

It also adds other extras such as a print buffer facility and an application generator.

Revelation comes from Washington-based Cosmos, and its biggest selling points will be Pick's strengths — relational database handling, variable-length records, and a high-level user query language. It also means PC users will be able to communicate easily with other Pick systems.

David O'Byrne, systems support manager with Interactive, said that when Revelation is running the user is completely unaware of PC-DOS even though that is also active.

'Revelation gives you a quite separate environment, but you can step back into PC-DOS at any time — say, to set up communications,' he said. 'So, you could drive a Sirius 1 terminal as a dumb terminal through the PC and simply pass files to it.'

Revelation is greedy for space.

It takes up the best part of 320K of RAM and will run only after an extra Intel 8087 chip has been installed in the PC to allow it to cope with floating-point arithmetic.

Interactive is offering a cut-price Revelation to users who buy it before the end of May, at a price of £595.

Prices down for machines

You won't find a price war in the UK to compare with what's happening in the US, but a season of deals and special offers has opened.

With its production now up to 6,000 units a month, Grundy Business Systems is offering a £25 discount to anybody who buys a Newbrain before May 31 — this brings the Model A down to £244 and the Model AD to £274.

Only sightly more modest is the discount offered by Milton, Gray and Associates of Twickenham. Vouchers worth £20 will be sent to buyers of a Commodore 64, Vic-20, or Atari 400 and 800 systems.

This is small beer by comparison to the US, where Commodore is offering $100 off a model 64 — it has been selling for $400. The $100 rebate has one condition; to qualify for it, buyers must trade in a home computer or video game machine.

Paperclip-ons

Kobra has produced two packages for use with the Paperclip word processing package, which operates on Commodore's 64 and 8000 models.

Spellpro is designed to check the spelling of word processor-generated text and can be loaded into one disk drive while Paperclip works alongside it in a second drive.

Mailpro can be used in the same way and provides facilities to enable you to address masses of mail very quickly.

Each package costs £149 for the Commodore 8000 and prices for the 64 are likely to be about £90 a pack.

The packages are available from Commodore dealers or from Kobra (04912 2512).

SCREEN DEBUT — Now you see it, now you don't. The portion of the screen you can see has been fitted with Formed Panel Film from 3M — the portion you can't see has a bright light shining on it. 3M's FPF is intended to spare your eyes by reducing glare, minimising reflection, and enhancing contrast and resolution. The cost per screen is £29.95 and FPF comes from 3M distributor Vision Products on Bourne End (06285) 29997.

Soft Boots

You can now run the Dragon software written by Salamander on a 32K Tandy Colour Computer.

Salamander has also branched out into the Oric market. In partnership with Oric it has produced several games selling for £7.95 and £9.95. And to make it easier for you to buy these items, it has persuaded Boots to stock a range of its software.

Snakes, ladders, choppers

Arcade addicts with a Vic-20 can satisfy their appetites with three new games cartridges from Audiogenic.

Apple Panic is the highly popular arcade game that casts the player as a workman climbing ladders to different levels on the screen, chased by a horde of apple monsters.

ChopLifter, said to be the rage in the US, has you flying a helicopter across hostile territory to rescue 16 commandos from a building beseiged by enemy tanks, aircraft and bombs. In Serpentine you are a small snake in a pit full of larger, hungry snakes.

All cartridges cost £24.95 and are available from Vic dealers or Audiogenic (0734 59647).

Who'll put pep into Apple?

Spare a thought as you hammer away at your Apple for the men who steer Apple Computer Inc.

In particular spare a thought for John Scully, who has been lured from Pepsi-Cola to take over as Apple president. All he gets for this responsibility is $1 million a year, plus $1 million signing-on fee, plus an option on several hundred thousand Apple shares.

Mr Scully has already identified Apple's main competitor, despite having no computer expertise to draw on. 'IBM is a formidable competitor,' he said, 'but so was Coca Cola.'

Which twin is the real Ajile?

You could be forgiven for doing a double-take if you spot the new Hyperion portable pc distributed by Gulfstream Computer Products of Essex.

It's exactly the same machine as the Ajile, distributed by Anderson Jacobson (*PCN, April 15*). The Hyperion, however, is grey rather than brown and cream, but apart from this, there is no difference.

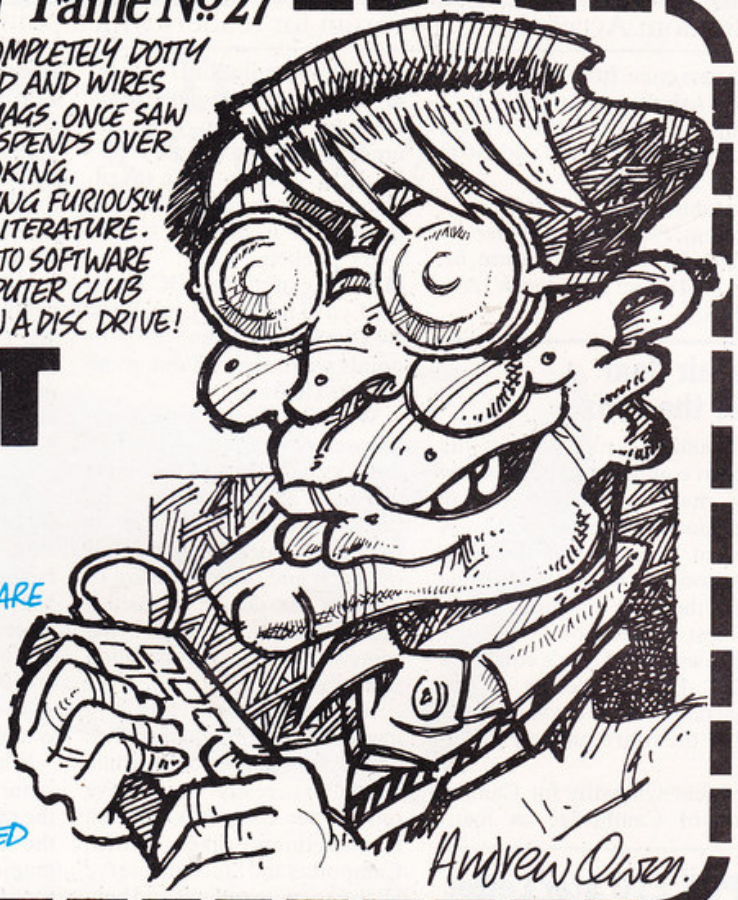
Gulfstream is in the process of appointing about 70 dealers throughout the UK and reckons it will sell at least 1,000 units here during 1983.

George McFarland, group managing director of Gulfstream, said: 'We are exclusive distributors for the Hyperion in the UK. We are not an OEM, but since we are now owned by Bytec (the Hyperion/Ajile's creator), that doesn't matter.'

Asked to comment on Hyperion's identical twin, Mike Parrish, administation and marketing manager for Anderson Jacobson, said: 'We were aware that if we were an OEM, someone else could distribute the machine. You can't guarantee exclusivity.'

Chromasonic Hall of Fame No.27

THE 'ENTHUSIASTS' ENTHUSIAST. COMPLETELY DOTTY ABOUT ANYTHING WITH A KEYBOARD AND WIRES COMING OUT. COLLECTS COMPUTER MAGS. ONCE SAW CLIVE SINCLAIR FROM A DISTANCE. SPENDS OVER SIXTEEN HOURS A DAY PEEKING, POKING, PLOTTING, PRINTING & PROGRAMMING FURIOUSLY. READS SPECIFICATIONS ON SALES LITERATURE. SENDS SELF-WRITTEN PROGRAMS TO SOFTWARE DISTRIBUTORS. ATTENDS EVERY COMPUTER CLUB IN HIS AREA. HAS A DREAM TO OWN A DISC DRIVE!



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A fair deal for the Lynx

I would like to point out the unfair comparisons being made by many magazines in the personal computer field. A recent example was the comparison of the BBC machine with the Lynx machine. This is almost impossible, because pricewise two Lynx's equal one BBC B. The design of the machines and the concepts behind them are entirely different.

I feel sympathy for Camputers of Cambridge as many magazines have been most helpful as regards poor publicity arising from these unfair comparisons. So on behalf of Lynx users let me try to make some fair comparisons:

■ For the price of one BBC B you can almost purchase two Lynx 48K machines.

■ The Lynx is an extremely powerful graphics machine, by far the best around for its price.

■ For small business users it will be possible to have access to CP/M disk operating systems at probably the cheapest price around. If we try to run CP/M on the BBC B machine with one 100K disk drive this will cost about £900, while for the same price you could purchase two Lynxes, with 80 columns, with one disk drive running CP/M plus £100 to spare.

The attraction of the Lynx for small business users is undeniable, and the CP/M is promised for the Lynx by the end of April.

■ In a recent bench test the Lynx had about double the speed of the Dragon and was faster then the Commodore 64 (remember the Lynx uses reverse Polish notation).

■ Camputers designed the Lynx for expansion, *ie* 80 columns, additional memory, CP/M, extensions to Basic (available shortly in ROM). This is good as it is tailored to suit users' pockets.

■ Having used the BBC B and the Lynx I think the Lynx Basic is extremely good, and the poor points will be ironed out in the ROM extension.

When it comes down to it, it is the users who count, and we like the Lynx. I think Camputers has made a contribution to the home/business market with its design, and deserves a pat on the back and some measure of support, as do other British manufacturers, against the somewhat unfair competition from abroad.

Remember that chips are imported into this country with 17 per cent import duty, while computers ready built have only 6 per cent duty. British manufacturers like Acorn, Camputers and Sinclair deserve all the encouragement and help the people of this country can give them. Stop knocking their products and emphasise their good points.

J McLauchlan,
Edinburgh

PCN £10 Star Letter

RAM? Commodore costs more

Having read many articles on various machines, one thing has come to my attention. This is that expansions for the Commodore Vic-20 are more expensive than for many other leading machines. The 3K expansion for the Vic is priced at £29.95, yet the ZX81 16K expansion is priced at £29.99 — mere 4p dearer with 15K more memory included.

The 16K expansion for the Vic is rather expensive I think at £74.95. Being only 13, my pocket money does not quite run to this.

After saying this, I would like to point out that I have found my Vic very enjoyable to use and have had many hours of pleasure from it.

Steven Willingham,
Bourne, Lincs

Econet costs explained

I was very interested to read your section in the second issue of PCN (*March 25*) entitled Count to ten to use the Econet', and have done a few calculations of my own to assess the relative costs of an Econet system compared with a group of computers using their own local disk storage.

It is important to realise that the Econet is a powerful system tool and much more than a simple means to share peripherals. For example, a number of routines are provided which may be used to build network services such as electronic mail or computer-computer communications.

Econet demonstrates this by supplying a number of commands enabling use of network facilities. For example the VIEW command allows a screen display to be copied to another machine's screen, and the NOTIFY command provides a simple message sending system.

While VIEW, NOTIFY and other commands are stored on the file server the system offers the basic facilities for communication without the need for a file server or any other sort of network controller.

With regard to the cost of using a network for shared storage, I note that your article was not really comparing like with like. Five machines sharing a dual disk drive have about 160K of storage each on average, whereas a computer with a single drive has only 100K of storage.

Prices for the Econet system were released at the recent local area network show in London and are now available from Acorn. From this price list I have drawn out the following illustrations which may be of interest to your readers:—

■ A minimum network consisting of two computers with Econet interface, cable terminators and clock box would cost:

Two Model B computers + Econet	£892.00
Two monochrome monitors	£209.08
Cable	£29.00
Terminator and clock boxes	£120.00
	£1,150.08

Of this, network costs are £230. As such this system would be useful to provide a basis for machine communication which could be expanded on at a later date.

■ To add 100K to a BBC computer the disk interface and the single disk drive are required at a cost of £335, whereas to add Econet interfaces to each of four machines and to provide the file server, dual disk drive and all the cables etc would cost about £468 per machine. In the second case each machine has an average of 200K of storage available. Therefore, when costed as price per 100K storage it is cheaper to use the Econet to provide storage for a four-station system.

With printers it is of course even more cost-effective to use a shared printer, as providing a printer for every computer could cost £400 for a matrix printer, or up to £2,000 for a letter-quality printer. The cost of the computer to provide shared printing facility is easily covered by the sharing of printers.

I hope you find the above figures interesting — all the prices are current and include VAT. Further details on the Econet system, and prices, are of course available from Acorn.

L Harewick,
Customer Engineering Section Leader,
Acorn Computers

The high-speed Hobbit

I was interested to read your review of the Hobbit floppy tape system for the BBC. It was very fair but I wonder if you would permit me to make a few points that your readers may not realise.

Your test involved writing 10,000 numbers into a file. Each number takes up 5 bytes and therefore the file was 50,000 bytes long. This is almost twice as long as the longest program that would fit into a 32K machine.

The Hobbit has an index block half way through the tape in order to optimise its chances of finding a particular file quickly. In the middle of your test the Hobbit will have spent about 70 seconds doing nothing but rewinding the tape from the end back to the beginning. This situation may be avoided when shorter files are used.

Here are some figures for writing similar files, using a simple FOR . . . NEXT loop:–

BBC cassette (1200 baud)	20min 50sec
Hobbit floppy tape	4min 33sec
Pet floppy disk	4min 27sec

16►

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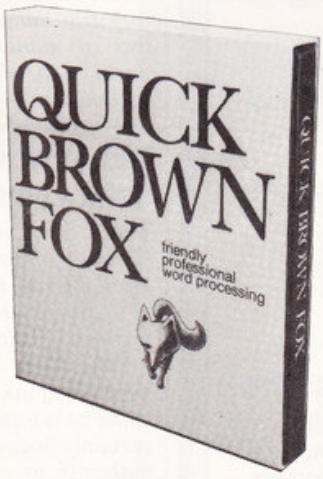

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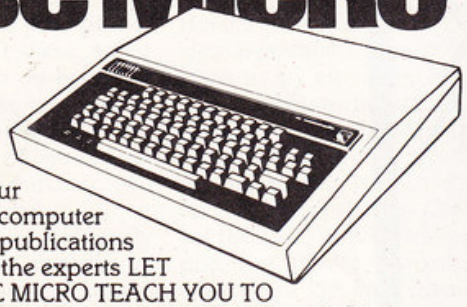

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◀14

I do not have a BBC floppy disk drive, but can see no reason why it should be significantly quicker than the Pet. Perhaps someone else could provide the figures.

I agree with your reviewer that the Hobbit should be considered an automatic cassette system, rather than an alternative to disks. I am, however, continually being surprised at the number of cases where it *is* directly comparable. Your reviewer has hit on one of these by accident — a long file, where the access time is small compared with the LOADing time.

Your reviewer had difficulties with his printer. I have used a parallel printer continually during the development of the system, with no problems. We think the problem may have been a knock-on effect from a bug which we were aware of, and has now been put right.

L J Want,
Co-Author of the Hobbit operating system,
Mickleover, Derby

Point taken, Mr Want. It's true that benchtests usually tell of a piece of equipment's ability to do a benchtest, and not its ability to execute everyday tasks. But to get meaningful figures it's necessary to do things like record long lists of numbers. IQ tests, I understand, are subject to similar criticism — Ed.

Get good advice before you buy

That's it, I've had enough. 'Simon's not so simple' (*PCN April 1*) was the biggest load of . . . (calm down Ian, this is a family magazine).

Who does this guy Keith Bowden think he is? Just because he is some 'flash' lecturer certainly does not give him the authority to go about recommending one computer over another.

Nobody has the right to say, 'Get this computer because *I* think it is better than that one.' If someone is going to spend up to £400 of hard-earned cash on a computer, they are going to want more than the enthusiastic opinion of a lecturer.

It is people like Mr Bowden who can put people off the fascinating hobby of computing, just by recommending the wrong machine. The unwitting person buys the computer, but it is only after he has bought it that he realises that it does not reach his expectations.

The hobby of computing is supposed to be a happy one, but unfortunately too many people discover the contrary. If someone is going to buy a computer, they should first be asked what exactly they want to use it for, and then they should be shown a suitable range of machines, while being told the advantages and the disadvantages of each machine. The person can then be left to decide for himself.

This is another point that I would like to raise. Notice how two-thirds of Mr Bowden's letter is just Commodore propaganda, and how the two most popular home computers, namely the Sinclair Spectrum and BBC Computer, are both 'gunned down'.

I have a BBC Model B and the lack of memory when using high-resolution graphics is always played on. I don't want to ponder on this for too long, for fear of being guilty of exactly what Mr Bowden did, but I would like to give him some food for thought. I would like to see a program for the Commodore 64 which is better than any Acornsoft program, and no more than 8K in length!

I received my £235 BBC Model A on March 8 1982. It arrived in bits, but half an hour with a soldering iron soon had it up and going. Since then I have gradually upgraded it myself.

I chose the BBC computer because I will be doing 'O' and 'A' Level computer studies, and am starting 'A' Level electronics, and I wanted a machine with structured Basic, which was versatile, easily expandable and which I was confident would last well into my University days.

The BBC computer was, and still is, the only computer which fills all those requirements. Mr Bowden seems to think that everyone who buys a computer will use it primarily to learn how to program. I, for one, shall be building, and buying, a lot of external hardware for my BBC computer.

Just for the record, I think the function keys on the BBC computer are a very strong plus point. I am not sure whether or not this is possible on the Commodore 64 but the BBC's function keys, including the Break key, can each contain a program up to 255 characters.

Ian McAlpine,
Craigavon, Northern Ireland

COMPETITION

Beeb Beeb! Now for the winners

No doubt it's been a trying week for those of you who entered PCN Paperchase on the trail of a BBC Micro B.

More than 4,000 got your entries in by the closing date, April 8. Not that you got the correct solution, though, which is *Great oaks from little acorns grow*. In fact, more than 1,000 failed, and some in certain style, not least the first one opened.

It was enough to send shivers down an editor's spine when 'A stitch in time saves nine' flopped out of the envelope.

But in the following days we discovered other examples of guesswork. Nice try, folks, but 'Two heads are better than one', 'Too many cooks spoil the broth' and 'A bird in the hand is worth two in the bush' may all be worthy in nature but showed that too many hands didn't make the listing work (but thanks for the laugh . . .)

Closer — just — were those who came up with 'From little apples great oaks grow'. So much for an English country garden . . .

But perhaps the most succinct of the lot was from a reader in Co Durham who said, simply 'Grow'. (We're trying, Mr X, we're trying.)

More sympathy, though, for those of you who appeared to have the correct answer, but failed to write in the missing word. 'Great oaks from little grow' was a bit on the silly side.

Thanks to all who sent in the correct listing. Here's your chance to check them against our own print-out.

But before printing the winners' names, here's a letter from Lucio Zys, from Stockbury, Kent, that's sure to prompt a nationwide groan of sympathy. He says:

'. . . just got off my hands and knees. Lounge carpet covered with scraps of paper with odd combinations of letters on them . . . Win or lose I enjoyed the puzzle immensely, but don't tell whoever set it — just tell him/her I HATE them!' We did . . . the man responsible, Nigel Cross, just grinned.

But now to make four other people grin. The winners — the four correct entries pulled out of the hat — are:

John Pattinson, of 96A Radford Boulevard, Radford, Nottingham;

Ian Gilroy, of 14 Humberdale Drive, N Ferriby, N Humberside;

G L Nelson, of 169 Woodfield Road, Harrogate, N Yorks;

Mrs A M Briggs, of 14 Limes Avenue, London N12.

Congratulations . . . we'll be getting your Model Bs to you as soon as possible.

Finally, we must own up to a little competitive licence. As some readers have pointed out, the original proverb comes from a poem written by David Everett, 1769-1813, and is 'Tall oaks from little acorns grow.'

But that wouldn't have been so much fun . . .

```
>LIST
  10INPUT "PLEASE ENTER AN INTEGER (1-99) ",A%
  20IF A%<1 OR A%>99 THEN PRINT"INTEGER OUT OF RANGE - RERUN":END
  30FOR N=0 TO 10 STEP 2: CC%=CC% + A%*N:NEXT N
  40CC%=CC%/A%
  50PRINT "CALCULATED NUMBER = ";CC%
  60A$="ABCDEFGHIJKLMNOPQRSTUVWXYZ -1234567890"
  70P$=MID$(A$,5,1):P$=P$+MID$(A$,12,2)
  80P$=P$+MID$(A$,27,1):P$=P$+MID$(A$,23,1)
  90P$=P$+MID$(A$,15,1):P$=P$+MID$(A$,18,1)
 100P$=P$+MID$(A$,11,1):P$=P$+MID$(A$,9,1)
 110P$=P$+MID$(A$,14,1):P$=P$+MID$(A$,7,1)
 120P$=P$+MID$(A$,28,1):P$=P$+MID$(A$,6,1)
 130P$=P$+MID$(A$,1,1):P$=P$+MID$(A$,3,1)
 140P$=P$+MID$(A$,20,1):P$=P$+MID$(A$,19,1)
 150 PRINT"PHRASE = ";P$
 160 PR$= "":A$=MID$(P$,5,3) + MID$(P$,11,1)
 170A$=A$+MID$(P$,17,1):A$=A$+MID$(P$,8,1)
 180A$=A$+MID$(P$,14,1):A$=A$+MID$(P$,6,1)
 190A$=A$+MID$(P$,4,1):A$=A$+MID$(P$,16,1)
 200A$=A$+MID$(P$,14,1):A$=A$+MID$(P$,1,1)
 210A$=A$+MID$(P$,7,1):A$=A$+MID$(P$,11,1)
 220A$=A$+MID$(P$,4,1):A$=A$+MID$(P$,17,1)
 230A$=A$+MID$(P$,12,1):A$=A$+MID$(P$,4,1)
 240A$=A$+MID$(P$,1,2):A$=A$+MID$(P$,16,1)
 250A$=A$+MID$(P$,16,1):A$=A$+MID$(P$,9,1)
 260A$=A$+MID$(P$,2,1):A$=A$+MID$(P$,4,1)
 270A$=A$+MID$(P$,3,1):A$=A$+MID$(P$,6,2)
 280A$=A$+MID$(P$,13,1):A$=A$+MID$(P$,4,1)
 290 FOR C=1 TO 30:PR$= MID$(A$,C,1) + PR$: NEXT C
 300PRINT "PROVERB = "PR$: END
```


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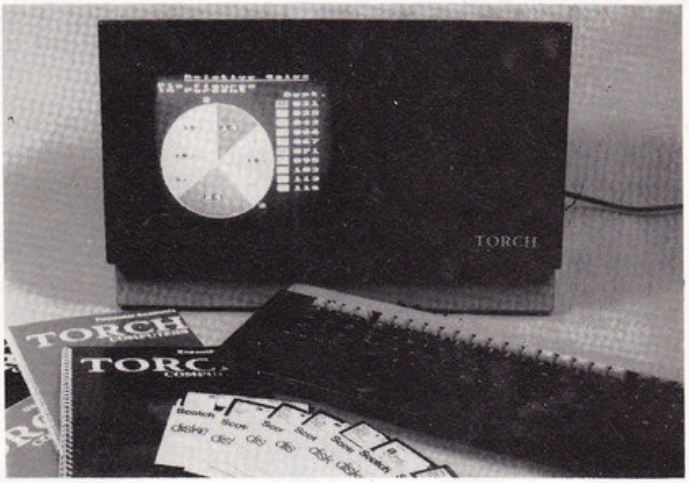

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Memories are made of this

I have devised the following program for the Lynx:–

```
10 INPUT "HOW MUCH
   MEMORY DO YOU
   WANT TO SEE,";A
20 FOR M = 0 TO A
30 LET P = PEEK(M)
40 PRINT CHR$(P);
50 NEXT M
RUN
```

One or two comments about the program may be necessary. When asked for a number, choose one higher than 1000 otherwise you might get a crash.

If you break out during the program and you can't see the cursor try changing the INK or PAPER colours, if nothing happens then you have crashed, so switch off.

I am about to form a Lynx users group to help and inform newcomers as well as more experienced programmers with information, and aspects concerning the Lynx. I am also in the process of producing a graphics aid for those who wish to design their own complex displays of text and graphics mixed. As owners will be aware there are three modes of display: TEXT in a 40 × 24 format; PRINT AT or WINDOW in a 124 × 248 format; and HI RES in a 256 × 248 format.

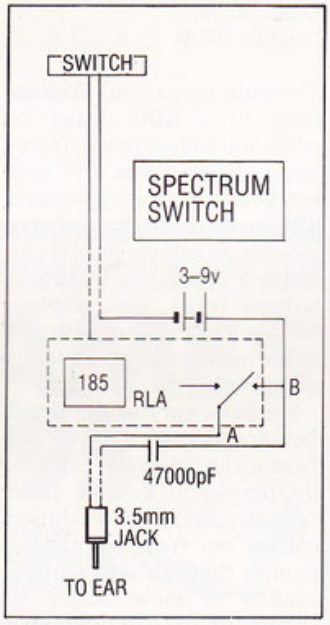
R B Jones,
Kenton, Middx.

Switch program for Spectrum

Here is a simple Spectrum add-on—it's a switch that plugs into the Ear socket. The switch can be anything you want; a pressure mat for a burglar alarm is just one example.

The wires A and B are connected to the NC (Normally Closed) contacts of the relay. When the switch is closed the relay will switch on and off, sending a series of pulses to the computer. The capacitor suppresses the relay and also keeps the current low. You'll need a program like this to use the switch:–

```
10 GOSUB 5000: CLEAR
20 LET a = USR USR "r"
30 LET k = PEEK 23608
40 IF K<3 THEN 20
50 REM the switch is on
60 :
70 :
5000 FOR n = USR "r" TO
     USR "u"
5020 READ a
5030 POKE n,a
5040 NEXT n
5050 DATA
     33,56,92,62,0,119,6,255,
     219,250,254,255,40,1,52,
     16,247,201,0,0,0,0,0,0,0
5060 RETURN
```



F Federilo,
Macclesfield, Cheshire

Dummy GOTOs keep things tidy

If you're developing programs in Basic, you often need to tidy up the program using RENUM. However, this means all your well-known line numbers are changed and it takes some time to learn the new ones. My way to keep track is to put some dummy GOTOs at the start of the program:–

```
10 GOTO 50: ' Program start
20 GOTO 250: ' start of sub-
   routine 1
30 GOTO 410: ' input routine
40 GOTO 630: ' subroutine 2
```

— and so on.

When you renumber the program, the command will change all these line numbers. So a quick LIST keeps you informed of line numbers. It's also a handy summary of the structure of the programs.

P G Bishop,
Tadworth, Surrey

Capital idea for the Spectrum

It used to really annoy me that I couldn't put the Spectrum in caps mode from within a Basic program. But I discovered that bit 3 of system variable 'flags 2' will set caps mode. This is location 23658.

So to use caps mode, you could POKE 23658,8 but this resets all the other flags. Alternatively, you could call the appropriate ROM routine with RANDOMISE USR 4317. But this puts the Spectrum back in lower case mode if you're in caps to start with.

My solution is to use a short machine code routine and call it with RANDOMISE USR. The routine is LD HL,23658, SET 3,(HL), RET — which assembles to 33,106,92,203,222,201. To force the Spectrum into lower case mode, change the 222 to 158.

R G Elmour,
Liverpool

Locate the Dragon's hidden characters

The Dragon uses memory locations 1024 to 1535 for its text screen. So you would expect that a command such as POKE 1024+M,I would be equivalent to PRINT@M,CHR$(I). But the codes used for screen POKEs are not ASCII. You can see this by running this program:

```
10 FOR I=1 TO 255
20 PRINT@100,I
30 POKE 1144,I
40 FOR D=1 TO 600:NEXT
D,I
```

Using this, I discovered that there are 32 printable characters which are available neither from the keyboard nor with the CHR$ function. The only inverse characters you can get are A . . . Z from the keyboard, and a few characters with ASCII codes 96 and 123 to 127.

But you can get at the rest with POKE 1024+M,I with I between 32 and 63. Try it for yourself to see which character is which. The inverse digits (Codes 48 to 57) are great for scoring video games.

David Prins,
Liverpool

String your BBC along

It's sometimes useful to program one of the BBC function keys with a string beginning with a double quote. If you had a lot of print statements to enter, it would be nice to program key F1 with "|MPRINT". Then using AUTO and pressing F1 at the end of every line lets you enter the text really quickly.

But you can't have "|MPRINT" on a key because the BBC assumes you are using the quotes simply to delimit the string. So if you enter *KEY1 "|MPRINT", you get |MPRINT on F1.

To avoid this, put a harmless control character at the start of the string. The BBC only recognises a quote as a delimiter if it is the first non-space character after the *KEY n. So you can create the string with:

*KEY 1 |@"|MPRINT"

D L Harper,
Mansfield, Notts

Beyond the reach of your Dragon

Here's a quick way of sticking a protected copyright message on a Dragon program. Type:–

```
10 REM
20 REM
```

Then type EXEC (39512) and press ENTER twice. The screen will fill with rubbish. LIST your program. Then type: YOUR MESSAGE = 39512 followed by: EXEC YOUR MESSAGE and press enter twice.

You should now see that YOUR MESSAGE is on line 65535. This line can't be deleted or edited . . . its line number is too high.

R Sheldon,
Wolverhampton

NEXT WEEK: Reading the graphics screen on the Ace; reading the Lynx keyboard; ZX81 indelible copyright notice; Oric screen control and more *FX commands you were afraid to ask about.

ROUTINE INQUIRIES

Max 'B DOS ERROR ON A' Phillips opens the pod door, Hal. Got a query? Send it here. No personal replies promised but you never know . . .

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

Making shift with BBC functions

I am trying to write a game for the BBC. I want to use the Return and Shift keys for functions such as 'fire' and 'thrust'. Could you tell me how to do this?
Michael Bilton,
Scoles, Leeds

You can read single keys using the BBC's INKEY function. Normally, the number you specify in brackets governs the time the function waits for a key to be pressed. This will read the return key but not the shift key. A second problem is that the BBC's auto-repeat function may hold the INKEY up so that the whole game goes very slowly.

You can get round this by setting a very fast auto-repeat rate *FX 12,1. Remember to turn it off with *FX 12,0 and *FX 15,0 before your program ends.

But there is a better way. If you give a negative number with INKEY, it tests that a particular key is held down at the moment when INKEY is called. INKEY (−1) is −1 if shift is held down and 0 if it isn't. INKEY (−74) checks the return key.

You can test all of the keys this way. Further information starts on page 273 of the user guide.

Play patient for Commodore Prestel

Can I get Prestel on my Commodore 64, and if so, how do I go about getting it?
John Sales,
Glasgow

All you need is a little patience. Commodore is working on a Prestel interface which will, incidentally, allow you to use Micronet 800.

It won't be ready until May at the earliest, so it's just a question of waiting.

Video vanquishes micro's signal

I own a 1K ZX81, and tried to plug it into my Philips 2000 video recorder. But it would not tune in, and all I got was wavy lines. What can I do to record my graphic programs? Do I need a bigger memory or what?
Paul Hilton,
Rock Ferry, Birkenhead

Congratulations on having discovered this for yourself. What we need is a few more empiricists and a few less theorists.

Anyway, the theory goes that most micros give a signal that is too variable for a video recorder to use, and the ZX81 itself seems to give a signal that is too weak for many automatic tuning systems. Video recorders need a stable, standardised signal rather than the haphazard signals micros get away with.

So to interface the two you need video lock, which is a way of keeping the signal within acceptable bounds. This could be added to your computer. It's also possible to have video lock as part of the recorder, but I doubt if you'll have it on the Philips 2000.

I would have thought that the best way to record your graphics programs was with your ZX81 — just use SAVE, LOAD and RUN.

Problems and pitfalls of program production

I am interested in selling home-produced software on a part-time basis. How do I get my programs duplicated?
C Wood,
Eastbourne, Sussex

It depends on how serious your business is going to get. Most people work their way through the same struggle. First, you can sit with your machine, typing SAVE on into the night.

When you get tired of that, it is sometimes possible to produce usable copies by 'backing up' two cassette recorders. You might be able to find tape duplicators locally. People have been known to help with the local talking newspaper in exchange for an hour or two on its tape copier.

But the best way is simply to approach the problem in the most serious (and hence expensive) way possible. There are a handful of companies which specialise in copying and packaging computer cassettes. Many of them have the sense to offer short runs — as little as ten cassettes — so that small companies can start really small before growing bigger.

It *is* worth the cost of using a serious duplicating company. If your cassettes don't LOAD then the cost of replacing them can destroy your profits. So go for a specialist company — they advertise in most of the trade magazines. See also the lead story on page 6 of last week's issue.

How to monitor your VDU

Is it worth laying out over £200 for a monitor or should I just use a domestic TV?

Could you explain the difference between low, medium and high resolution monitors (apart from the price!) and recommend a cheap monitor?
Francis Jago,
London SW19

It's really up to you. Wander along to a BBC dealer or exhibition and see proper monitors working. Some TVs give very good pictures . . . I've seen BBCs and Newbrains give very passable 80 column displays on ordinary portables. Others, perhaps yours, give displays that are hard to work with and do an injustice to the micro's graphics ability.

Monitors vary in the detail they are able to resolve, and there are lots of ways of expressing this. You can do it in columns, pixels, dot resolution and so on. You do need a monitor that has sufficient resolution to show clearly 80 columns of text and preferably the BBC's 640 x 256 graphics mode.

Some of the cheaper monitors have low resolutions and can't really work with more than 40 column text.

As for recommending monitors, you'll get a good deal from most companies such as Microvitec, Cabel and so on.

Choose a monitor from a dealer, so you can see it working and can get it quickly repaired, if need be.

Spectrum DATAs defined

When defining graphics on the Spectrum, I usually use the DATA and BIN statements. These are all right unless you are writing a great long listing with a lot of graphics. I have seen another way in books and magazines using just a DATA statement followed by numbers separated by commas. Please could you explain how to do this?
Nicholas Gorton,
Elswick, Preston

It's simply a matter of fiddling about with numbers. When you define a character, perhaps by shading in the squares on a grid and converting shaded squares to 1s and empty squares to 0s, you create a set of eight binary numbers.

These are POKEd into the Spectrum's memory using the BIN function. This persuades the Spectrum that the numbers are actually binary and not our normal base ten system.

The method you have seen involves taking the definition a step further. You convert the binary numbers into their base ten equivalents and then POKE those instead.

One simple way to convert the number is to write the headings 128 64 32 16 8 4 2 1 above each binary number. Then you add together all the headings that have a 1 underneath them. So a number such as 10010111 is 128+16+4+2+1 — or 151 — in base ten.

Once you've got your eight base ten numbers, you just enter those on a DATA line, and READ and POKE each one in sequence.

After a while you'll find this a rather tedious process — it's a job for your Spectrum. Why not write a program that lets you design characters on an enlarged grid by moving a cursor around? When each character is finished, the program can calculate and print the relevant base ten numbers.

There are lots of handy features you could include. You could display what each character would actually look like as the user created it. You could have a little 'scratchpad' area where you could play about with all the characters.

You could even include commands to turn the grid upside-down, reflect or reverse it. So it would be easy to define a PacPerson going left, up, right and down.

It isn't an easy program to write but it will make your life easier. This makes it easier to define characters that can be PRINTed in pairs and so on.

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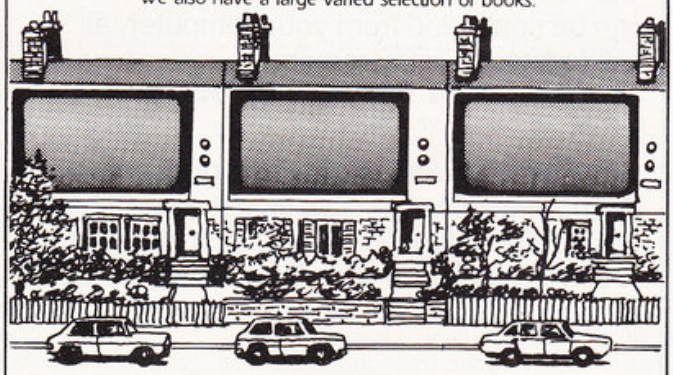

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Where's your guarantee?

Hand-holding is a patronising expression popular among computer equipment suppliers.

It means that when you (cast by implication in the role of a child) need help they (with their experience and wisdom) will be on hand to offer it. After all, what you are using is their baby.

So perhaps it's appropriate that, if they go out of business, you'll be left holding not the hand but the baby. And if what you've bought is a real dog, you'll have been sold a pup. This is not a comforting thought, but what can you do about it?

You may shrug phlegmatically or you may panic, but any constructive response demands patience or money — or both.

Bankruptcy is one of those ill winds that blows nobody much good, but it doesn't take the bankruptcy of a supplier to leave you with an unsupported piece of hardware or software. A software house may lose a key programmer, a hardware manufacturer may discontinue a line, or an independent supplier may go into a different business altogether.

Whatever the reason, you could find yourself with an inoperative system and no ready shoulder to cry on.

There are only two factors you can use to lighten your misfortune, and one of them is luck. So there's really only one — caution.

Caution applies in the first place to your choice of supplier. You're safer in a mass market than in a minority-interest group, safer with one supplier for hardware and software than with two or more, safer with a multinational than with a one-man band, safer with a package than with a one-off, and safer (although it may appear odd) in the middle of the road.

Patience comes into play here. Veteran Pet users will recall that the first disk drives available on their system were produced not by Pet but by Computhink. Who? You may well ask. As soon as Commodore brought out disk drives the supply of software supporting Commodore disks practically dried up.

Or, for a more recent example, consider the IBM PC. If you bought a 'grey' system and the importer finds that IBM, by launching the machine here officially, has cut the ground from under it, you may find yourself having to go cap-in-hand to IBM for support. And woe betide you if your system has non-standard components.

That's not to say that he who hesitates is saved — it may just be that it takes longer for him to be lost. And in the interval, a way out may have been found.

Nascom, for example, changed hands some three years ago, and the transition was relatively painless for most users. In the case of one user, the fate of his dealer was more immediately important than the fate of the manufacturer — where Nascom was charging £45 for a repair to a Nascom II he got it done by his dealer for £5.

Line of redress

Dealers, distributors and shops are your first line of redress, and the level of their competence is crucial. An agent who has to send equipment back to the original supplier for attention is of little use if the original supplier has ceased trading — but there are plenty of independent maintenance companies. And remember that more maintenance companies exist for popular machines than for esoteric oddities — after all, it's easier and cheaper to get a Ford repaired than a Maserati.

This applies as much to software as to hardware — and with software there is the added complication that the author may work for a sub-contracted company, and not for the nominal seller.

The Computer Retailers Association (CRA) has approved in principle a scheme that could be a step in the right direction. It proposes to store as much source code as possible with an independent agent.

So if a software supplier falls by the wayside the source code will be available if any maintenance is needed.

There are difficulties with the plan and it has shortcomings. CRA chairman Colin Stanley admits: 'The main problem will be getting the suppliers to agree.' With members of the CRA (which includes Pegasus and Tabs) there is no problem, but independent suppliers — and particularly US software houses — might need more persuading.

And the maintenance will still cost you. 'It would be the responsibility of the user to sort out maintenance,' said Mr Stanley.

This is one reason for keeping it simple — especially if you are a business user — and buying an unadorned package, says National Computing Centre consultant Eric Bagshaw. It may even be worth altering your business procedures to fit in with the package, he says, if it spares you the trouble of looking for one particularly idiosyncratic programmer when you need support.

So, if your supplier goes out of business you must expect to incur added costs the next time you need support. If it's an unusual piece of software, there may be no possibility of support.

Such advice as the experts can offer suggests that you exercise foresight when you're buying. Easier said than done, perhaps, but at the moment there are no alternatives — except trusting to luck.

Ian McKinnell

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The GTIA is the heart of the Atari graphics system. Richard Hawes POKEs around inside.

The moving picture

Most Atari owners know that what makes their computer so special is the extra custom chips that are included in addition to the 6502 processor.

These extra chips allow the Atari computer to do all of the exciting extras without tying up the main processor.

When the Atari computers were first released in America the graphics were controlled by a chip called the CTIA. This chip was responsible for handling the colour and luminance levels sent to the television screen as well as the Atari's powerful player/missile (sprite) graphics system. The CTIA also watches over the joystick buttons and the OPTION, SELECT and START keys on the console.

When the Atari computer was released in the UK the CTIA was replaced by a newly developed, more sophisticated chip called the GTIA. As well as giving the Atari twice as many colours as before (256 instead of 128), the GTIA also added three new graphics modes (9-11) to the existing nine (0-8).

Many of you Atarians may not realise it but your computer is capable of producing three modes more than some of the manuals describe. The reason that certain manuals keep these modes a secret is that they are American manuals and until

```
PROGRAM 1

10 GRAPHICS 9
20 FOR Z=80 TO 64 STEP -1
30 COLOR Z
40 PLOT 8,Z:DRAWTO 73,Z
50 NEXT Z
60 FOR K=80 TO 95 STEP 1
70 READ X:COLOR X
80 PLOT 8,K:DRAWTO 73,K
90 NEXT K
100 SETCOLOR 4,3,0:GOTO 100
110 DATA 15,14,13,12,11,10,9,8,7,6,5,4,3,2,1,0

PROGRAM 2

10 GRAPHICS 10
20 FOR A=704 TO 712:READ COLOUR:POKE A,COLOUR:NEXT A
30 DATA 0,26,42,58,74,90,106,122,138,154
40 FOR X=1 TO 8
50 FOR Y=34 TO 39
60 COLOR X:PLOT (5*X)+Y,0:DRAWTO (5*X)+Y,191
70 NEXT Y:NEXT X
80 FOR X=8 TO 1 STEP -1
90 FOR Y=5 TO 0 STEP -1
100 COLOR 9-X
110 PLOT (5*X)+Y-5,0
120 DRAWTO (5*X)+Y-5,191
130 NEXT Y:NEXT X
140 FOR X=1 TO 8:Z=PEEK(704+X):Z=Z+16:IF Z>255 THEN Z=26
150 POKE 704+X,Z:NEXT X:FOR Y=1 TO 5:NEXT Y:GOTO 140

PROGRAM 3
10 GRAPHICS 11
20 FOR LOOP=0 TO 11
30 FOR A=1 TO 15
40 COLOR A:PLOT 0,A+LOOP*15:DRAWTO 79,A+LOOP*15
50 NEXT A
60 NEXT LOOP
70 FOR SHADE=0 TO 14
80 SETCOLOR 4,0,SHADE:FOR LOOP=1 TO 40:NEXT LOOP
90 NEXT SHADE:GOTO 70
```

show

recently the American Ataris did not contain this new wonder-chip.

The Atari Basic language cartridge is therefore capable of selecting 12 text and graphic modes. (There are also five other modes in the operating system, available to more experienced programmers). The three GTIA extras are selected using the standard Basic command — GRAPHICS n — where n is the number of the mode 0 to 11.

The first thing to note when using the three new GTIA modes is that there is no text window such as you see in the other nine modes (with the exception of the character mode 0).

A text window is useful for advanced program design because it allows you to see commands you type in, or parts of your program, in the four-line area at the bottom of the screen and at the same time to see the result or graphic display on the screen above.

A text window can be removed from ordinary graphics modes by adding 16 to the mode number when using the GRAPHICS command.

GTIA modes 9-11 have the same screen dimensions — 80 dots across by 192 dots down. This gives each dot the rather odd appearance of being four times wider than it is high. A brief summary of the capabilities of each mode follows:

GRAPHICS 9 — You can only display one colour but you can display 16 shades of colour. The displayed colour can then be changed using the SETCOLOR command.

GRAPHICS 10 — You can display any eight colours and any of 16 luminances for each colour. The background colour can also be specified. The individual colours can then be changed.

GRAPHICS 11 — In this mode you can display any 16 different colours on the screen at one time. The colours must, however, all be of the same luminance. The luminance can be changed at any time.

The best way to gain an understanding of these modes is to try them out for yourself. Just to show you how easy it is I have writtren three simple programs to demonstrate the effects of each graphics mode. You should note that none of the programs has more than 15 lines, proving how much can be achieved with such little effort.

Why not try out the example programs provided, make changes and see what effect those changes have?

All these programs go into an 'infinite' loop when run so that they will continue to display the graphic effects and not automatically return to character mode 0.

Program 1 — Graphics 9

This program very simply, in just 11 lines, shows an example of subtle shading using varying luminances of the same colour. The program will draw a stick of rock in 16 *different* shades of pink.

Program 2 — Graphics 10

This program will fill the screen with 16 vertical bars using eight different colours. Then the program will change the colours in each of the bars in such a way as to produce the effect of all the bars flowing into the centre.

Program 3 — Graphics 11

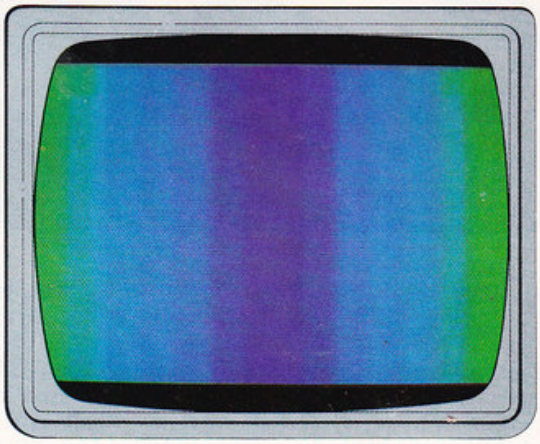
This program in just nine lines fills the screen in very thin horizontal lines. There are 12 bands of colour in all, each band comprising 15 horizontal lines, each using one of 15 selected colours. It then cycles through eight luminances (brightnesses) of the displayed colours.

The following comments on the listings explain what is happening.

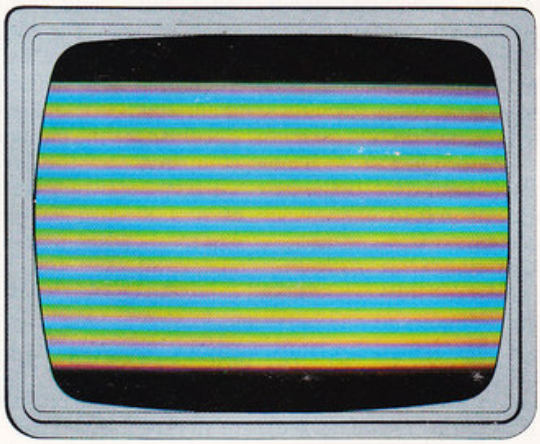
Line 10, all programs, selects GTIA mode with the GRAPHICS command.
Lines 20-90, program 1, draws rock.
Line 100, program 1, sets pink colour.
Lines 20-130, program 2, and 20-60, program 3, fill screen in desired pattern.
Lines 140-150, program 2, change colours to produce effect.
Lines 70-90, program 3, rotate through available brightnesses.

Looking at the colours and luminances of the pictures produced by the example programs, you can see that there's a lot more to the GTIA chip than you might have thought.

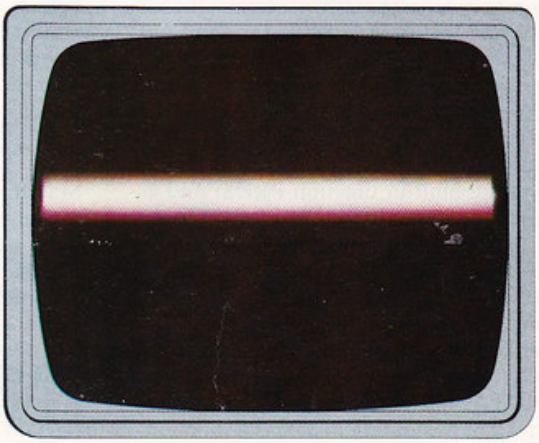
Program 2 — Here the screen is filled with 16 vertical bars using eight different colours.

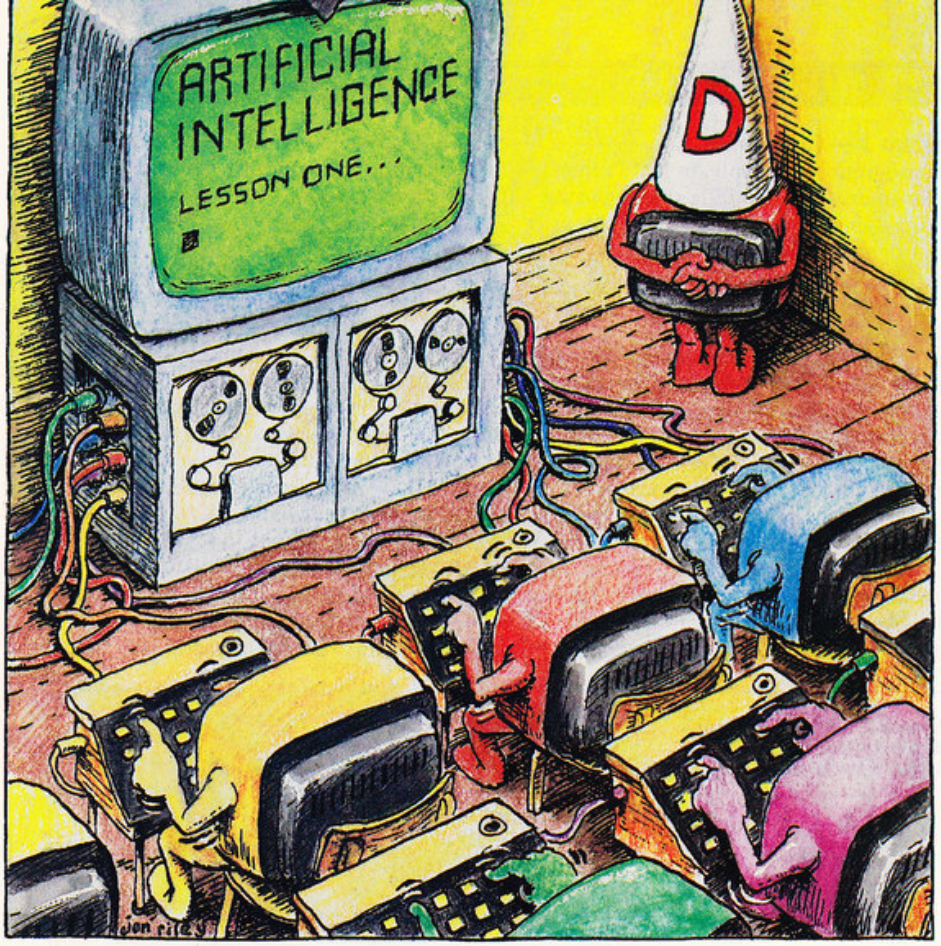


Program 3 — Perhaps the most impressive of the three, this program shows 12 bands of colour in very thin horizontal lines. Each band comprises 15 horizontal lines each using one of the 15 selected colours.



Program 1 — This shows an example of subtle shading using varying luminances of the same colour.





Jon Riley

Lisp taped

SpecLisp AI for Spectrum

You can now program artificial intelligence on the Spectrum. Ted Ball looks at an AI package.

Some knowledge of Lisp is essential to anyone seriously interested in Artificial Intelligence (AI). Not only is it the most widely used programming language in the field, but books and papers on AI frequently include programs in LISP, and other AI programming languages (including Planner, Pop-2, and Prolog) are based on Lisp.

Lisp has been used in numerous applications: natural language comprehension, compiler writing, robotics, computer aided instruction, etc, and now SpecLisp, the first product from a new company, Serious Software, opens up the whole world of AI to the owner of a 48K Spectrum.

Lisp stands for *LIS*t *P*rocessing, and there are only two types of object in Lisp, atoms (names and numbers) and lists. A list is represented by being enclosed in brackets, and the elements of a list may be atoms or lists, or a mixture of both. Thus (a b c), ((a b) c) and ((a b c)) are all lists, but the first has three elements, the atoms, a,b,c, the second has two elements, the list (a b) and the atom c, while the third has one element, the list (a b c). The nesting of lists within lists may continue to any depth.

Even programs in Lisp are lists, on the same footing as data. So you can type in

(plus 2 3)

using the built-in function PLUS, and as Lisp is an interactive interpreted language the answer, 5, is printed out immediately. However, you could type

(eval (list (quote plus) 2 3))

which also prints out the answer '5'. EVAL evaluates the following list, LIST creates a list from the following elements, and QUOTE means use the name 'plus' instead of evaluating PLUS as a function. The EVAL expression has created the list (plus 2 3) and then treated the list as a program instruction.

Lisp is an extensible language that allows you to define new functions that can be used in exactly the same way as the built-in functions. For example, if you don't like the word plus you can define 'add' to mean the same thing by

(de add (m n) (plus m n))

where 'de', short for DEFINE, introduces the definition, the next word is the name of the defined function, followed by a list of the parameters and a list which is the body of the function. In practice, a definition would be more complicated than this, and can involve conditional expressions and sequences of expressions.

Features

SpecLisp 1.2 provides about 60 built-in functions, compared with the 100 or more usually found in mainframe Lisps, but all the basic functions you need are included. Lisp has been around since 1962 and several dialects have developed, but SpecLisp 1.2 generally conforms to the common features of the dialects. One departure, which will be welcomed by stuctured programming enthusiasts, is a WHILE structure instead of the labels and GO function found in most versions of Lisp.

Mainframe Lisps often allow floating point numbers and integers of unlimited length, but although the only numbers allowed in SpecLisp are integers in the range −32767 to +32767 this is not really important as the normal uses for Lisp rarely require more than simple integer arithmetic.

SpecLisp does not provide any direct means for using the colour or graphics on the Spectrum, so you are restricted to simple text output, unless you add your own machine code routines (which can be called by using the SpecLisp function SUBR). It would be easy to include a single function, equivalent to PRINT CHR$ N in Basic, which would allow the user access to all the colour and graphics of the Spectrum.

There are very few editing facilities provided: you can use the DELETE key, SHIFT 0, in the usual way, and delete a whole input line with SHIFT 5, but once you have entered a definition the only way to change it is to retype the whole thing. You can save programs on tape, but you need to load SpecLisp before you can re-load and run a saved program.

Presentation

The review copy of SpecLisp 1.2 came on a Boots cassette with a printed label stuck on, and the manual was offset from a typed original. I was unable to contact the manufacturer to find out if this is the normal packaging or a pre-production version supplied for review.

The documentation consists of a 31-page manual for SpecLisp version 1.1 and an additional four pages giving some corrections to the manual and describing the differences between versions 1.1 and 1.2. The manual is quite comprehensive, including sections on loading and using SpecLisp, definitions and syntax of the built-in functions, and the internal workings of the interpreter.

There is a demonstration program on the tape, which allows you to set up and use a simple database. The manual contains a listing of the database program and some information on how to use it. However, the description of the database functions is not complete, and you need to study the program listing to find out how to use it.

30▶

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Getting started

The manual is purely a reference document for SpecLisp, and does not teach you how to program in Lisp, but it does include a short list of recommended textbooks on Lisp and Artificial Intelligence.

SpecLisp is quite easy to use, and you should have little difficulty using it in conjunction with a suitable textbook.

Because there are many dialects of Lisp you may find some differences between SpecLisp and the textbook version, such as DIFF instead of DIFFERENCE or DIV instead of QUOTIENT, but it does not take long to get used to this.

In use

SpecLisp runs automatically when it has finished loading, and prints, in white on a black screen, a copyright message, and an asterisk, which is the usual SpecLisp prompt. It is then ready for you to start typing in commands and programs.

I tested the interpreter with a number of simple programs, some textbook examples, and some programs I wrote myself to test particular points. I managed to get all the programs working, and by the time I had them completely translated into SpecLisp from the Lisp I am familiar with, I had come across most of the error messages.

Some of the error messages are straightforward and fully informative. For example 'x is not a number', which you get if you try to apply an arithmetic function to an atom or expression that does not evaluate to a number, will usually show exactly where you have gone wrong. Other error messages, however, are not specific enough, in particular 'PNAME property not found', which you get if you try to use a function that has not been defined.

This message ought to have been extended to include the name that caused the trouble.

Reliability

SpecLisp is not very robust, and can be crashed quite easily: typing in (1), or any number enclosed in parentheses, produces garbage on the screen and drops you back into Basic.

There are also some bugs in the arithmetic. One of the examples I tried was a recursive function for calculating factorials, which worked up to factorial 7, which is less than 32767, but when I tried factorial 8, which produces a result big enough to overflow, I got:

"(" EXPECTED
"(" EXPECTED
−25216

The answer is correct, expressed in 2s complement arithmetic and hence a negative number, but the messages preceding the answer are rather odd. Factorial 9 is even worse. This gave −25216 and this time the answer is wrong. It should be −30336.

Another bug is that there is no checking for division by zero: (div 1 0) caused the machine to hang up, and I had to switch off and start again.

There is also no checking for stack overflow. This will not occur often, but it can happen and particularly in a language like Lisp, which is stack-based and allows recursion. There should be a built-in test to prevent stack overflow from crashing the computer.

Verdict

I was quite pleased with SpecLisp until the bugs started appearing, and without the bugs I would have given much higher ratings. Unfortunately, the bugs are serious enough to require elimination before the product can be considered saleable.

At £19.95 I think it is overpriced compared with other programs of similar size and complexity which sell at prices usually between about £8 and £15.

Name SpecLisp 1.2 **Application** Artificial Intelligence programming **System** 48K ZX Spectrum **Price** £19.95 **Publisher** Serious Software, 7 Woodside Road, Bickley, Kent BR1 2ES. **Format** Cassette **Outlets** Mail order.

RATING

Features
Documentation
Performance
Usability
Reliability
Overall value

8.1 The Database Functions

```
(de demo()
(progn(l1 l2)
(print (quote ok:))
(while t
  (setq l1 (read))
  (cond((atom l1)(print(quote(incorrect entrg))))
    (t
    (setq l2 (list(car l1)(cadr l1)))
    (cond((equal(cddr l1)(quote(;)))(print(insert l2)))
      ((equal(cddr l1)(quote(?)))(print(fetch l2)))
      ((equal(cddr l1)(quote(↑)))(print(remove l2)))
      (t(print(quote(incorrect entry))))
    ))
  )
)))


(de append(x y)
(cond((null x)y)
  (t(cons(car x)(append(cdr x)y)))
))


(de insert(fact)
(progn (l)
(setq l (get(car fact)(quote data)))
(cond((member(cadr fact)l)nil)
  (t(putprop (car fact)(append(cdr fact)l)(quote data))
    fact)
)))


(de match (p d)
(cond ((and(null p)(null d))t)
  ((or (null p)(null d))nil)
  ((or (equal (car p)(car d))(equal (car p)(quote )))
    (match (cdr p)(cdr d)))))


(de fetch(patt)
(progn (item result)
(setq item (get(car patt)(quote data)))
(setq patt (cadr patt))
(while item
  (cond ((match patt (car item))
    (setq result (cons(car item)result))))
  (setq item (cdr item)))
result
))
(de delete (e l)
(cond ((equal e(car l))(cdr l))
  (t(cons (car l)(delete e(cdr l))))))


(de remove(fact)
(progn (l)
(setq l (get (car fact)(quote data)))
(cond ((member (cadr fact) l)(quote data))
  (putprop (car fact)(delete(cadr fact)l)(quote data))
  fact
```

```
To insert the relation 'alice is the mother of ann' type:

      (mother (alice ann);)

The function insertplaces (alice ann) on a list under the data
property of mother.

To fetch what is on the data list of mother:

      (mother (_ _)?)

The underline will match with anything in that position of the
list. The above is equal to the specLISP function of
(get (quote mother)(quote data))

To fetch all the relations where alice is a mother:

      (mother (alice_)?)

To fetch the mother of fred:

      (mother (_ fred)?)

To remove the relation 'shirley is the mother of michele':

      (mother (shirley michele)↑)

To see if shirley is the mother of michele:

      (mother (shirley michele)?)
```

Demonstration database program supplied with SpecList. Below it are examples of the ways in which you can use its commands to insert, find or remove data and relationships.

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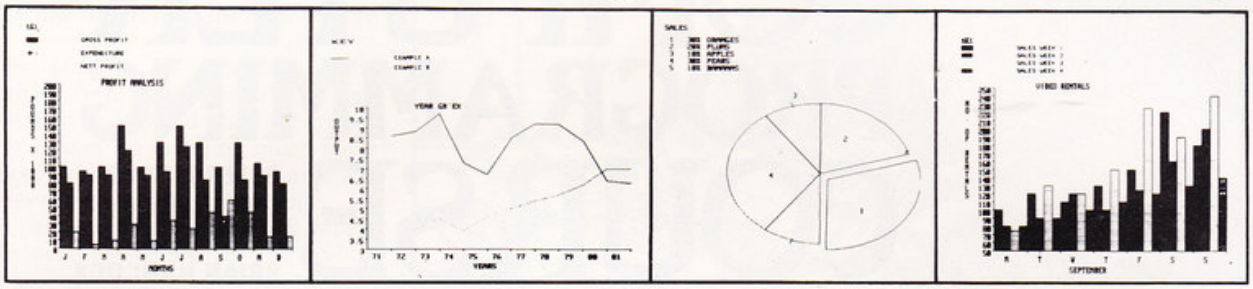

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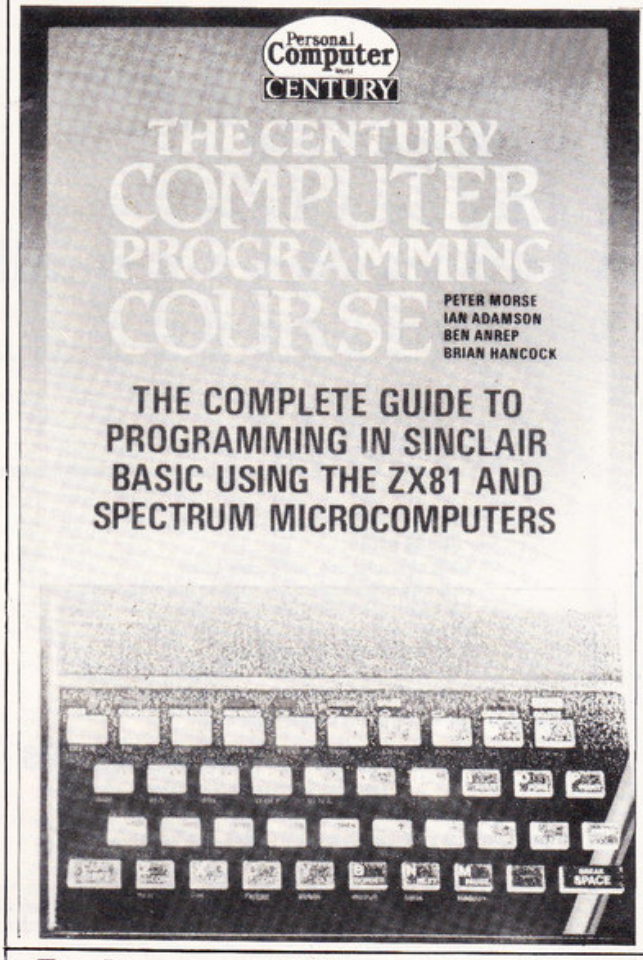
The complete guide to programming in Sinclair BASIC using ZX81 and Spectrum Microcomputers



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CENTURY

Karl Dallas clues up on a Vic-20 assembly language programming package for beginners.

Three-pipe problem

I think I can claim to be ideally suited for reviewing a beginner's guide to assembly language programming: though reasonably proficient in Basic, I have the same relationship to programming in assembler or (worse) machine code as a toddler has to running the four-minute mile.

After reading Dr Watson's guide (though it is far from 'elementary'), I think I can at least understand what is going on, even if I can't do anything much more advanced than adding two numbers together and getting the right result.

The package consists of a book, which has obviously been designed to be read on its own, since it has a different publisher (Glentop Publishers) and contains listings and keying-in instructions for two assembly programs, a hexadecimal/binary tutor and exercises, which were on the cassette supplied.

Both the assemblers provided run on the expanded Vic, though the first will run on the unexpanded. The second adds more sophisticated commands to the first, and as printed isn't comprehensible on its own. The hex/bin tutor runs only on the unexpanded Vic.

John Storey

Getting started

Actually, unless you're totally proficient in binary and hexadecimal notation, I'd advise you to skip the two assemblers and first run the tutor which follows them, since it will make the opening lessons much easier to understand.

In use

As the intro says, a mistake in writing an assembly language or machine-code program can 'bring the whole system about your ears', though they have inserted some useful error messages to stop you making elementary mistakes like missing out the space between a mnemonic and its relevant numeral.

It's fortunate, though, that the human brain is smarter than any computer, because it would otherwise hang up on the various small errors which pepper the book — things like saying, 'At Menu select "R" to run the program' (page 1.9) when you have to press '3' for the third of three options (enter, list and run); telling the reader to revise program 2.2 when they mean 2.3 (page 2.8); saying the answer to an exercise is on page 9.5 when it's on page 9.4; and referring the user to a table in Appendix I which is actually in Appendix II.

None of them significant, but irritating all the same.

More serious, perhaps, is the way the reader is suddenly instructed to modify a program using only direct POKE commands, which of course can't be done while the assembler is running — another consequence of the book's ability to stand alone, I suspect — and the sudden appearance of address numbers before the mnemonics in the program on page 3.13 when they are calculated automatically from the start address given at the beginning of the 'enter' routine (usually 828, or the second cassette buffer).

Author Peter Holmes tells me all these and similar errors will be corrected in the second edition.

I found that if a keying error got past the assembler's error trapping routine, it didn't hang but returned the Vic to a clear screen READY. Typing RUN put me back in the menu, with no really serious harm done.

The mnemonics used throughout are slightly different from those that more experienced programmers might expect — and different from those used in Commodore's own assembler — but they are easier to understand, in my opinion, and the logic behind them so obvious that it prepares beginners for the puristically more acceptable but less easy to comprehend mnemonics they will encounter as they get deeper into the subject.

And since the second assembler on the program contains a monitor, and the second section of the book begins to dip its toe into the murky, deeper waters of 'real' machine code programming, it really helps the beginner to get to grips with the heart of the 6502 chip.

Verdict

If you've ever wanted to know what all that LDAIM and JMPIA gibberish really meant, but were afraid to ask — or were baffled by the apparent belief of most 'experts' that you can't understand anything until they've explained the chip architecture to you — then I don't know of a better guide. There may be easier ways of adding two and two together than:

```
LDXIM 2
STX 900
LDAIM 2
ADC 900
STA 7680
RTS
```

But there aren't easier ways of learning how your computer does it.

RATINGS

Features
Presentation
Performance
User interface
Reliability
Overall value

Name Dr Watson Computer Learning Series: Beginners Assembly Language Programming **System** Vic-20 **Price** £14.95 **Publisher** Honeyfold Software **Format** Cassette plus paperback book **Language** Basic **Other versions** Other Commodore computers **Outlets** Mail order

How does Supergraf for the Victor/Sirius measure up? Deenagh Brook at the keyboard.

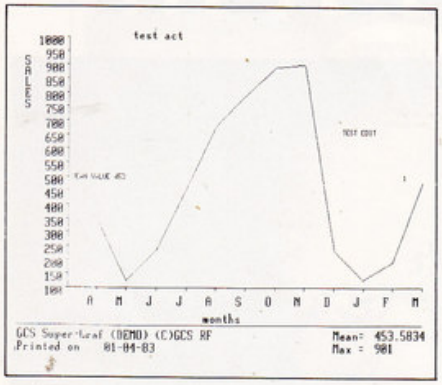
Graphs without graft

Supergraf is a package for users of the Sirius/Victor to help you use the graphics facilities. It will run on the basic 128K RAM system and can either use custom data or draw on another program such as a spreadsheet.

It is aimed at the business user who wants hard copies of the graphs and histograms that appear on your screen without the necessity of buying a special plotter.

Features

The system produces graphs in different forms, histograms and pie charts, and is menu-driven. It is capable of reproducing several graphs on the same screen for comparison. Every graph is set up from a series of questions such as, 'What is the title of this graph?' and you can also define the



highest and lowest points to be graphed, and the increments used. The Y axis can be numbered, or represent days or months. Alternatively, the system can be left to set up the axes.

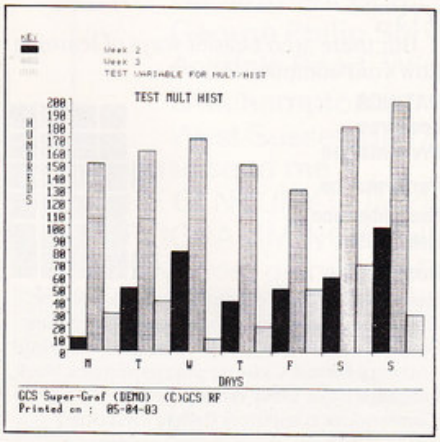
The graphs are extremely simple to set up and once created can be saved, reloaded, edited and merged. As many data points as will make sense can be plotted. Only the size of your printer paper limits the scope. Text can be added to each graph by moving the cursor to the required position on the graph.

Presentation

The package came with two disks, clearly marked for drives A or B, and a binder with typed instructions. The packaging gave the impression of having been rushed.

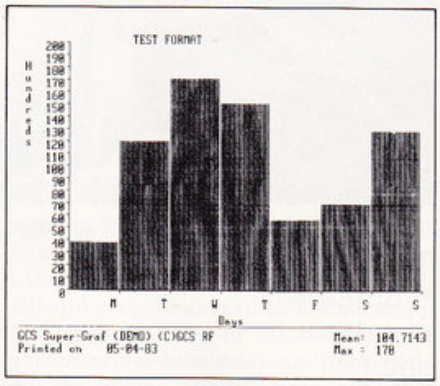
The documentation is rather brief and is a little puzzling as to what level of user it is aimed. There are parts which are quite explicit and others not nearly explicit enough. The documentation also lacks an explanation of the error messages.

The publisher of the package, Georgetown Computers, says the manual is to be revised and re-printed but the system is easy enough to operate for you not to need to refer constantly to the manual.



Getting started

Although the disks supplied include the operating system, getting started was



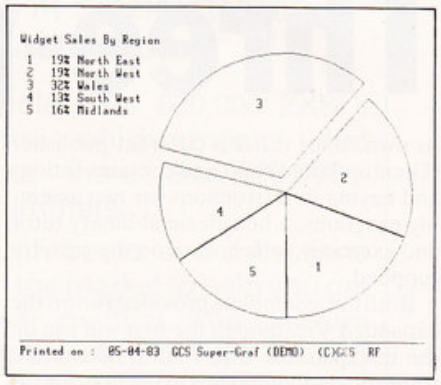
confusing. When the printer is first used it must be defined and although explained quite nicely, this is quite complicated. Georgetown says the printer definitions are important because each loads a different set of control characters but the company says it will try to do this as a separate module to the main package.

There are some easy-to-follow instructions to lead you through creating a graph, and instructions on creating disk and location passwords which, unfortunately, use rather unfriendly statements such as BEGIN V39.GRF.

You can set up a location password and then if the disk password has been forgotten there is a routine for displaying the disk identity provided you can remember the location password. However, if you enter anything else when the program asks for the location password it stops at line 120. Type in RUN 130 and the program replies. 'Yes, that is the correct location password. The disk password is XXX.'

In use

The package is menu-driven, some options



leading to sub-menus which all follow a set pattern. There are also options for creating 12-month graphs, user-defined graphs and multiple diagrams.

All may be stored or amended, and one nice touch is the ability to switch a graph to a histogram, and vice versa.

It is possible to amend data as soon as it has been entered but this is somewhat laborious. The program goes through every data item and asks if it is all right.

In any new piece of software there are bugs, but there did not appear to be any major system-crashers in this package, although there is still some tidying up to be done.

Verdict

This is a useful piece of software which should prove valuable. As you gain more experience you should be able to create your own files and then graph whatever you like.

At £195 it seems expensive, but how long would it take to create a program to produce instant graphs with text and user definable axes?

RATING

Features	
Documentation	
Performance	
User interface	
Reliability	
Overall value	

Name Supergraf **Application** Business graphics **System** Sirius/Victor with 128K, printer **Price** £195 **Publisher** Georgetown Computer Systems, 0235 817927 **Format** Disk **Language** Basic **Outlets** Dealers and direct

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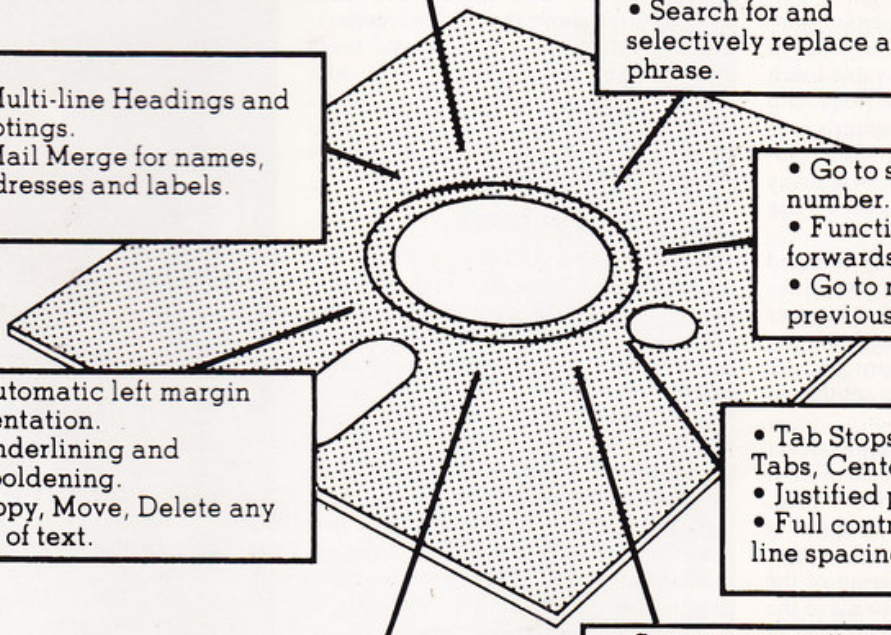

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Epson's

Barry Miles looks at the successor to the Epson MX80

In recent years, a number of microcomputer users have come to regard the MX80 from Epson as the industry-standard for reasonably-priced high-quality printing. It was therefore with great anticipation that I unpacked the successor — the FX80.

The MX80 had, in fact, gone into very short supply which caused some people to assume that Epson were putting all their efforts into the new machines (the RX80 will also be reviewed soon). A rather generous thought was that Epson did not want dealers to be left with a large stock of old printers on their hands when the new ones became available.

Whatever the truth of that, I was very pleased to get my hands on one of the first FX80s.

Presentation

The first reaction was that the size and weight had gone up. In particular the width was substantially greater, which prompted a rearrangement of the other hardware in my office.

The need to fit the optional IEEE interface meant that I had to remove the screws and delve inside. This was interesting, because it showed that thought had been given to the user who must do this.

The interface is easy to fit, provided you have a degree of sympathy for mechanical things, and can press home a multipin plug without bending pins.

The top of the printer has been substantially changed, and mostly for the better. In the first place, an easily removable hatch allows you access to the various Dip switches, which control the printer's normal behaviour. This is a definite advantage, because the facilities are now so many that you are likely to want to switch these from time to time.

The switches are more easily changed than before, and can even be thrown with a (strong) fingernail. Thus if you want your printer to wake up with a slashed zero, an ability to jump over perforations, and a £ sign readily available, you can set this up easily.

The next major change is some clever stuff for the paper transport mechanism. It is a pin-feed, with optional friction feed. The pins have been cunningly designed to engage only at bottom dead centre, presumably to reduce the tearing of the perforations. There are clips to move the pinfeed sideways, and the engagement of the paper is automatic.

You must be careful to follow the instructions in the manual about folding the paper before seeking to submit it to the printer, but apart from that it is fairly straightforward. MX80 users will find the FX is a bit more bother when putting the paper in, but once it is there, it does not tend to climb off the sprockets in the way of its ancestor.

This all sounds very good, but there is a snag. The paper must be between 9.5 and 10 inches wide if you are to use the pinfeed. My wordprocessing paper is 9.25 inches wide. 'Ah,' I hear you cry. 'That's OK, we can buy an optional tractor feed to clip on.'

Very true. However, the tractor only works for paper from five inches to nine inches wide. So now you have two options: to run the friction feed, which always allows the paper to drift, or to scrap loads of labels and paper.

Another major inconvenience is that you must not wind the paper backwards in order to change it. If you do, the perforations will snag and cause damage.

The top of the machine contains other evidence of re-design, some of it attractive, and some not. I liked the new transparent paper separator, which is much more attractive than its predecessor, a rattling piece of wire. However, the printer cover has been changed to a completely opaque piece of matt plastic, which I think will be removed by most users, who generally cannot bear not to see what is actually getting onto the paper.

The bail bar, which holds the paper in place against the platen, is now quite a complicated, fully cantilevered affair, which permits you to tear off the paper one inch from the last print position. The printer then resumes printing one inch below the tear-off point. You are not recommended to use this anywhere other than along the perforations.

A rather strange addition, presumably to keep the dust out, is a narrow lid, which is spring fitted above the pin-feed mechanism, and which must be removed every time you want to change the pin-feed width setting. Again permanent removal seems the obvious thing, although a dust cover is always a good idea when the machine is not in use.

Features

Apart from these criticisms, the rest of its facilities are excellent. If you should want proportional spacing, you have it. In fact you can even redefine the spaces to be left between the letters, if do not like what Epson has given you.

You want to define your own character set? You can do so. There is a tutorial section in the manual on how to do this, and the designing of logos and letterheads will be a new cottage industry. Because you may vary the inter-line spacing by increments as small as 1/216in you will be able to design a logo which is as tall as you like.

You want to print twice as fast as before (*ie* at 160 characters per second)? You can. Tests show it runs at the rated speed. You want italics? They're built in, even in the subscript and superscript mode (of which more later). I am not an enthusiast of the design of the italic character set, but hope to redesign it later.

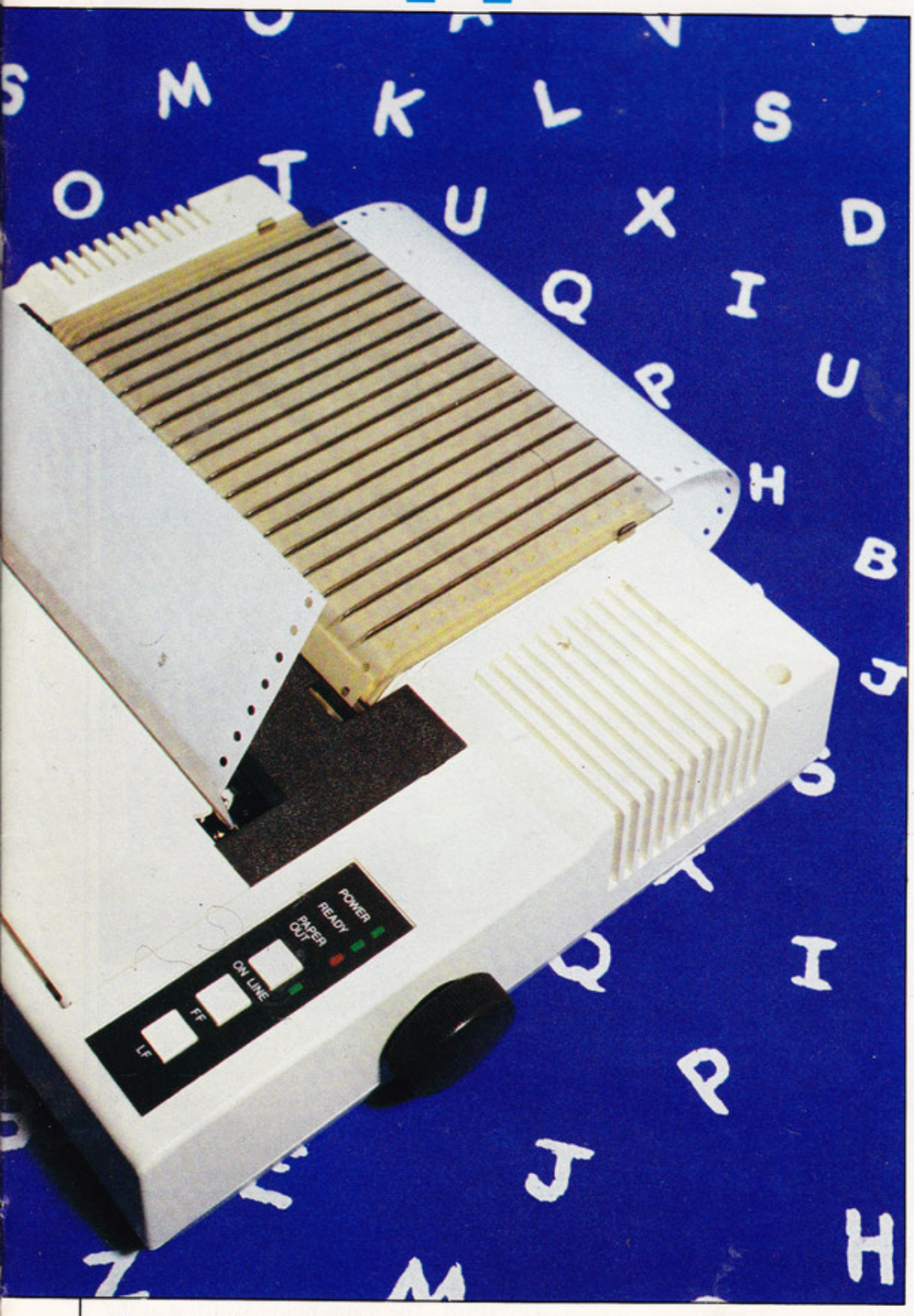
Programmers will be pleased with the ability to go into a mode in which all characters sent to the printer are dumped in hexadecimal.

Double-density, and even quadruple density bit image graphics are readily available.

The FX even permits you to tabulate vertically, both up and down, and can even store information about three separate and different page layouts, so that it will jump about putting in information in a truly impressive way.

The user who is looking for a printer to do letter-quality printing will look very hard at the 12 pitch Elite option. Not only are the characters closer together (12 to the inch instead of the usual ten), but they are smaller too, to keep the proportions correct.

heir apparent



The subscripts and superscripts are really first-class. Not only is a half line feed performed, but the letters are tiny, and are double-struck, with the gaps filled in, so that they look very close to a daisywheel quality. I find these small letters very useful for putting telephone numbers and disk directory listings onto small areas.

The printer also has a quiet mode, in which it prints at half speed.

When you are not using the 2K RAM buffer for your own character set, it acts as a print buffer which takes the output of your computer as fast as it can send it, leaving the computer free for other work. Obviously this is not as useful as a 16K buffer, but it will speed your work when smaller jobs are being done.

The manual is a very well-produced large book, and is written in English, not a combination of English and Japanese. This is just as well, since the number of codes you can send to the printer is very large indeed, and you will need to refer to the book often in order to get the best out of the printer. In fact the keen user will re-read the manual at intervals in order to re-discover those facilities long-since forgotten.

A very good innovation in the way of commands arises because Epson has clearly decided that the number of possible combinations of printing modes is such that the user will find the use of multiple escape sequences a nuisance. It has, therefore, provided a table in the manual which will set up any combination of modes you choose.

The command is CHR$ (27); "!"; CHR$ (n) where n is any decimal value between 0 and 63. This is very convenient, and emphasises the range of possibilities. The manual gives a good illustration of every mode so that you can select the font you want.

For the benefit of readers who are not familiar with the Epson range in general, it is worth considering the features that have made the range so popular.

First and foremost must be the attractive character set. The 11 × 0 matrix gives a free rein to the character designer, and the result is something much improved on the quality of much printout.

If you use the double strike mode of printing, the printer does not merely bash it again. It moves the roller by 1/216in before doing so. The result is the filling in of the gaps to a large extent, so that the reader, while not being fooled into thinking the printing was done on a daisywheel, will nonetheless feel that quality has been approached.

In addition you have the enhanced mode, which strikes again when the head has moved along a fraction, so you can embolden the text in two ways, simultaneously if you wish.

You also have available a very pleasant set of condensed characters, which prints at 16.5 characters to the inch, and is very useful for tables of figures. In this mode you will obtain a maximum number of 137 characters per line.

Double-width characters are also available, which are useful for headings, and stand out well if you have them struck twice. You may use this mode to double the width of the condensed characters so that you end up with 68 characters to the line.

Verdict

If you are considering one of these printers, the best thing you can do is to have a demonstration of the machine, since it is really impressive, and the combination of character sizes and degree of density of print available is so wide that you will find your most exacting requirements provided for.

The machine is not cheap, at a recommended retail price of well over £400 including VAT, but the reputation for reliability and the wealth of facilities make that a very reasonable price.

Machine FX80 Epson Dot Matrix Printer. Pinfeed and Friction **Price** £438 including VAT **Speed** 160 cps **Interfaces** parallel Centronics optional IEEE etc. **Contact** Westrex, Greenford, or Epson UK Wembley

The JP101 is the first printer Olivetti has produced for the micro market. Drew Athol reviews it.

A spark of genius

Sooner or later Olivetti was bound to produce a printer aimed at the personal computer market. The new JP101 (about to be marketed by Acorn as the JPI) is that printer — a non-impact spark-jet machine that prints text and graphics using ordinary paper. It falls in the medium price range of printers.

The JP101 is a state-of-the-art machine, made in Singapore. The test print poses the cheeky question: 'Don't you think JP101 is the ideal printer for micro and personal computers?' This naturally made me itch to put it to the test.

Setting it up

The printer arrives in the inevitable cardboard box, which seemed adequate for the weight. For your £359, you get the printer (packed in styrofoam end cheeks) with a 13 amp mains plug fitted to its fixed mains lead, a box of four ink cartridges, a dust cover (now why doesn't everyone do that?), paper roll supports (another nice touch), a test print, and a manual.

But after so many signs of attention to detail, the manual was a disappointment. It is badly produced, with several misprints, a few downright errors, and the occasional poor translation — for example: 'In this way the blocked print can be relaunched.' It would also be difficult for beginners to understand.

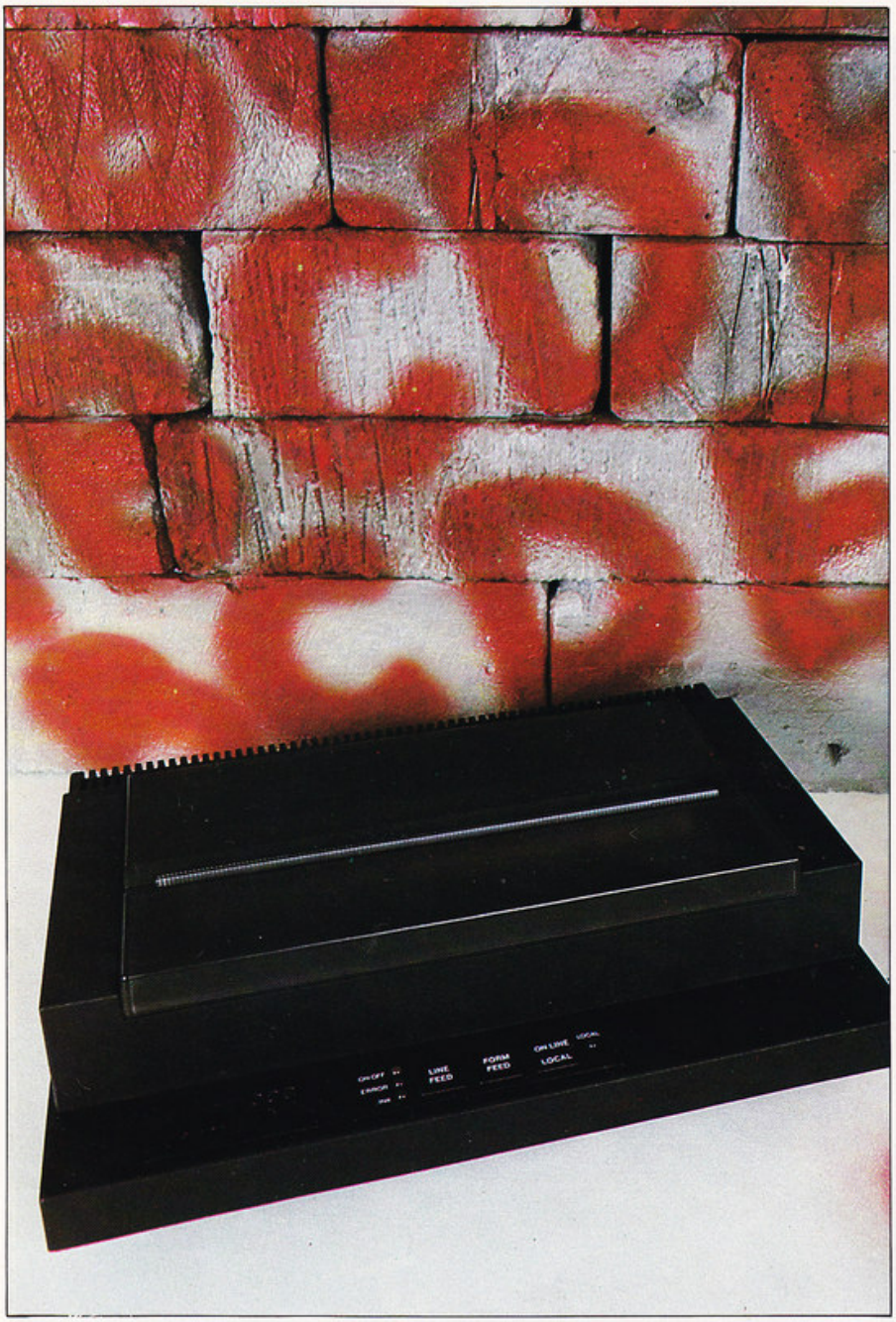
Physically, the printer is pure sleek high-tech, with no ugly knobs or tractors protruding to spoil its clean lines. All the components are mounted on the sheet metal baseplate, which fixes to the black plastic cover by means of four chunky captive screws. Internal DIP switches set default language set and form length (11 or 12in). The hinged frosted plastic lid includes a tear bar for use with paper rolls.

In its standard version, the JP101 has only a parallel (Centronics) interface through a 36-pin Amphenol connector, but a version with a serial board, which allows RS232 and 20ma current loop connections as well, is available at a cost of £414.

The JP101 is controlled by an internal Z80A processor which manages a 1K character buffer. That means you can print a full 24 x 40 page of text without tying up the computer while it prints out. Printing is bi-directional and logic-seeking. Everything possible seems to have been done to make this a fast printer, and it is.

Paper width is restricted to 8-9in for paper rolls, or 8½-9½in for sprocketed paper. Paper rolls are driven by grooved sections on the tractors, which are solid plastic cylinders mounted *under*, not above, the platen. Only the righthand tractor moves; it is held in place by pressure when the platen is closed.

I found the tractor placement and the lack of a paper advance knob made paper loading a me-versus-it affair. Setting the paper physically to top-of-page is accomplished by pulling the paper by hand while pressing the release lever at the left of the platen.



Rogue Images

In use

I had one false start when I connected the JP101 to an Osborne 1, using the parallel cable for an Epson printer. About every thousandth character (I didn't actually count) printed twice. Olivetti diagnosed an incompatible cable, and when I checked the Olivetti and Epson MX80 manuals against each other, I found a couple of minor differences. Moral: always use the proper cable.

No problems, though, when I hooked up the printer to a BBC Model B. This was not surprising, since the Beeb uses a somewhat sawn-off parallel connection.

There are very few controls on the JP101. The mains power switch is at the rear, and three large push-buttons on the front panel provide the usual linefeed, formfeed, and local/online functions. Four LEDs, also on the front panel, indicate (mains power) on/off, error, ink (low) and local. Print density is easily adjusted with a thumb-wheel at the bottom of the left-hand side of the machine. This control varies the voltage applied to the plate.

If you open the hinged lid while mains power is on, power to the plate is cut, the printer is put into local mode, the 'error' LED lights, and an awful, nasal bleep

sounds. The term 'audible alarm' is particularly apt in this case.

Since the JP101 prints text a line at a time, rather than a character at a time, speed is quoted as 50 lines a minute for full 80-character lines, using ten characters to the inch. This works out at almost 67 characters a second. Program listings print rather faster, due to the shorter lines. I achieved a typical speed of about 80 lines a minute, or about 80 characters a second, for program listings.

But there is one advantage this machine has that makes it well worth the wrestle of paper loading, and that is the noise it doesn't make. To simulate the noise it *does* make, scrape a finger nail along the sides of the teeth of a comb; it really is as quiet as that.

However, the myriad sparks produced while printing generate lots of ozone. Whether this will become a selling point in these ecological times remains to be seen.

With no ribbon to fade or wear out, print density is consistent right to the very end of an ink cartridge. Cartridge life is claimed to be roughly 150,000 characters, which seemed to be fairly accurate, although I didn't count exactly.

Software features are fairly standard, with a choice of ten, 12, or 18 characters to the inch (giving 80, 97, and 147 characters to the line, respectively), six or eight vertical lines to the inch, variable line spacing, a choice of eight extra language sets (USA, British, German, Spanish, Danish, French, Italian, Swedish/Finnish and Norwegian), three types of underlining, and bit-image graphics. Horizontal and vertical tabs are supported, and graphics can be inverse (white-on-black) and/or 'zoom'. 'Zoom' doubles the image size, both horizontally and vertically.

Text print quality is adequate, but the 7 x 7 matrix (7 x 5 at 18 characters to the inch) makes lower-case letters look ragged. Except for rough drafts, the JP101 couldn't be used for word-processing, especially since backspacing and overstriking appear to be impossible.

Graphics quality, on the other hand, is marvellous and I found the graphics flexible and fairly easy to program. I did miscalculate the image size at one point, whereupon the JP101 converted program listings into abstract dot-patterns until I switched it off and on again.

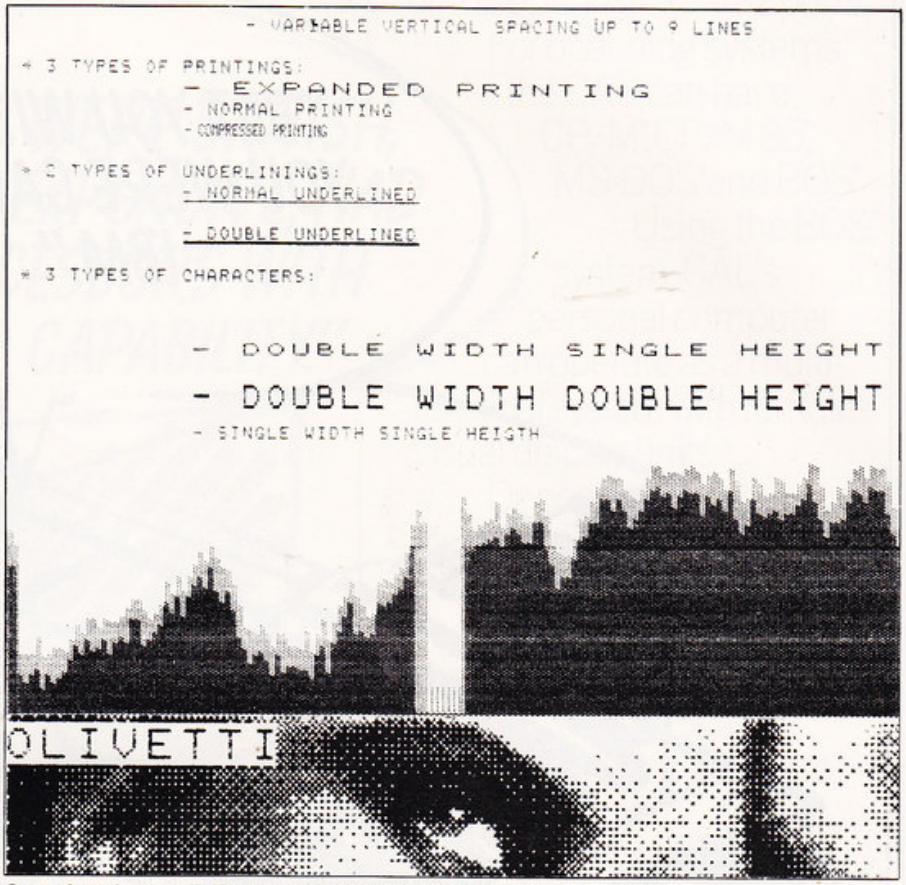
When you use the graphics mode, carriage returns and formatting into lines are handled by the printer. All you need to send it is the actual hex characters for the pattern, uninterrupted by control codes.

Verdict

The JP101 will appeal to those seeking a fast, quiet, reliable printer whose print quality need not be brilliant. I am told that solicitors buy these printers because they are quiet, and can print rough drafts of lengthy documents relatively quickly.

The graphics are more flexible and easier to program than on many dot-matrix printers. This feature will definitely appeal to the home user.

Would I buy one? On balance, I found the low noise, high speed and versatile graphics far outweighed the mediocre text quality, awkward paper loading, and shoddy manual, and I would recommend the JP101 to those with about £350 to spend on a printer.



Output from the versatile JP101 spark-jet printer. Text quality is only 'adequate' but graphics quality is excellent — flexible and easy to program.

The ink-jet principle

The spark ink-jet printing principle is a new idea loosely based on laser printing technology. One of the major advantages is a drastic reduction in the number of moving parts.

A spark-jet printer does not contain a ribbon or a conventional print-head; instead, an ink-jet cartridge is propelled across the paper inside a small plastic carriage.

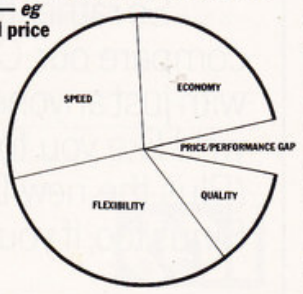
The cartridge is a narrow glass tube with a pinhole-sized nozzle at one end; the other end is sealed. Inside the tube is a rod of compacted ink powder which is held against the nozzle by a spring.

When the cartridge is clipped into place in the carriage, the nozzle travels just above a metal plate which runs the full width of the paper. To print a single dot, an instantaneous high voltage (about 4·7 KV) is applied to the plate. The voltage discharges through the cartridge, causing a spark which fragments a tiny quantity of ink from the rod. The pressure of the spring forces the now-powdered ink out as a jet through the nozzle, printing as a dot on the paper.

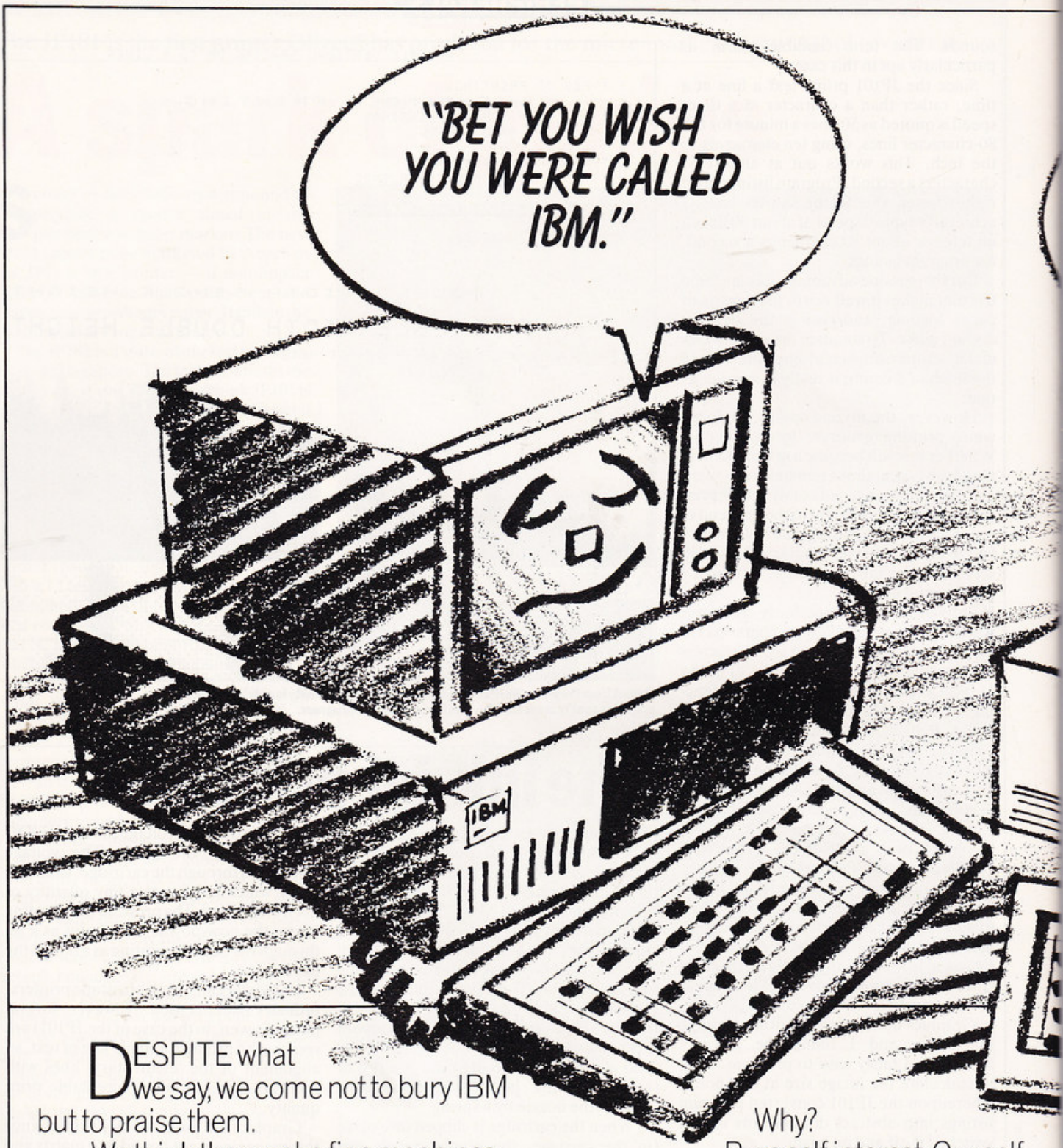
Unlike thermal or electrostatic printers, ordinary paper is used. However, several passes (seven, in the case of the JP101) are required to produce a single line of text, so alignment of the 'elementary' lines with each other is crucial to acceptable print quality.

Graphics are particularly flexible, since the image size is not bound by a matrix and both horizontal and vertical dimensions are user-programmable.

Machine Olivetti JP101 **Price** £359 (parallel only), £414 (serial and parallel) **Interfaces** Centronics parallel (standard), plus optional RS232 and 20ma current loop **Speed** 67-80 CPS or greater **Ink cartridges** £6 per box of four **Outlets** Micro Peripherals, 61 New Market Square, Basingstoke, Hants, telephone 0256 3232.



The PCN Printer Pie roughly indicates the trade-off between the four major printer variables. We assume more speed will mean less of a couple of other variables — *eg* print quality and price (price is represented as its negative value — economy). Excellent value for money will therefore close up the price performance gap.



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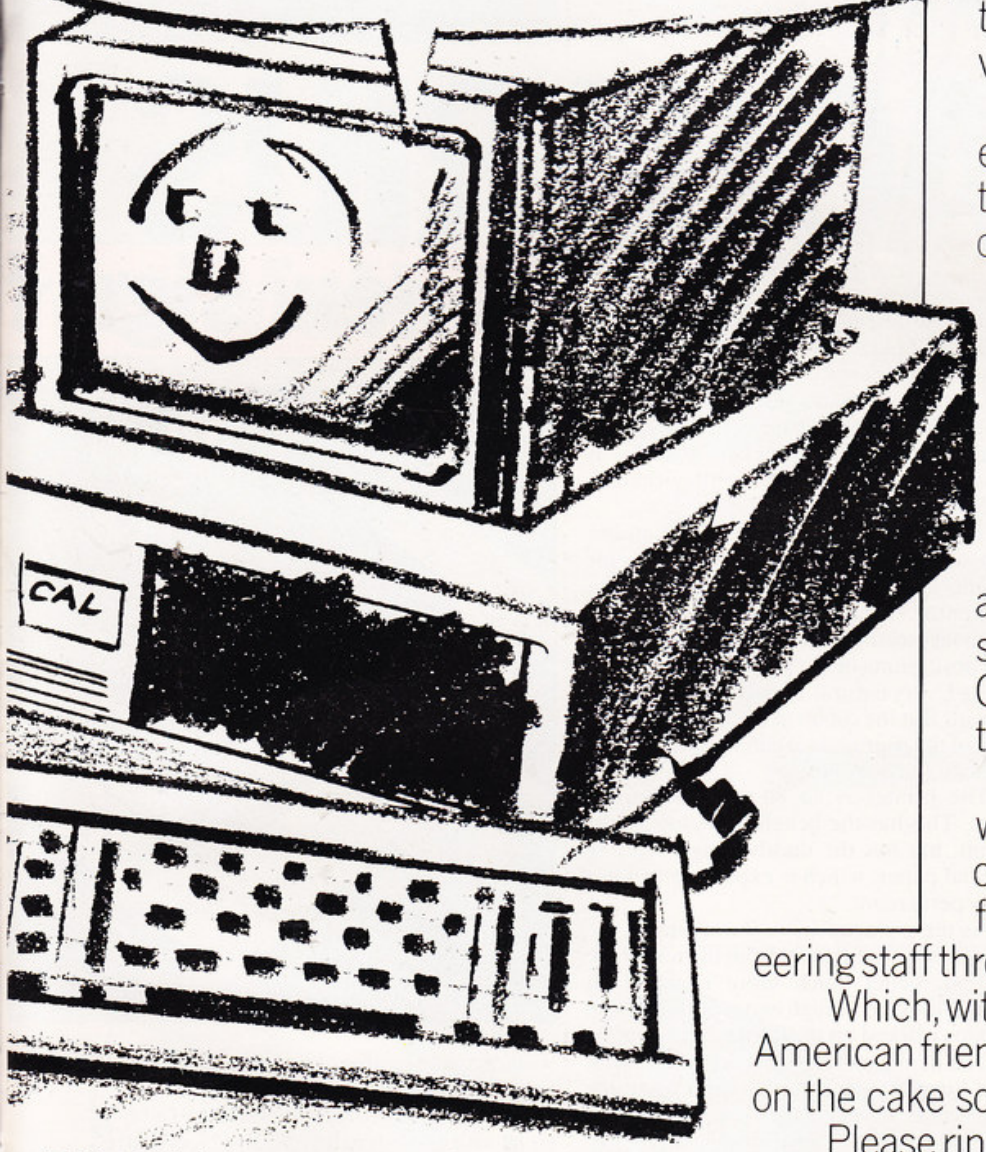

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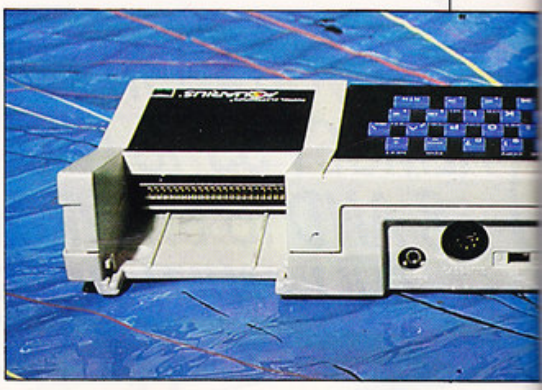
Exclusive! Richard King is first to toy with Mattel's new venture into the micro market.

AQUARIUS

A new sign f



A computer from one of the world's largest toy manufacturers must be reckoned a major event, even if it isn't given an enormous fanfare. The Mattel Aquarius is the machine in question.

The computer field is littered with lethal traps for the manufacturer who chooses to work in the small-home-hobby end — perhaps even more so than at the other extreme, the state-of-the-art end.

Cost-value equations are the determining factor in Mattel's chosen market, and an unwise choice in some tuppenny component or feature can render a machine dead before it's even launched. And the enormous volumes needed to get the price down can make mistakes appallingly expensive.

So the Aquarius must be looked at as a major event, simply because Mattel has the resources to succeed.

Presentation

The toy industry is all about impulse-buying, so attractive and practical packaging is the norm. The Aquarius certainly looks interesting from the outside — the boxes appeared to be fairly tough, but would require extra padding before being launched into HM postal service.

The overall construction of the machine was adequate, but not exactly husky. In particular, I felt that the expansion-modules were rather fragile — they're liable to be left about by children, and if knocked off a table might break.

My overall feeling about the construction was that it was the result of some very fine-tuned cost/benefit analysis equations, and that robustness had been given a low priority.

However, I was glad to find that all the necessary cables and so on were present and correct.

Documentation

The Aquarius documentation is best described as superb — up to a point. This is a home/hobby machine, and the documentation is aimed squarely at the youngish novice. The hardware is given the black-box treatment, meaning that the insides and the workings aren't explained, only the results.

This is no bad thing though, since the emphasis is thereby put on the *operation* of the machine, rather than its functioning.

I particularly liked the 'flipcards'. These are a set of quick-reference cards, printed on stiff laminated board, which are made into a book with wire ring-binding. One cover is made so that it folds out to form a triangular stand.

Each card is on a different subject and has an index-tag at the bottom. This proved invaluable when first getting to know the machine.

The other book was a regular Basic reference manual, with each keyword covered in sequence. This was good, but I felt that it might be a little confusing at times. It wasn't always too easy to follow, but overall was considerably better than most.

Construction

The machine tested consisted of the main console, a small expansion chassis with games-paddles, and a printer. A selection of memory expansion modules were provided, 4K and 16K RAMpacks, and a ROMpack containing a program called Finplan, of which more later.

The console is moulded in plastic, with a very pale grey housing and very dark grey insert. The keys are powder-blue with white legends, and this scheme of two-tone grey and blue controls is repeated on the other components.

On the right hand side there is a panel which can be pulled out. This reveals a multi-way connector socket, and this is where a selection of expansion devices may be plugged in.

The most useful was the expansion chassis, which carries two more sockets for memory modules. When plugged into the computer, it sticks out quite a long way at the back, forming an L shape. This makes the positioning of the printer in the corner of the L very natural, and the result is a neat layout. But the cables at the back get in the way of the printer, so it can't be brought up close to the console.

The printer is an 80-column thermal type. This has the benefit of being totally silent, but has the disadvantage of using special paper, which is expensive and not very permanent.

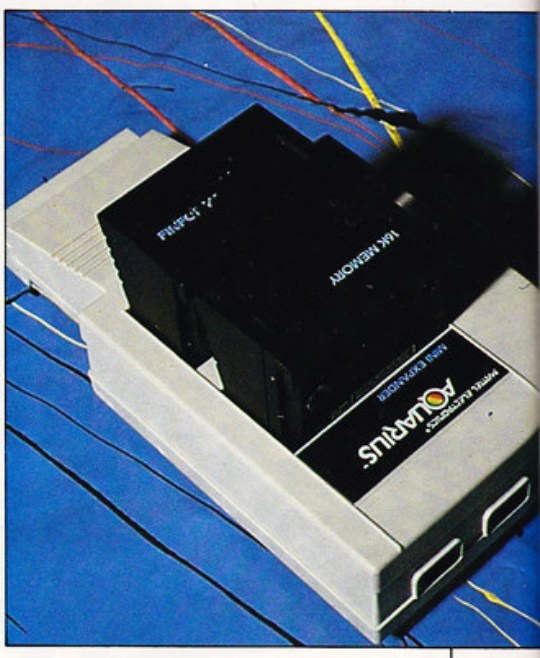
As the pictures show, the styling of the printer is very different from the rest of the system, being much more rounded. It almost looks as though two separate design groups worked on this project.

The keyboard is very much like that of the Sinclair Spectrum, except that it's made of a 'dryer' plastic compound, and doesn't have such a ridiculous number of functions per key.

It's also a membrane keyboard, and the keys have an odd feel — as though they are balanced on top of something, rather like little balls. At first there seemed to be a rather long delay on the keys, causing typist overrun.

Later, I realised that the pressure required to make contact is quite high. This, combined with the wobbliness of the keys, means that if you are typing quite fast you can depress a key and fail to make contact.

Like other keyboards of this type, there is only one shift key, and no space-bar. I don't like it — nor do I see any inherent problem in membrane technology which would make either of these features impossible.



Ian McKinnell

But for better or worse, we seem to be stuck with a standard layout, and I feel that this type of keyboard should stick as close to that standard as possible. It makes changing from one machine to another much easier.

A good feature was the Reset key, which is at the top right of the keyboard. In order to prevent this being hit accidentally there is a little wall around it. A good idea.

One of the most interesting features was the plastic overlay, carrying legends for the special uses of the keys. Only one of these was provided, with Basic keywords which can be entered with a single keypress, *à la* Sinclair. I understand that similar overlays will be provided for other programs.

The Aquarius puts out a signal which can be displayed on a normal television tuned

rom Mattel

to channel 36. Any household TV will do very well as a screen, but there's no provision for using a colour monitor, though.

The display was much as one has come to expect from machines in this class. The Aquarius seems to generate a pale blue background at all times, and the display proper is inside this border.

There are 16 colours, much better than the pseudo-RGB colour-set used by the Spectrum, which has only eight, but they seem rather oddly well-spaced, with a noticeable bias towards blue and green.

The letters were reasonably crisp, and apart from a rather unpleasant crawl in the dark blue, the display was quite acceptable.

Storage

Program and data storage is on normal audio cassette. Mattel sells its own tape unit, but that wasn't included with our review machine.

The recording speed is 300 CPS, which is not very fast, but we've come to expect the sluggishness that results. Recording and playback levels are critical, as always. Why don't the manufacturers pay more attention to this section? It's always foul to use.

Expansion

The connections to the main unit are on the back, apart from the main bus, which is tucked away beside the keyboard, under a slip-out panel. The other connections are a low voltage co-axial power socket, a TV output socket and the tape input and output sockets.

I felt that the expansion connectors on the small expansion chassis, which is the one I tested, might prove a little difficult. There are two of these, one for a RAM expansion pack, one for a ROMpack.

These connectors are covered by a pair of dinky little doors, which are sprung so they stay closed. The desired memory module is pushed through the doors and plugs into the connector at the bottom of the well.

The problem is that the well is quite deep, and it's impossible to see where the two parts are in relation to each other. For an adult, aware of this, it merely takes a little care. A child, perhaps not too patient, might find this frustrating and try to force it.

The relatively fragile modules might break under this treatment. Some form of

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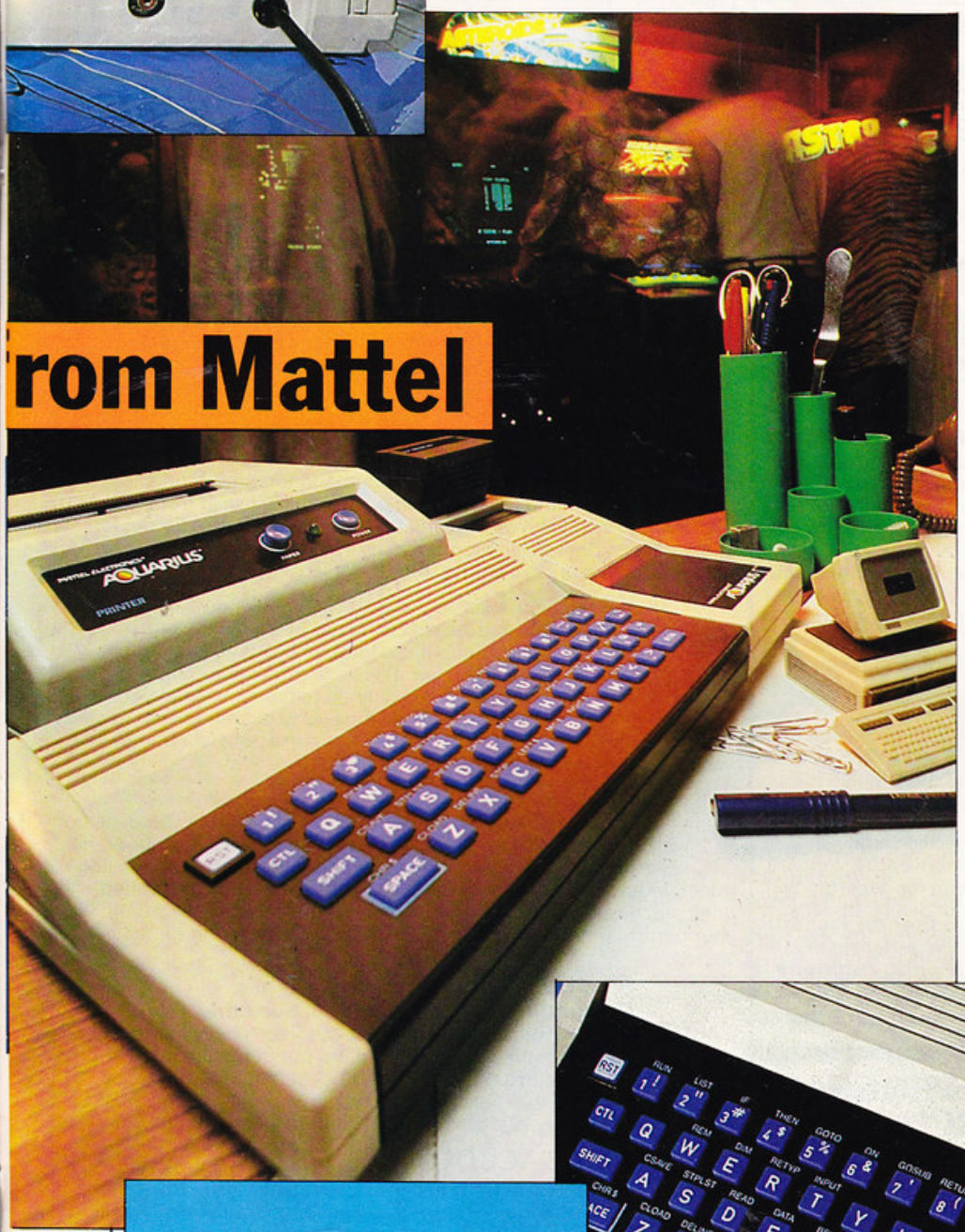

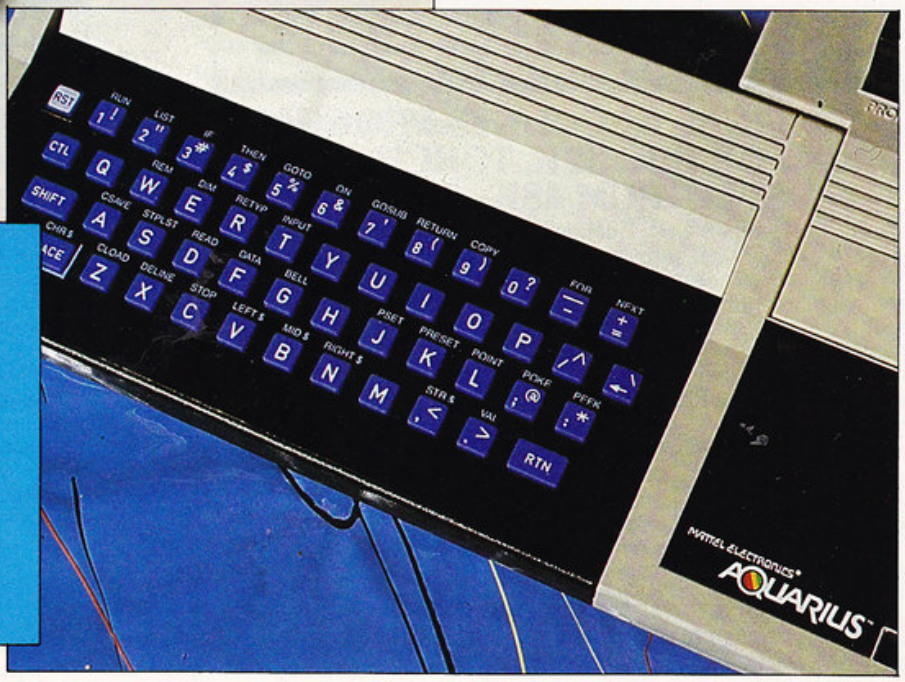

Top — The back of the machine, showing the expansion connector socket, and the cassette, TV and power sockets.

Left — The small expansion chassis with two modules installed. The Finplan ROMpack is at the front (top) and the 16K RAMpack is at the rear.

Above — The Mattel Aquarius could prove useful for school homework as well as being fun to play games on.

Right — The keyboard with the overlay installed.

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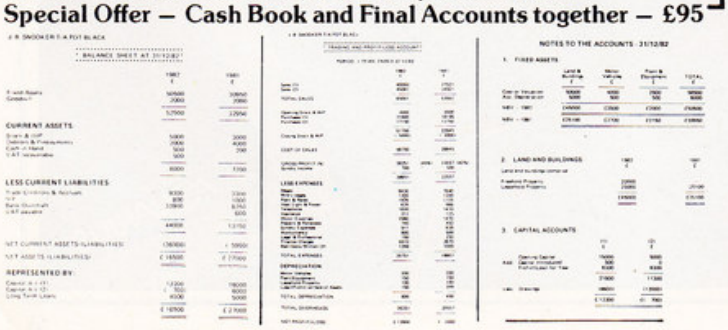

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 2     PROJECTED CASH FLOW              YEAR        ENDED
 3
 4                                      Oct.        Nov.
 5                                       £           £
 6     INCOME
 7     Sales                           11786       10944
 8                                     ------      ------
 9
10     REVENUE EXPENDITURE
11     Purchases                         500         500
12     Advertising                       500        1000
13     Director's salary                1596        1596
14     Salaries                         2216        2216
15     Rent
16     Telephone                                     300
17     Insurance                                     200
18     Printing, stationary                          400
19     Repairs & renewals
20     Hire of equipment                  60          60
   COMMAND BCDEFGPRSTW*?
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Program Availability Chart:-

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Dragon 32k or 64k	●	●	●	●	●			●	●		
VIC 20 (16k +)	●	●	●	●				●	●		
Sinclair ZX81 (16k +)	●										
Grundy Newbrain	●										
Sharp MZ80A	●	●	●	●				●	●		
Sharp MZ80K	●	●	●	●				●	●		
Sharp MZ80B	●	●	●	●				●	●		
BBC Micro model A or B 32k	●	●	●	●	●	●	●	●	●	●	●
Atari 400/800	●										
Torch	●	●	●	●	●	●	●	●	●	●	●
Epson HX-20	●										
Commodore 64	●										

BEEBPLOT & SPECTRUMPLOT £19.95

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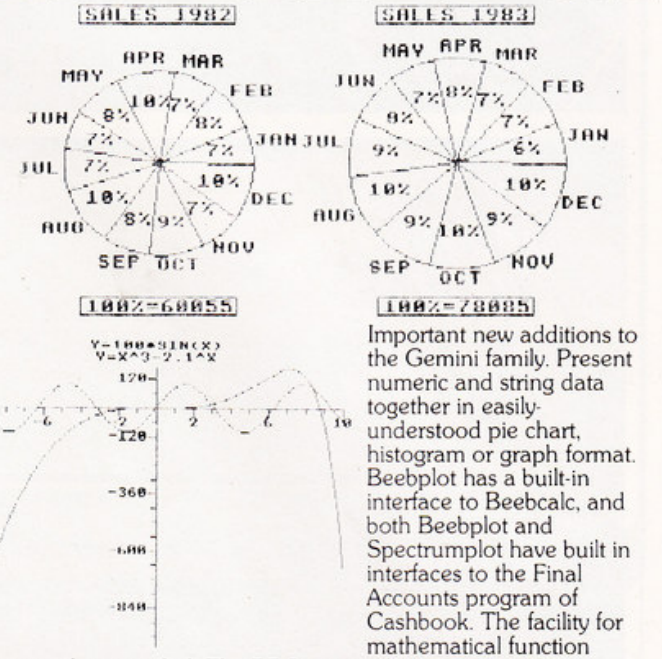

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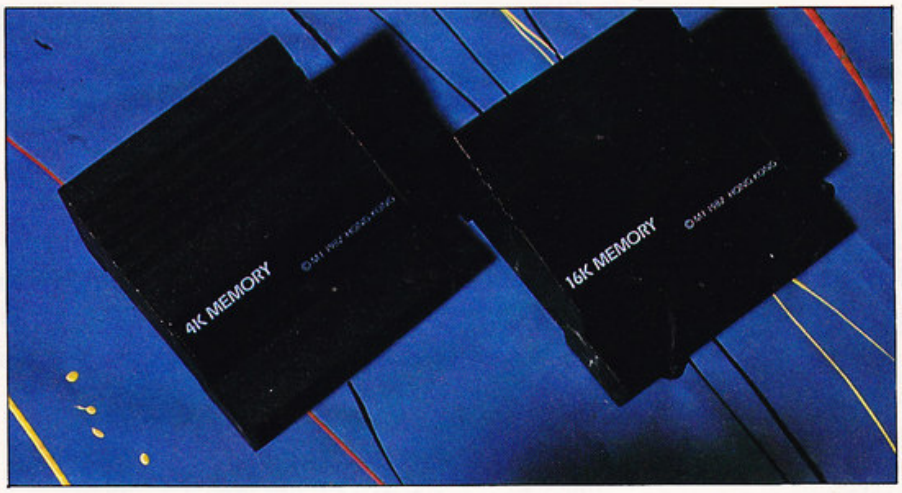

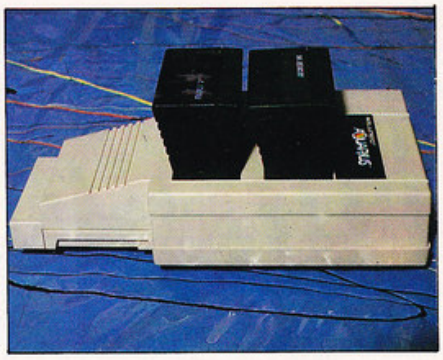

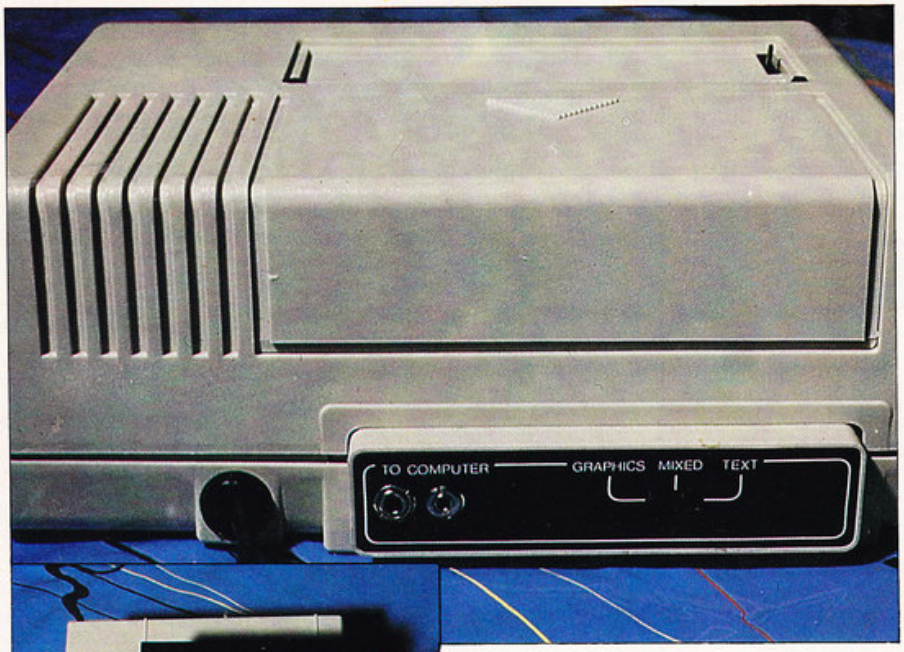

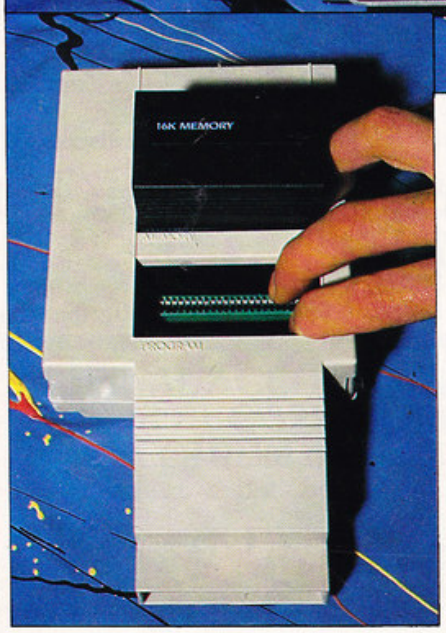

Clockwise from top, a couple of memory modules, the small expansion chassis with the same two modules installed, the printer, the small chassis showing the protective doors, and the rear of the printer.

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guide-rail would have been a good idea to help smaller people to use them correctly.

Operation

In use the Aquarius was quite pleasant. The Basic was pretty standard and didn't seem to have any major problems. Naturally, on a machine in this range there wasn't much in the way of an operating system, just the regular CLOAD and CSAVE type of commands, which were built into the language.

The most interesting item was a ROM-pack carrying a program called Finplan. This, it transpired, was a spreadsheet calculating program. It takes over control whenever it is plugged into the ROM-socket on the expansion chassis or directly into the machine.

This is a good idea, since it eliminates the need specifically to start the program. On power-up or RESET, a preliminary display appears. Pressing ENTER clears the screen and an empty worksheet appears.

Even though there were no instructions for it, I didn't find it at all difficult to use, because in general the commands are very like VisiCalc. That isn't to say I found it good to use, though. In fact I hated it.

There is nothing wrong with the display, though the narrowness of the screen makes it feel a bit cramped, nor is there anything to complain about in the general approach.

The commands which move the cursor are different, as usual, but access to the other commands such as insert, delete and so on is by pressing '/' as normal. In many respects these alternate commands are much as expected.

The trouble is that there are a few missing. 'Replicate', for example. Multiple similar entries (the meat of most spreadsheet calculations) are a pain as a result.

The most serious failing of Finplan, though, was the complete absence of the '@' type of command. The result was no SUM, AVERAGE, MINIMUM or MAXIMUM. Of course, as soon as I found that those weren't available I realised that LOOKUP and NPV (Net Present Value) wouldn't be, either.

So don't expect to do any serious work with Finplan. In fact, don't even expect to learn much about spreadsheets. Finplan just isn't up to it. I don't know why, either, because the code needed to perform the missing functions is not large — in fact, much of it is already there, anyway, otherwise the program wouldn't be a spreadsheet.

I can only suggest that the original specification was drawn up on the assumption that such complex facilities would only confuse the user, so should be left out. The result is a program that will prove even more confusing to use.

Support

The very idea of user-support is a rock on which many companies entering these

48▶

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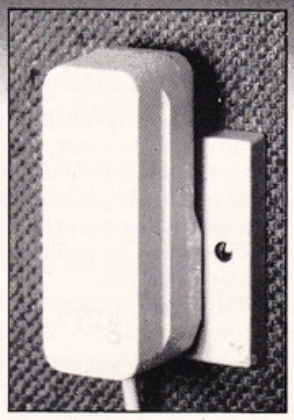

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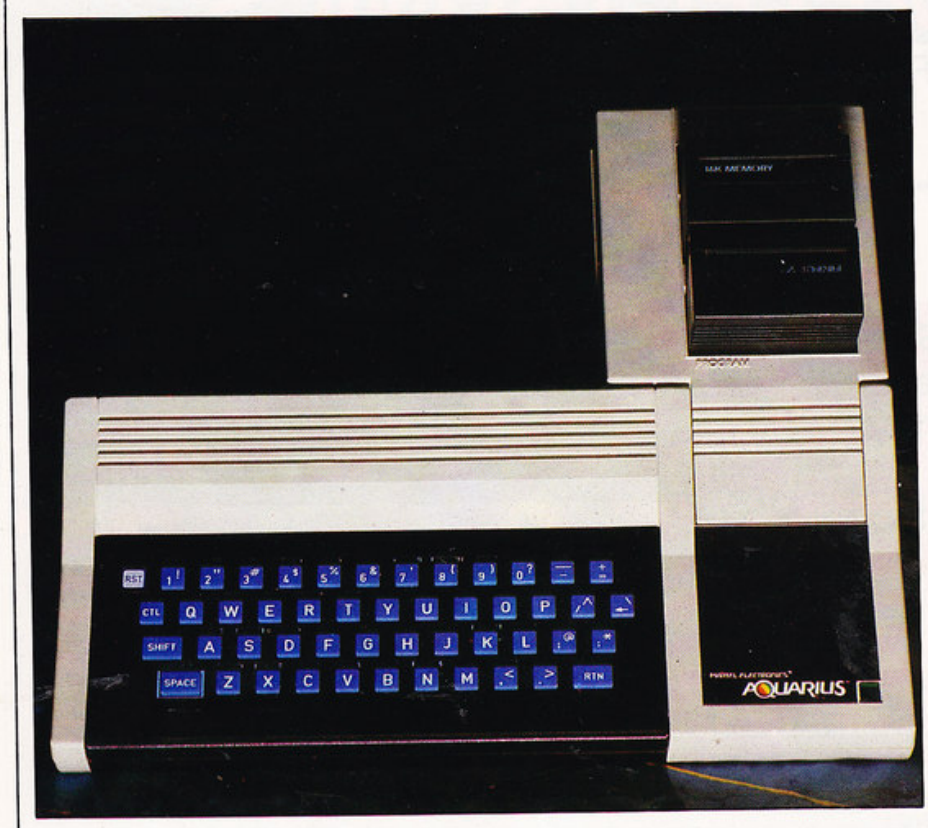

Above — One of the most useful parts of the package is the flip-card quick reference manual.

Below — Colourful, as spreadsheets go, but Finplan has major shortcomings.

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waters has foundered. The problem is that the volumes are so huge, the questions so varied and the profit-per-unit so small that it just isn't economic.

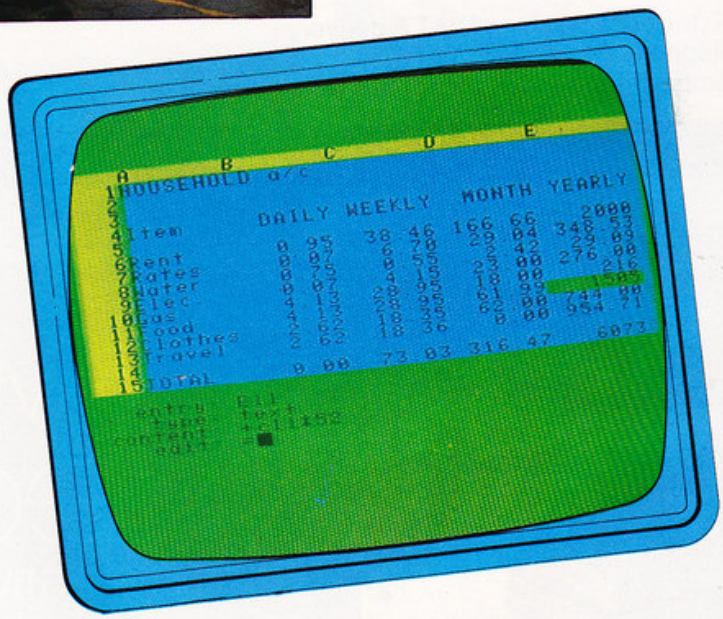
The best support you can get at this level is the shop where the machine was purchased, and that, unfortunately, generally ranges from abysmal to awful. The few really knowledgeable people usually move on to another company just before you hit a real problem.

Fortunately, Mattel seems to have produced a machine which is sufficiently tightly defined to eliminate the worst problems. The modes of operation are solid and simple, with no unnecessary complexities.

I would expect there to be a considerable volume of software for this machine. It is very similar to many others, runs a Z80 and seems to have a decent bus, though it's a bit difficult to tell without full technical documentation.

Mattel will, I hope, make such details available, thus promoting the kind of second-market suppliers which ensure that a machine survives. However, even if they are secretive, they are big enough to assure a reasonable supply of options. Of course, it won't be long before some bright spark with a notebook and an oscilloscope will have extracted its entrails.

The ROMpackaged software idea is gaining ground, and the Aquarius is obviously based on the assumption that this is how most programs will be sold.



packs are produced, either by Mattel or by third parties, the machine will prove itself fully equal or even superior to its competitors.

Certainly, Mattel's strength of will in refusing to claim massive capabilities for its baby is laudable. Too many machines are promoted as being able to do things which they simply will never be up to. It wouldn't be possible to run an integrated ledger system on this machine. . . Mattel does not pretend that you could.

As a first machine it would appear to be an excellent choice.

Summary

Despite my criticism of the keyboard and the shortcomings of the one demonstrable program, I rather liked the Aquarius. I feel that when some more advanced ROM-

SPECIFICATION

Price:	Aquarius computer £109.95, small expansion chassis £49.95, cassette recorder £49.95, printer £139.95, 4K RAMpack £19.95, 16K RAMpack £49.95.
Processor:	Z80
RAM memory:	4K expandable to 52K via expansion chassis.
ROM memory:	8K Basic.
Screen:	40×24, 16 colours.
Keyboard:	Membrane type.
Interfaces:	System bus to expansion chassis.
Storage	Domestic audio tape recorder.
OS/Language:	Basic.
Distributor:	High street stores.

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AWARI

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★ Select the 'Witch-doctor' level and it's a threat to your sanity. We haven't beaten it and we wrote it!

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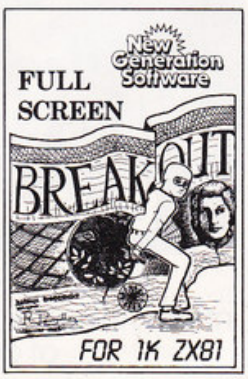

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BALLOONING

ATARI

A flight of fancy

Name: Up Up Away **System:** Atari 400/800 **Price:** £21.95 **Publisher:** Pulsar Software, 051-236 6628 **Format:** Disk/cassette **Language:** Machine code **Outlets:** Mail order, dealers.

It really does make a change to find a game both simple in concept and enjoyable that doesn't depend on the mandatory zapping of aliens for its thrills.

Even so, if this is representative of hot-air ballooning, I'd take up Russian roulette as the odds on staying alive are better.

Fortunately, the disaster level doesn't detract from the appeal of this professional product.

Objectives

Although this is a game for one player, others would enjoy just sitting and watching the antics of the balloon wobbling its way across the sky. This whole game seems so simple you wonder how you're going to enjoy it and still be challenged.

There you are on the ground in a hot-air balloon being fuelled and all you have to do is drift around the sky amassing points by staying aloft until you have to refuel.

To achieve this, just land at the fuel dump, top up, and off you go again. Sounds simple, doesn't it? Well, it would be, if only there were no hazards.

First impressions

As ever, this game comes packaged in the ubiquitous flat cardboard box with an illustration on the front and a bit of tempting blurb on the back. In this case the illustration contains a jolly mixture of the balloonist and some of his hazards tastefully portrayed in cheerful pastel shades.

The disk or cassette is held firmly in the package in its own compartment and the instructions are on a small, well-printed fold-over sheet. The first reaction to the instructions is that they seem too sparse.

However, they do give you all the information you need.

Once you are playing the game, the things that stand out are the very good graphics and sensible use of sound — with the solitary exception of the playing of that most famous dirge, Chopin's Piano Sonata in B Flat Minor each time a life is lost.

It seems a shame this piece of music is as overused in games as it is at state funerals.

In play

Having loaded the program from disk or cassette, it starts by displaying the title page to the tune of *Up, Up and Away*.

This page lets you select your preferred skill level from five options, novice, student, graduate, pilot and expert, using the Select key. The game starts by using the Start key.

This is the only time the keyboard is used — thereafter all action is dictated by the joystick.

Novice level is nice and slow, giving lots of time to get acquainted with the scenario. The screen scrolls from right to left showing your beautiful pink balloon, the passing landscape (trees, hills, church, pub and fuel dumps) plus various fluffy bits in the sky.

The skill levels vary from level to level by allowing you differing amounts of fuel, sand, speed, number of lives (five for novice, four for student and three for each of graduate, pilot and expert) and other random hazards.

These include nasty little boys throwing stones, flying kites, windmills turning to the tune — of course — of *A Windmill in Old Amsterdam* — aerobatic planes and thunder and lightning. And each time one of these hazards hits you, or you run into a tree, your balloon bursts spectacularly and Chopin starts playing yet again.

If you start out flying as a novice pilot, you are automatically upgraded to the next level on completing a couple of trips around the balloonist's world.

As you are flying along a nice touch is that if you manage to stay in the air long enough, *Roll out the Barrel* starts playing as you pass the pub (*pass?*). This comes as a shock the first time it happens, but is welcome thereafter.

This continues for each level until expert is reached. At this stage the speed and hazards are so intense it is necessary to have a strong, sturdy joystick and wrist.

It has to be admitted that the lightning, the stone-throwing boys, the kites and windmill can be dealt with relatively straightforwardly due to the predictable nature of these hazards — but only with care and a lot of study of the phenomena.

Against these features is the totally (as far as I could work out) random appearances and activities of the flying circus which, when coupled to the other hazards and restrictions, make this a very demanding game at the upper skill levels.

Verdict

This is a professionally written and presented game incorporating just the right blend of humour, skill, graphics and sound plus the randomness of the flying circus to keep you on your toes or preferably in the air.

The graphics really are very good, to such an extent that while the game was being played a throng formed to watch what was happening.

The fact that the game, in all honesty, is really a very simple concept and is only made challenging by the inclusion of dubious real hazards should not detract from the enjoyment it gives both players and watchers.

At the price it may not be the best value for money game available, but it is quite likely to start a trend towards less violent high quality graphics games.

Nigel Cross

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	

CASH PRIZES

ZX81

Ten grand puzzles

Name: Krakit **Application:** Quiz **System:** ZX81, 16K **Price:** £9.95 **Publisher:** Artic Computing, 0482 75284 **Format:** Cassette **Language:** Basic and machine code **Other versions:** Spectrum, 16K **Outlets:** Mail order.

If you fancy the idea of making £10,000 simply by playing a game, then Krakit from Artic could be the program for you.

It's another attempt to follow in the footsteps of the Masquerade book, by setting a series of riddles which lead to a real — and substantial — treasure. But you don't get the benefit of a book filled with pretty pictures that Masquerade had to offer.

Objectives

To get sight of the ten grand, you have to crack no less than 12 clues. Each clue solved will give you the name of a country, city or town, and a number between one and six digits long.

When you find the answers and note them on the 'clue page' provided, you fill in the registration form that comes with the cassette, dash to the nearest postbox to send the answers to the address supplied. Then you wait and hope . . .

You can run the program as many times as you like, and SAVE intermediate answers on cassette, so you don't have to solve the whole puzzle in one sitting.

First impressions

Krakit comes with very brief instructions and rules for play, plus the clue page. You also get a registration form which has to be filled in as soon as you buy the quiz. But most of the documentation comes as a program called 'Rules', which is the first piece of software on the cassette.

In use

The first thing you see is a display declaring that two people have died, but their legacy of £10,000 has been deposited in a bank account somewhere in the world. You have the choice of seeing the clues, storing your answers, seeing or SAVEing your answers.

The clues are very difficult to solve, as you might expect. There are two types — rhymes, or pieces of code. After a mere six hours spent trying to solve the first clue, I gave up in despair.

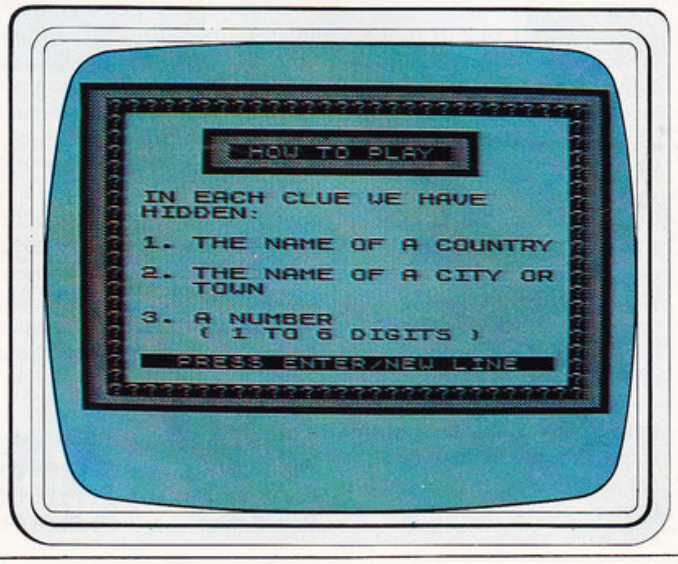
Verdict

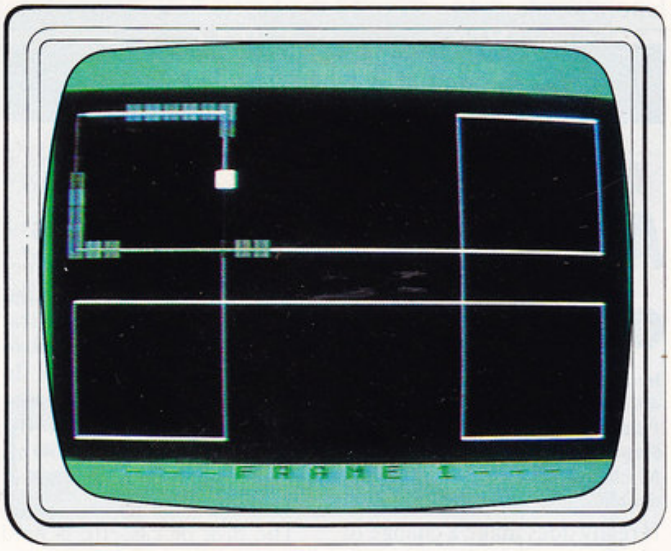
Once somebody wins the prize, there will not be much use for Krakit. I did not think much of the idea, since I could not see why you would want to use a computer to solve riddles.

A book, at least, you can carry around and try to solve the puzzles on the bus — and have pictures to look at. But with Krakit you'll be left with a piece of cassette tape and not much more. **David Janda**

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	





SPECTRUM

Cops and robbers

Name: Cruising on Broadway **System:** Spectrum, 16K **Price:** £4.95 **Publisher:** Solarsoft, 01-930 3266 **Format:** Cassette **Outlets:** WH Smith.

The Lullaby of Broadway this game isn't. It is a cops-and-robbers style chase that screams down that New York thoroughfare — depicted in the stylised form of different patterns of lines. Cash prizes are up for grabs for the highest scores notched up this year.

Objectives

The game, actually called Cruising on Broadway, is for one player, who has to race along various different sets of lines in the shortest possible time. At the same time you avoid a little square chaser.

Your only defence is to create a temporary gap in the line. This holds up your pursuer.

You score points for the length of line you manage to cover and the time you take to do it. Each time you complete a frame, you get either a more difficult one or an earlier one with extra chasers.

Although the game is unbeatable, you can enter your high score on a points table and print it out at the end of the game to claim a prize.

First impressions

There's nothing sophisticated about the graphics or sound in this game, but despite this it is gripping and exciting. It comes as a cassette with a set of straightforward loading instructions, complete with a portrait of the author, and I found no problems in getting the hang of it.

In play

Your 'car' tears around a geometric racetrack, changing the colour of the track as it goes. You pause only to press a key to drill a hole — which quickly disappears — in your pursuer's path.

The game is written in machine code, and is fast. There is no time-limit within which you must complete a frame, and you can earn a time bonus if you are quick.

The game cannot be PAUSEd or SAVEd, so make sure you avoid interruptions.

If the chaser catches you, the game must start all over again at the first frame. No second chance is given, and the frustration of losing everything just as you approach a new high score could be terminal.

Verdict

'Cruising' is proof that the simplest ideas are often the best. It is simple and fast, and I found it highly addictive during the weekend I played it. I don't really see where Broadway comes in, since the graphics are nothing fancy, but I suppose it sounds more impressive than 'Cruising on Lime Street'.

All in all, despite the player only getting one chance in a game, I found it both good entertainment and good value. **Roger Tiplady**

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	

SHOOTING MATCH

VIC-20

Save the succulent

Name: Kaktus **Application:** Shooting game **System:** Vic-20, 8K memory expansion, joystick optional **Price:** £7.95 **Publisher:** Audiogenic, 0734-595647 **Format:** Cassette **Language:** Machine code **Other versions:** None **Outlets:** Mail order, high street dealers.

The good news is that this is a good, challenging game that makes imaginative use of the Vic's graphics. The bad news is that you need at least an 8K expansion to run it.

You'll have to look fairly hard at the box to discover that because it's printed in pretty small type on the spine.

Objectives

A cactus in the centre of the screen is being eaten by wasps and hornets. You are a gopher who must scamper from left to right in a tunnel under the cactus, shooting at the insects to protect the cactus. (So, who said game scenarios had to be logical?)

First impressions

When the game begins, the graphics are invariably off-centre. You can move them back with the cursor controls, but take care not to move them over too far. If you do, you cannot move them back again. All you can do is restart.

In play

There are more than enough hazards in this game to keep you on your toes. The insects release acid drops, which can eat away the ground over the gopher's burrow. If they hit the gopher himself, he is killed. On the other hand, they do provide extra holes to fire through.

Your gopher is allowed to come out of the burrow into the open, but it's difficult to see why, since out there, he is much more likely to be hit by the acid drops and is a lot less mobile.

He is also in danger of being trapped above ground by the occasional mole, who closes up the entrance to his burrow.

The game ends when all three lives are gone, or the insects succeed in eating away the base of the cactus so that it falls.

You control the game with a joystick, or failing that, with reasonably easy-to-use keys — but the L key, which you use to fire, does not repeat if you hold it down.

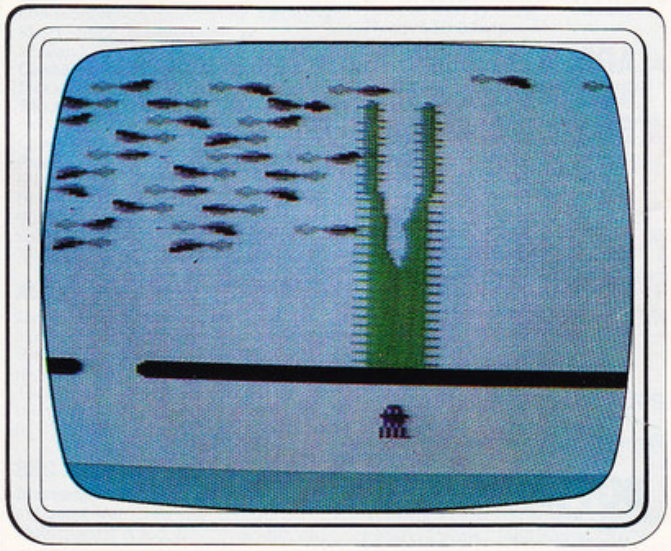
Verdict

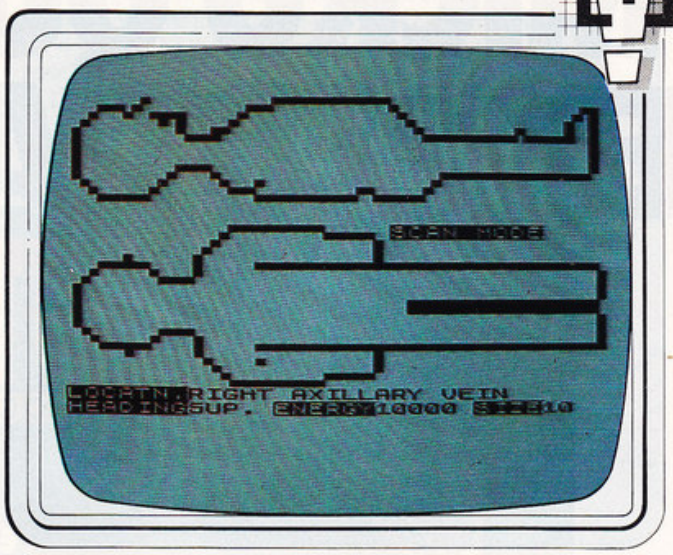
Though obviously inspired by Space Invaders — nothing wrong with emulating a classic — Kaktus is sufficiently different to interest players who have got bored with variations on the alien attack theme. The graphics, though simple, are effective, and the mole provides enough of a 'wild' element to add to the general interest.

Karl Dallas

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	





ZX81

Enemy within

Name: Fantastic Voyage **System:** ZX81, 16K **Price:** £5.95 **Publisher:** Foilkade, 0225 834981 **Format:** Cassette **Language:** Basic and machine code **Outlets:** Mail order.

A shootout with a real difference — that's Fantastic Voyage. Instead of facing waves of lamb-chop-shaped invaders or mincing meteorites, you pilot a microscopic submarine through the veins of a human body, battling against rogue white blood cells to hunt and destroy a blood clot in a brain capillary.

Objectives

You are injected into a right arm and must make your way to the brain by navigating through the body's bloodstream.

Your aim is to destroy the blood clot and to do so you have four difficulty levels.

First impressions

The instructions you get are on a very small piece of paper giving details of the commands you may use in the three modes of play, and a map of the blood circulatory system you must travel along.

Some heavily medical terms are used for the different veins and arteries, and I couldn't understand half of them!

In play

I went straight into scan mode, which gave me a side and front view of the patient. My submarine was a tiny dot in the right arm, where I had been injected. Also on display were my energy level, direction, and size, which gets larger the longer you stay in the body.

After a good while looking at the map, I managed to get to the right brain capillary. So I switched to view mode, where I used the 'L' and 'R' keys to steer along the artery; the movement of the submarine is very well done, as you see the artery walls moving past you.

Suddenly a bug-eyed monster — actually a white blood cell — moved in front of my sub, and I was automatically put into attack mode. This gave me control over the 'Z', 'X', 'N', 'M', and 'B' keys to let me move up, down, left, right, and fire, as well as display the rogue white cell in front of me.

Destroying white blood cells is none too easy. They jitter about the screen at a rapid rate and you have to use laser power sparingly, as it consumes valuable energy.

Still, I got rid of it in the end, and the computer put me back into view mode to carry on the clot hunt. But I never found it!

Verdict

A very good game indeed, blood clot or no blood clot. Not only is the theme interesting, but there's some very clever programming at work here. There is a good deal to do.

My only grumble, apart from the missing clot, is that there are too many white blood cells to be dealt with — and surely losing all those cells can't do the patient too much good?

David Janda

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	

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CLUBNET

Clubnet keeps you in touch with the microcosm of personal computer enthusiasts throughout the UK. It is divided into two sections — clubs and user groups.

We publish a list of each section on alternate weeks, and this week is the turn of user groups.

Entries include up-to-date information as far as possible, and group organisers should let us know of change.

And if you've just started your own club drop us a line and we'll spread the word. Write to: Clubnet, *Personal Computer News*, VNU, 62 Oxford Street, London W1A 2HG.

The listing is based on information supplied by the Amateur Computer Club.

USER GROUPS

Acorn

Acorn Atom User Group. Subs: £4. No meetings but quarterly newsletter. Contact Peter Frost, 18 Frankwell Drive, Coventry, 0203 613156.

Manchester Acorn User Group. Meets at AMC, Crescent Road, Crupsall, Manchester 8 on Tuesdays except school holidays, fees: £1. Contact John Ashurst, 192 Vendure Close, Failsworth, Manchester, 061-681 4962.

Medway Acorn User Group. Meets at St John Fisher School on last Monday of month at 7pm. Session at 9pm Thursdays at the Fox & Hound, Chatham. Contact Clem Rutler, c/o St John's Fisher School, Ordance Street, Chatham, Kent, 0634 42811 (day), 0634 373459 (eve).

National Acorn Atom User Group. Program magazine. Contact Alan Carr, 105 Fairhole Avenue, Gidea Park, Romford, Essex.

Apple

Apple Music Synthesis Group. Contact Dr David Ellis, 22 Lennox Gardens, London SW1.

Apple Users Group. Contact Steve Profitt, The Granary, Hill Farm Road, Marlow Bottom, Buckinghamshire, 062-84 73074.

Bristol Apple Users & Dabblers. Meets at 10 Waring House, Redcliffe Hill, Bristol BS1 6TB, once a month. Newsletter. Contact Ewa Dabkowski, c/o Datalink, 10 Waring House, Redcliffe Hill, Bristol BS1 6TB, 0272 213427.

British Apple Systems User Group. Meets at Old School, Branch Road, Park Street, St Albans, Hertfordshire, on first Tuesday and third Sunday each month. Annual subs: £12.50, joining fee: £2.50. Publishes magazine. Contact John Sharp, 09273 75093.

Croydon Apple User Group. Meets at Sidda House, 350 Lower Addiscombe Road, Croydon, on second Monday of month. Subs: £5, £10 commercial members. Contact Paul Vernon, 60 Flawkhurst Way, West Wickham, Kent, 01-777 5478.

Milton Keynes Microcomputer User Group. Meets every Tuesday, 7.30pm. Contact Brian Pain, Sir Frank Markham School, Woughton Centre, Chaffron Way, Milton Keynes.

Atari

Birmingham Users Group. Meets at the Malaga Grill, Matador Public House, Bull Ring shopping centre, Birmingham, on second and fourth Thursday every month at 7.30pm. Subs: £5. Meetings: 25p members, 50p non-members. Contact Mike Aston, 42 Short Street, Wednesbury, W Midlands.

Carshalton Atari User Club. Contact Paul Deegan on 01-642 5232.

Silica Atari 400/800 User Club. New club, library planned, newsletter. Contact Richard Hawes, 01-301 1111.

Preston Atari Computer Enthusiasts. Meets at KSC Club, Merrion House, Beach Grove, Ashton, Preston, on third Thursday of month at 7.30pm. Subs: £5. Contact Roger Taylop, 0253 738192.

Atom

Liverpool BBC and Atom User Group. Meets at Old Swan Technical College, Room C33 on first Wednesday of month at 7.30pm and at Birkenhead Technical College on third Thursday of month at 7.30pm. Contact Nick Kelly, 051-525 2934 (evenings).

BBC

Bournemouth BBC Users Group. Meets at Lansdowne Computer Centre, 5 Holdenhurst Road, Bournemouth, on first and fourth Wednesdays of month at 7.30pm. Contact Norman Carey, 0202 749612.

BEEBUG. Ten magazines with programs. Discount deals, library and query service. Contact Sheridan Williams or David Graham at PO Box 50, St Albans, Hertfordshire AL1 2AR.

Brent Barnet Users Group. Meets on last Sunday of month. Subs: £3. Newsletter. Contact Joseph Fox, 4 Harman Close, London NW2 2EA.

Preston Area BBC Micro User Group. Meets at Boatmans Arms, Marsh Lane, Preston, on last Thursday of month. Subs: £5. Contact Duncan Coulter, Membership Secretary, 8 Briar Grove, Ingol, Preston, Lancashire, 0772 725793.

Comal

Comal User Group. Meets at Polytechnic of North London, Holloway, on second Wednesday of month, term time. Subs: £7.50. Contact John Collins, 75 74111.

Commodore ICPUG

Barnsley. Subs: £7.50. Contact Bob Wood, 13 Word Green, Barnsley, South Yorkshire. 0226 85084.

Blackpool. Meets at Arnold School, Blackpool, on third Thursday of month. Contact David Jarrett, 197 Victoria Road, Thornton Cleveleys, Blackpool FY5 3ST.

Carrickfergus. Contact David Bolton, 19 Carrickburn Road, Carrickfergus, Antrim BT38 7ND, 09603 63788.

Cheltenham. Meets at The Cheltenham Ladies College on last Thursday of month at 7.30. Contact Alison Schofield, 78 Hesters Way Road, Cheltenham, Gloucester, 0242 580789.

Clwyd. Contact John Poole, 6 Ridgeway Close, Connah's Quay, Clwyd CH5 4LZ.

Corby. Contact Peter Ashby, 215 Wincohn Way, Corby, Northamptonshire, 05363 4442.

Derby. Meets at Derby Professional Colour every other Tuesday at 7pm. Contact Robert Watts, 0332 72569.

SE Canterbury. Meets at The Physics Lab, Canterbury University, on first Tuesday and Wednesday of month. Subs: £7 adults, £3.50 juniors. Contact R Moseley, Rosemount, Romney Hill, Maidstone, 0622 37643.

Coventry. Meets at Stoke Park School & County College at 7pm on fourth Wednesday of month except July, August, December. Subs: £2.50. Contact Will Light, 22 Ivybridge Road, Styvechal, Coventry, Warwickshire.

North-East Pet and ICPUG. Meets at Lawson School, Burnley at 7pm second and third Mondays of month. Contact Jim Cocallis, 20 Worcester Road, Newton Hall Estate, Durham.

Dyfed. No meetings, software library. Contact Simon Kniveton, 097 086 303.

Hainault. Meets at Grange Remedial Centre, Woodman Path, Hainault. Contact Carol Taylor, 101 Courtlands Avenue, Cranbrook, Ilford, Essex.

Glasgow. Contact Dr Jim MacBrayne, 27 Daidmyre Crescent, Newton Mearns, Glasgow, 041-639 5696.

Gloucester & Bristol Area. Meets at 23 Sheppard Leaze, Wotton-under-Edge, Gloucester, on last Friday of month.

Hampshire. Meets at 70 Reading Road, Farnborough, on third Wednesday of month. Contact Ron Geere, 109 York Road, Farnborough, Hants, 0252 542921.

North Herts. Meets at Provident Mutual Assurance, Purwell Lane, Hitchin, on the last Wednesday of month. Contact B Grainger, 73 Minehead Way, Stevenage, Herts SG1 2HS, 0438 727925.

Kilmarnock. Meets at Symington Primary School on first and third Thursdays of month at 7pm. Software library. Contact John Smith, 19 Brewlands Road, Symington, Kilmarnock KA1 5RW, 0563 830407.

Liverpool. Meets at The Merchant Taylor School for Boys, Crosby, on second Thursday of month at 7pm. Software exchange. Contact Tony Bond, 27 Ince Road, Liverpool L23 4UE, 051-924 1505.

London. Contact Alan Birks, 135 Queen Alexandra Mansions, Judd Street, London WC1, 01-430 8025.

North London. Contact Barry Miles, Department of Business Studies, North London Polytechnic, Holloway Road, London N7, 01-607 2789.

Norfolk. Contact Peter Petts, Bramley Hale, Wretton, King's Lynn, Norfolk PE33 9QS, 0366 500692.

Northumberland. Proposed new club. Contact Graham Saunders, 22 Front Street, Guide Post, Northumberland.

Slough. Meets at Slough College on second Thursday of month at 7.30pm, visitors — 65p adults, 40p students. Contact Brian Jones, 53 Beechwood Avenue, Woodley, Reading RG5 3DF, 0734 661494.

South-East Regional Group. Meets at Charles Darwin School, Jail Lane, Biggin Hill, Kent, on third and fourth Thursday of month at 7.30pm. Subs: £7.50. Free library, discount service, courses and newsletter. Contact Jack Cohen, 30 Brancaster Road, Newbury Park, Ilford, Essex, 01-597 1229.

Staffordshire. Annual subs: £6.50. Group newsletter. Contact at 57 Clough Hall Road, Kidsgrove, Stoke-on-Trent.

South Midlands. Meets at 12 York Street, Stourport-on-Severn on last Thursday of month. Help available with business programming problems. Contact M J Merriman at above address.

Teddington. Contact G Squibb, 108 Teddington Park Road, Teddington, Middlesex, 01-977 2346.

Watford. Meets on second Monday of month. Contact Stephen Rabagtiati, c/o Institute of Grocery Dist., Grange Lane, Letchmore Heath, Watford, Herts, 01-779 7141.

Commodore Pet

Southern Users of Pets Association. Contact Howard Pilgrim, 42 Compton Road, Brighton BN1 5AN.

Pet User Group Crawley. Contact Richard Dyer, 33 Parham Road, Ilfield, Crawley.

Pet Users Education Group. Produces newsletter. Contact Dr Chris Smith, Department of Physiology, Queen Elizabeth College, Camden Hill Road, London W8 7AH.

UK Pet Users Club. Annual subs: £10, newsletter. Contact 360 Euston Road, London NW1 3BL.

Pet Users Group. Meets at Polytechnic of North London, Eden Grove, Room 320. On alternate Tuesdays, 6pm. Contact Barry Miles 01-607 2789.

Pet User Club. Contact Margaret Gulliford, 818 Leigh Road, Slough Industrial Estate, 0753 74111.

Independent Pet Users Group. Contact 57 Clough Hall Road, Kielsgrove, Stoke-on-Trent, Staffordshire.

West Lancashire Pet Users Club. Meets at Arnold School, Blackpool on the third Thursday of month. Contact D Jowett, 197 Victoria Road, East Thornton, Blackpool FY5 35T.

Commodore Vic

Vic Burnley. Proposed club. Contact John Ingham, 72 Ardwick Street, Burnley, Lancashire.

Vic Users Group. Meets on alternate Tuesdays at 6.30pm at Polytechnic of North London, Community Centre. Contact Robin Bradbeer.

Vic-20 Cromer. Proposed club Contact J Blair, 7 Beach Road, Cromer, Norfolk, 0263 512849.

Compucolour

Compucolour Users Group UK. Meets at Community Centre, Caversham Park Village twice a year. Subs £15. Contacts with USA, Australia and Canada. Newsletter, program library. Contact Peter Hiner, 11 Pennycroft, Harpenden, Herts, 05827 64872

CP/M

CP/M Users Group UK. Subs £7. Software library, newsletter, help service. Contact Lesley Spicer, 11 Sun Street, London EC2M 2QD, 01-247 0691.

Irish CP/M Users group. Subs £5, meets monthly in Dublin area. Newsletter. Contact Doug Notley, Gardner House, Ballsbridge, Dublin 4, Dublin 686411.

COSMAC

COSMAC Users Club. Contact James Cunningham, 7 Harrowden Court, Harrowden Road, Luton, Bedfordshire 0582 423934.

Digital Equipment

Digital Equipment Computer Users Society. Program library. Contact the secretary, PO Box 53, Reading, Berks, 0734 387725.

Education

Education ZX80/81 User Group. Subs £2.50. Contact Eric Deeson, Highgate School, Balsall Heath Road, Highgate, Birmingham B12 9DS.

MUSE. Subs £10, students £6.50. National body for co-ordinating activity in schools, colleges. Contact Lorraine Boyce, MUSE Information Office, Westhill College, Weoley Park Road, Birmingham, 021-471 3723.

Computer Education Society of Ireland. Subs: £3. Contact Dairmuid McCarthy, 7 St Kevins Park, Kilmacud, Blackrock, Co. Dublin.

Educational Users Group. Offshoot of national TRS-80 Users Group. Contact Dave Fletcher, Head Teacher, Beaconsfield First and Middle School, Beaconsfield Road, Southall, Middlesex.

Mini and Microcomputer Users in Education. National organisation. Contact R Trigger, 48 Chadcote Way, Catshill, Bromsgrove, Worcestershire B61 0JT.

Forum

Forum 80 Users Group. Contact Frederick Brown, 421 Endike Lane, Hull HU6 8AG.

Forth

Forth Interest Group UK. Meets at Room 408 South Bank Polytechnic on the first Thursday of month. Subs: £7. Newsletter. Contact K Goldie-Morrison, 15 St Albans Mansion, Kensington Court Place, London W8 5QH, 01-937 3231.

FX-500-P

FX-500-P Users Association. Contact Max Francis, 38 Grymsdyke, Great Missenden, Bucks HP16 0LP.

Genealogists

Society of Genealogists Computer Interest Group. Subs £3. Newsletter. Contact Anthony Camp, 01-373 7054.

Intel MDS

UK Intel MDS Users Group. Newsletter. Contact Lewis Hard, c/o S.P.A.C.E., The Old Coach House, Court Row, Upton-on-Severn, Worcester WR8 0NS.

Ithaca Audio S100

Ithaca Audio S100 Users group. Software exchange, discount. Contact Dave Weaver, 41 Dore Avenue, North Hykenham, Lincoln LN6 8LN.

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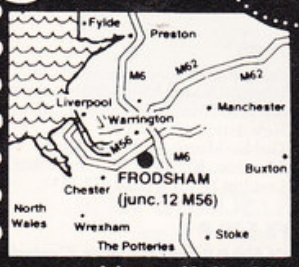

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ICI

ICI Micro Users Group. Meets fortnightly. Contact Keith Heron, 32 Norfolk Road, Congleton, Cheshire.

Jupiter Ace

Jupiter Ace Users Club. Subs £7. Newsletter, add-ons. Contact, John Noyce, Remsoft, 18 George Street, Brighton BN2 1RH.

Mattel

Mattel Intellivision TV game Group. Proposed group to organise games, competitions. Contact Warrington 62215 after 4pm.

Medical

Primary Health Care Group. Contact Dr Alastair Malcolm, British Computer Society, Cheveley Park Medical Centre, Belmont, Durham, 0385 64282.
Medical Micro Users Group. Newsletter. Contact Medicom, 1-2 Hanover Street, London W1.
TRS-80 Medical and Laboratory Users. Newsletter. Contact Dr Robinson, The Residency, Northwick Park Hospital, Harrow, Middlesex.

Nascom

Birmingham Nascom User Group. Meets at Davenports Social Club, Granville Street, Birmingham on the last Thursday of month, 8pm. Contact Martin Sidebotham, 021-744 3093.
International Nascom Microcomputer Club. Subs: £5. Newsletter, program library. Contact 80 Oakfield Corner, Sycamore Road, Amersham, Buckinghamshire HP6 5EQ.
Merseyside Nascom User Group. Meets at Mona Hotel, St James Street, Liverpool, on the first Wednesday of month, 7.30pm. Contact Mr T Searle, 051-526 5256.
Nascom Thames Valley User Group. Meets at Frogmore Hotel, Windsor, on Thursday fortnightly, 8pm. Newsletter. Contact Mike Rothery, 37 Eaton Wick Road, Eton Wick, Windsor, Berks, Windsor 56106.

Newbrain

National Newbrain User Group. Subs: £5. Contact J Hudson, 6 Swanborough Place, Whitehawk, Brighton.

Ohio

Ohio Scientific User Group. Subs: £5. Newsletter. Contact Tom Graves, 19a West End, Street, Somerset 0458 45359.

Oric

Oric Owners Group. Subs: £10. Communicates through bi-monthly newsletter. Contact Paul Kaufman, 3 Club Mews, Ely, Cambridgeshire.

Osborne

Osborne User Group. Subs: £10. Newsletter. Contact J Anglesea, Flat 19, Rowan House, Handsworth, Birmingham B20 2JR.

OSI

OSI UK User Group. Contact Richard Elen, 12 Bennerley Road, London SW11 6DS.

Pascal

Pascal User Group. Subs: £9. Contact Nick Hughes, PO Box 52, Pinner, Middlesex HA5 3FE.

PDP

PDP8 User Group. Newsletter. Contact Nigel Dunn, 21 Campion Road, Widmer End, High Wycombe, Buckinghamshire, 0494 714483.
PDP11 User Group. Information service only. Contact Pete Harris, 119 Carpenter Way, Potters Bar, Hertfordshire EN6 5QB. 070 752091.

Pilot

UK Pilot User Group. Contact Alec Wood, Wirral Grammar School for Boys, Cross Lane, Bebington, Wirral, Merseyside LG3 3AQ.

Prestel

ACC National Prestel Committee. Administrates Club Spot 800 (hobbyists on Prestel). Contact secretary, Rupert Steele, St John's College, Oxford OX1 3JP.

Research Machines

Research Machines 380Z. Contact Peter Smith, Birmingham Educational Computing Centre, Camp Hill Teachers Centre, Stratford Road, Birmingham B11 1AR.
Research Machines Ltd National User Group. Contact M D Fisher, PO Box 75, Oxford OX4 1EY.
NERML 380Z User Group. Meets monthly at Micro-Electronics Education Centre of the Polytechnic Coach Lane Campus. Subs: £5. Contact Mr Hatfield or Mr Reed, Computer Unit, Northumberland Building, Newcastle Polytechnic. 0632 326002.
Research Machines National User Group. Contact RML, Mill Street, Osney, Oxford OX2 0BW. 0865 249866.
West Midland RML User Group. Contact Spencer Instone c/o, 59 Avenue Road, Leamington Spa.

Sharp MZ80

International Sharp Users Group. Subs: £3. Newsletter. Contact Graham Knight, c/o Knights Computers, 108 Rosemount Place, Aberdeen, 0224 630526.
Sharp MZ80K User Group. Contact Joe Street, 16 Elmhurst Drive, Hornchurch, Essex RM11 1PE.
Postal MZ80K User Group. Contact Noel Williams, 07425 88058.
Sharp MZ80 Users Club. Contact Tim Powell, Computer Centre, Yeovil College, Yeovil, Somerset BA21 4AE.
Sharp PC1211 Users' Club. Subs: £5 Newsletter. Contact Jonathan Dakeyne, 281 Lidgett Lane, Leeds LS17 3AQ.

Sinclair

Sinclair ZX Computer Club. General monthly meeting, newsletter. Equipment for hire, specialist meetings, library. Contact secretary, Ken Knight, 0296 5181.
Colchester Sinclair User Group. Meets fortnightly. Contact Richard Lawn, 102 Pretty Gate Road, Colchester, Essex.
Cardiff ZX Club. Meets on last Sunday of month, 2pm. Subs: £5. Telephone service, software library. Contact Mike Hayes, 54 Oakley Place, Grangetown, Cardiff. 0222 371732.
Brighton ZX Users Group. Contact J Ireland-Hill Jnr, 145 Godwin Road, Hove, Brighton.
Glasgow ZX80/81 User Group. Contact Ian Watt, 107 Greenwood Road, Clarkston, Glasgow, 041-638 1241.
Hassocks ZX Micro User Club. Contact Paul King, 25 Fir Tree Way, Hassocks, West Sussex.
ZX Computer Club. Meets at ZX Computer Centre, 17 Sweeting Street, Liverpool, on Wednesday, 6.30pm. Contact Keith Archer, 051-260 4950.
National ZX User Club. Monthly magazine 'Interface'. Contact Tim Hartnell, Interface, 44-48 Earls Court, London W8.
Sinclair User Group. Meets at Polytechnic of North London, Room 2-5 Tower Block. Mondays, 6.30pm. Contact Irving Brand, Polytechnic of North London, Holloway Road, London.
Edinburgh ZX. Meets at Claremont Hotel, Claremont Crescent, Edinburgh on second and fourth Wednesdays every month, 7.30pm. Subs: £5 adults, £3 juniors, students, OAPs and unemployed. Newsletter. Contact John Palmer, 56 Meadowfield Drive, Edinburgh. 031-661 3183.
ZX80/81 National Software Association. Subs: £6. Newsletter, software available on cassette. Contact 15 Woodlands Road, Wombourne, Staffordshire WV5 0JZ.
ZX Amateur Radio User Group. Newsletter. Contact Paul Newsman, 3 Red House Lane, Leiston, Suffolk. SAE essential. No telephone enquiries.
Guildford ZX81/80 Users Group. Meets Fridays, club magazine. Contact A Bond, 54 Farnham Road, Guildford, Surrey GU2 5PE, 0483 62035.
ZX80/81 Users Club. Newsletter. Contact David Blagden, PO Box 159, Kingston-upon-Thames, Surrey KT2 5UQ.
Swale ZX User Group. Contact John Schmitt. 87 2887.
Sinclair Club. Contact J Edwards, 296 Blossomfield Road, Solihull, West Midlands, 021-705 1647.

Sirius

Sirius User Group. Newsletter, program library. Contact Ray D'Arcy, Sirius User Club, The Microsystems Centre, Enterprise House, 7-71 Gordon Street, Luton. 0582 412215.

68XX

68XX Special Interest Group. Contact Tim Turner, 63 Millais Road, London E11 4HB, 01-558 3681.

Software

Software Group. Meets at Polytechnic of North London, Room 2-3 Tower block Thursdays, 6pm. Contact Mike Duck at Polytechnic of North London, Holloway, London N7.
Program of the Month Club. Discount programs, newsletter. Contact Mr Durrant, 55 St Thomas Street, Oxford OX1 1JG, 0855 250333.

Sorcerer

European Sorcerer Club. Monthly meetings. Subs: £7.50, newsletter. Contact Colin Marle, 32 Watchyard Avenue, Formby, near Liverpool L37 3JU, 070 48 72137.
Exidy Sorcerer User Group. Newsletter, program exchange. Contact Andy Marshall, 44 Arthurs Bridge Road, Woking, Surrey GU21 4NT.

Spreadsheet

International Electronic Spreadsheet Users Group. Newsletter. Contact UK Alpha House, 7th Floor, Rowlandsway, Manchester M22 5RG.

Tangerine

Tangerine Homebrew. Contact A Coates, 35 Mogg Street, St Werburghs, Bristol BS2 9UB.
Tangerine Users Group. Hardware and software suppliers. Contact Bob Green, 16 Iddesleigh Road, Charminster, Bournemouth.

Texas Instruments

National TI 58/59 User Group. Subs: £5.50. Program exchange, newsletter. Contact R Murphy, Department of Electronic Engineering, University College, Singleton Park, Swansea, S Wales.
TI User Group. Proposed new club. Contact T Grimshaw, 21 Allingham Street, Longsight, Manchester.
TI 9900 User Group. Software, data libraries. Contact Chris Cadogan, Department of Computer Science, University of Manchester M13 9PL.
TI99/4A User Group. Meets at 30 Gipton Wood Road, Leeds 8, Mondays 7pm. Subs: £6. Contact I Youlden. 0532 401408.

Triton

Triton User Group. Subs: £4. Newsletter, software exchange. Contact Nigel Stride, Transam Ltd, 12 Chapel Street, London NW1, 01-402 8137.

TRS-80

National TRS-80 User Group. Meets at Adam & Eve Pub, 1st Floor, Bradford Street, Birmingham on last Friday of month. Subs: £2.50. Newsletter, software library. Contact Michael Gibbons, 1 New Street, Castle Bromwich, Birmingham B38 9AP, 021-747 2260.
Chelmsford TRS-80 User Club. Contact Michael Dean, 22 Roughtons, Galleywood, Chelmsford, Essex.
North East TRS-80 User Group. Meets at Information Technology Centre, Gateshead on the third Wednesday of month, 7pm. Subs £5. Newsletter. Contact J Dunn, 8 Ettrich Terrace, North Gateshead, County Durham.
Scottish TRS-80 & Genie User Group. Meets at Mansion House Hotel, Milton Road second Thursdays of month, 7.30pm. Contact Dick Mackie, 3 Warrender Park Crescent, Edinburgh EH9 1DX, 031-229 6032.
Isle of Wight TRS-80 User Club. Meets at London Hotel, Ryde on last Friday of month, 7.30pm. Contact Sean Coulson, 0903 614589.
TRS-80 User Group. Contact Alan Reid, 22 Woodeys Road, Rainham, Kent. 0634 367012.
UK DOSPLUS User Group. Contact Peter Tootill, 101 Swanside Road, Liverpool L14 7NL.
Merseyside TRS-80/Video Genie User Group. Meets second Thursday of month. 7.15pm. Contact Peter Toothill, 101 Swanside Road, Liverpool L14 7NL. 051-220 9733.
TRS-80 Genie Group. Meets at Central Common Room, The Residency, Northwick Park Hospital on first Sunday of month. Contact Dr Nick Robinson, Central Room, The Residency, Northwick Park Hospital.
TRS-80 Users Group. Meets at Welwyn Park Community Centre on alternate Thursdays at 7pm. Subs: £12. Saturday workshop. Contact Neil Griffiths, 0858 65718.
East Midlands TRS-80 Users Group. Newsletter. Contact Mike Costello, 15 Langbank Avenue, Rise Park, Nottingham NG5 5BU. 0602 751753.
TRS-80 Level 1 User Group. Subs: £5. Software library, newsletter. Contact N Rushton, 123 Roughwood Drive, Northwood, Kirby, Merseyside.
National TRS-80 & Genie User Group. Fees £7 for six months, newsletter. Contact Brian Pain, 24 Oxford Street, Stony Stratford, Milton Keynes.
Northwest TRS-80 User Group. Meets at Barton Aero Club, Barton Aerodrome, Irlam, near Manchester on last Wednesday of month, 8pm. Subs: £8. Sub-group meets at Crown Hotel, Blackfriars Street, on first and third Monday of month. Newsletter, software library. Contact Melvin Franklin, 40 Cowlees, Westhoughton, Bolton, Lancashire.
SW London TRS-80 User Group. Contact Ron Everitt, 01-394 2123.

Colour Genie

National Colour Genie Users Group. Subs: £10. Produces monthly newsletter, has software library and prepares national workshops. Contact Marc Leduc, 46 Highbury Avenue, Notts NG6 9DB.

UCSD

UCSD System Users Society. Contact John Ash, Dicoll Data Systems Ltd, Bond Close, Kingsland Estate, Basingstoke, Hants RG24 0QB.
UCSD Pascal UK Users Group. Contact Malcolm Harper, Oxford University Computing Laboratory Programming Research Group, 45 Banbury Road, Oxford OX2 6PE.

CUA

CUA User Group. Contact Adrian Waters, 9 Moss Lane, Romford, Essex.

6502

6502 User Club (Southern Region). Contact Steve Cole, 70 Sydney Road, Gosport, Hants.
6502 User Club. Contact Walter Wallenborn, 21 Argyll Avenue, Luton, Bedfordshire LU3 1EG. 0582 26967.

Remember

Let us know about your micro club or user group so we can be sure the information printed here is up to date. Drop a card to Sandra Grandison, Listings Editor, at *Personal Computer News*, 62 Oxford Street, London W1A 2HG, or give her a call on 01-636 6890.

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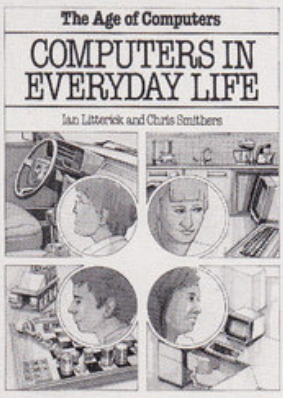
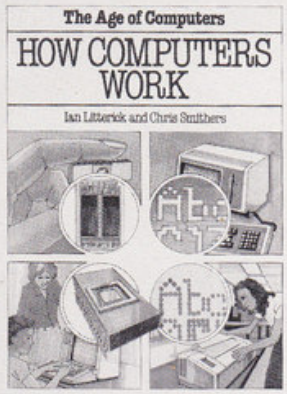




'Computers in Everyday Life' and 'How Computers Work', by Ian Litterick and Chris Smithers, published by Wayland Publishers at £4.75 each (hardback, 47 pages).

I must say, I rather liked reading *How Computers Work. Computers in Everyday Life* I'm not so sure about, but we'll get back to that later.

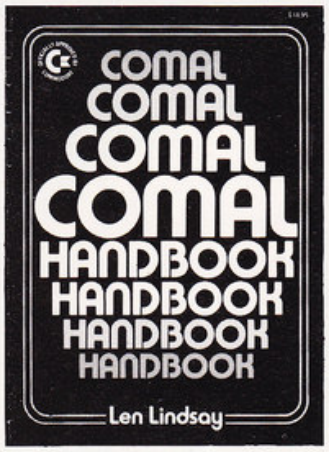
These books are for the under-12s and tackle the difficult problem of actually conveying computer concepts at level one. They rather remind me of the good old *Look and Learn* series — they are lavishly illustrated in colour and have lots of comforting adult stereotypes dotted about.

In *How Computers Work* we look at what's in the computer, how it's made, the logic behind it, how data is stored, put on paper or displayed. This book probably raises more questions in the juvenile mind than it answers, but this is undoubtedly the idea. Jolly good.

Computers in Everyday Life introduces the young reader to the brave new world of the microchip. We look at the family of the not-too-distant future using computers for just about everything. They control the central heating, send and receive voice-grams, warm up the car from the kitchen.

I wonder. When I was a child (not too long ago) I remember reading a book like this (Look and Learn possibly). Everyone was using helicopters and hovercraft to travel to work. I'm still driving a car with an A-series pushrod engine.

This time round it may all come true. **IS**



'The Comal Handbook' by Len Lindsay, published by Reston (a subsidiary of Prentice Hall) (ringbound paperback £16.10).

This really is a handbook in the normal meaning of the word. It is not intended to be read straight through, but is more a reference work.

No-one interested in programming in Comal should fail to buy this book.

Len Lindsay has been carrying on a crusade in favour of this highly structured language for a considerable time, aided by the Danish authors.

Comal has reached a position of such prestige in Denmark that it will be very unlikely that a microcomputer will be accepted into a school there if it does not run this language. The reason for all the excitement is that the designers of the language have put the easy flexibility of Basic together with the Structured Programming commands of Pascal to produce a language rich in facilities, and very easy to learn.

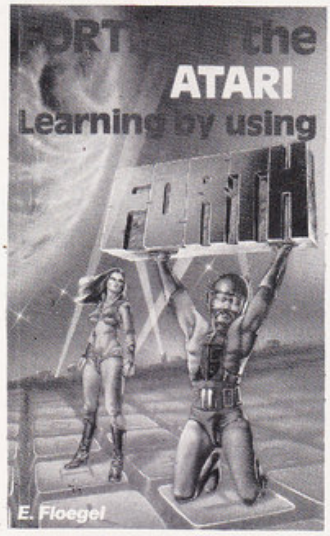
The language has been distributed free during much of its life, and various versions contain different facilities. Accordingly, a reference work enabling you to be confident you are approaching matters correctly is very valuable.

Every Comal keyword is dealt with on at least one page, and the treatment is very, very thorough. Examples abound, and are cross-referenced.

The Table of Contents will be helpful to infrequent users of the language who will be able to find the best Comal structure for achieving whatever Basic command they wish, in addition to being able to find any Comal keyword.

The reference section is followed by appendices, which *are* worthy of reading at a stretch. They are a complete guide as to how to get the best out of the structures which are peculiar to Comal. Many useful subprograms (PROCEDURES in Comal) are supplied.

The Comal Kernal, the final Standardised Comal, and finally an index (for once complete) finish off the sort of book which aficionados of the language will no doubt wear out. Highly recommended. **BM**



'Forth on the Atari' by E Floegel, published by W Wofacker GMBH International at US$7.95 (paperback, 118 pages). (Available through Maplin).

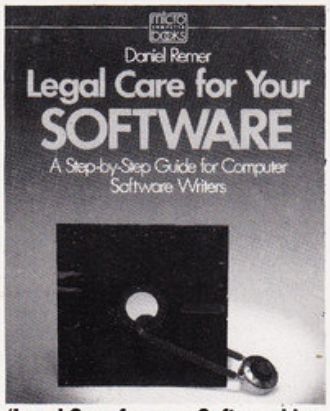
If Forth is supposed to be an 'easy-to-use language' one hopes there's a more efficient way of learning it than by recourse to this book.

You can't doubt the technical ability of the author. On the contrary, he appears to exhibit all the marks of one who is so familiar with his subject that it's difficult for him to claw back his experience and find neutral ground.

Forth on the Atari claims to provide the novice and the experienced programmer with enough knowledge to program Forth. I suspect, however, that the text is too terse and the exercises too skimpy to take more than a minority of accomplished programmers past the first pages.

In fact, this is a pretty strange sort of book all round.

The gross cover was one thing, but having got past that even pretence to quality was gone. The book is typeset on a daisywheel printer and is riddled with mistakes. **IS**



'Legal Care for your Software' by Daniel Remer, published by Addison Wesley at £11.95 (A4 paperback, 247 pages).

Now that you have turned your brainwave into a software product that is bound to be the ultimate money-spinner, how do you know that you're not going to be 'ripped-off'?

To be honest, you don't. At any time prior to, during and after your product hits the streets every shark around will be nosing about trying to make a fast buck out of it — usually with no recompense to you.

How do you protect yourself? *Legal Care for your Software* attempts to cover this problem in detail, by looking at patent law, copyright, trade secrets, trademarks, copy protection, contracts and limited liability.

Unfortunately, it only deals with the legal aspects and implications in respect of the American legal system — will someone produce an equivalent version for Britain?

The basic problem, here and in the US, is that software invariably has a short life. Bearing this in mind, safeguarding your software by legal methods involves its careful examination to ascertain which method or methods should be employed. Copyright is one method, but this has drawbacks insofar as this only covers 'an original expression of an idea' not the idea itself.

This means that any public domain or copied sections do not get covered by copyright, even though the rest may.

Assuming that copyright does not cover all your requirements then a patent is another method, although registration can take up to two years.

Bearing in mind the price of *Legal Care for your Software* I would recommend it only to the most serious of people, and even then, as a reference work to be used in conjunction with a lawyer. **NC**

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PCN.1

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PCN ProgramCards

Back to our regular format again this week after the errata and addenda of the last issue.

Each program — on one or more cards — is presented with notes at the appropriate point alongside, so that you can understand what's going on, and anticipate the action on screen.

As well as complete programs, each week we feature a sub-routine, with an example of its use, from the *PCN* library.

THIS WEEK

'At last!' we hear all of you Oric-1 users cry, 'the final two ProgramCards for M M Tew's Wacky Racers program.' Now you can sit down and enjoy this entertaining game.

To start with, though, we have a very handy look-up chart for users of Commodore equipment so that future published programs can be more easily understood. This is a comprehensive list of control codes and their graphic representations, plus how to get them from the keyboard. It also includes our abbreviations which will be used in future issues where applicable.

This was submitted to us by R M Axon of Chester, and has saved him a great deal of aggravation and time. We hope it is equally useful to you.

BBC owners and users will also be able to complete the Computer Set Up program from Miklos Shawl with the last four ProgramCards included this week. This program, since its arrival in our office, has proved itself extremely useful with respect to the Data and Time facilities.

In the subroutine section we are continuing in the date conversion vein with a pair of routines to convert Gregorian formatted dates to and from Julian dates. This is very useful for calculating elapsed days between two dates etc.

The example program uses both routines to print the difference between two dates and also add or subtract a number of days to or from a given date, thereby producing a new date — typically used in libraries.

See your name in print!

Become a legend in your own lunchtime. Send your example of programming expertise on disk or cassette with a plain paper printout to the address below.

We'd also like a brief description of what the program does, and notes including memory requirements, special hardware needed etc.

All programs are checked by a referee before publication so that only fully debugged programs are published.

As if the promise of fame was not enough we'll even pay you for them, at our standard rates.

Should you require your material to be returned please enclose an SAE.

If you are interested in becoming a referee for submitted programs then send details of experience, machines covered etc to: Programs Editor, Personal Computer News, VNU, Evelyn House, 62 Oxford Street, London W1A 2HG.

PCN ProgramCards

CBM Controls Card 1 of 1

8307CC

A look-up chart of COMMODORE product's control codes with PCN ProgramCard abbreviations.

```
 1            PET, VIC 20 AND COMMODORE 64 CURSOR AND COLOUR CODES
 2     CLear screen and Home cursor     =    Reverse shift 'S'
 3     HOME cursor                      =    Reverse 'S'
 4     Cursor Down                      =    Reverse 'Q'
 5     Cursor Up                        =    Reverse shift 'Q'
 6     Cursor Right                     =    Reverse 'J'
 7     Cursor Left                      =    Reverse shift '-'
 8     Cursor Left for PET                   Reverse shift 'J'
 9     Reverse field ON                 =    Reverse 'R'
10     Reverse field OFF                =    Reverse shift 'R'
11     DELete                           =    Reverse 'T'
12     INSert                           =    Reverse shift 'T'
13           VIC 20 AND COMMODORE 64 ONLY
14     Function Key 1                   =    Reverse shift 'E'
15     Function Key 2                   =    Reverse shift 'I'
16     Function Key 3                   =    Reverse '-'
17     Function Key 4                   =    Reverse shift 'J'
18     Function Ket 5                   =    Reverse shift 'G'
19     Function Key 6                   =    Reverse shift 'K'
20     Function Key 7                   =    Reverse shift 'H'
21     Function Key 8                   =    Reverse shift 'L'
22           COLOURS FOR VIC 20 AND COMMODORE 64
23     BlacK                            =    Reverse shift 'P'
24     WhiTe                            =    Reverse 'E'
25     ReD                              =    Reverse '£'
26     CYan                             =    Reverse CBM/shift '*'
27     PUrple                           =    Reverse CBM/shift '-'
28     GreeN                            =    Reverse '↑'
29     BLue                             =    Reverse '←'
30     YeLlow                           =    Reverse shift '↑'
31           COMMODORE 64 ONLY
32     ORanGe                           =    CBM shift/1, Reverse shift 'A'
33     BRowN                            =    CBM shift/2, Reverse shift 'U'
34     Light ReD                        =    CBM shift/3, Reverse shift 'V'
35     Dark GreY                        =    CBM shift/4, Reverse shift 'W'
36     Medium GreY                      =    CBM shift/5, Reverse shift 'X'
37     Light GreeN                      =    CBM shift/6, Reverse shift 'Y'
38     Light BLue                       =    CBM shift/7, Reverse shift 'Z'
39     Light GreY                       =    CBM shift/8, Reverse shift '+'
```

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To be used in conjunction with future programs where confusion may occur.
PCN ProgramCard abbreviation.

```
 2 CLH
 3 HOME
 4 CD
 5 CU
 6 CR
 7 CL
 9 RON
10 ROFF
11 DEL
12 INS
14 FK1
15 FK2
16 FK3
17 FK4
18 FK5
19 FK6
20 FK7
21 FK8
23 BK
24 WT
25 RD
26 CY
27 PU
28 GN
29 BL
30 YL
32 ORG
33 BRN
34 LRD
35 DGY
36 MGY
37 LGN
38 LBL
39 LGY
```

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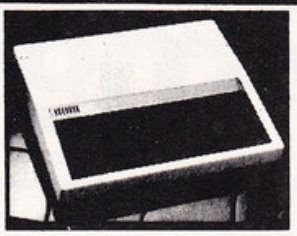

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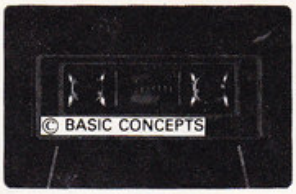

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A program for the programmer, allowing creation and saving of character sets/shape tables and subsequent inclusion into user's basic program. Demonstration program and full ASCII character set included.
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GEMPACK IV *by W. E. MacGowan.*
Two great machine code games, with full colour graphics.
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In **Sub Chase** you must depth charge the wolf pack without being sunk.
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PCN ProgramCards

Computer Set Up Card 3 of 6

8307CSU3/6

```
 69      REM************************
 70
 71 DEF PROC_oldate ( date% )
 72                   REM *** updating date$
 73
 74      LOCAL  day%, month%, year%
 75
 76  day%   = date% DIV 10000
 77  date%  = date% MOD 10000
 78  month% = date% DIV 100
 79  date%  = date% MOD 100
 80  year%  = date% MOD 100
 81  date$  = STR$( day% ) + "/"
 82
 83  IF month% < 10 THEN date$ = date$ + "0"
 84
 85  date$ = date$ + STR$( month% )
 86  date$ = date$ + "/" + STR$( year% )
 87
 88 ENDPROC :REM***( oldate )
 89
 90      REM************************
 91
 92 DEF PROC_setclock
 93                  REM *** updating  TIME
 94      LOCAL  hdths%, seconds%
 95      LOCAL  minutes%, hours%
 96
 97  CLS
 98  PRINT TAB( 5, 5 );
 99  PRINT "Enter time as hh,mm,ss ";
100  INPUT hours%, minutes%, seconds%
101  hdths% = seconds% * 100
102  hdths% = hdths% + minutes% * 6000
103  TIME = hdths% + hours% * 360000
104
105 ENDPROC :REM***( setclock )
106
```

71	Procedure to format date
74	Used in this procedure only
76	Calculate day number
77	Strip day number from date%
78	Calculate month number
79	Strip month number from date%
80	Calculate year number
81	Start of date string build-up
83	Insert zero for month numbers less than 10
85	Concatenate month number
86	Concatenate divider and year number
88	Return to main-line
92	Procedure to input new time and store in TIME
94-95	Used in this procedure only
97-99	Display prompt on blank screen
100	Enter time using "," as delimiter
101-103	Calculate TIME in 1/100 second units and store
105	Return to main-line

PCN ProgramCards

Computer Set Up Card 4 of 6

8307CSU4/6

```
107      REM************************
108
109 DEF PROC_printTIME ( flash%, across%, down%, time% )
110
111      LOCAL  tenths%, seconds%
112      LOCAL  minutes%, hours%
113      LOCAL  yy%, noon$
114
115  tenths%  = ( time% MOD 100 ) MOD 10
116  seconds% = time% DIV 100
117  minutes% = seconds% DIV 60
118  seconds% = seconds% MOD 60
119  hours%   = minutes% DIV 60 MOD 24
120  minutes% = minutes% MOD 60
121
122  IF hours% > 11 THEN noon$ = " pm" ELSE noon$ = " am"
123  hours% = hours% MOD 12
124  IF hours% = 0 THEN hours% = 12
125
126    FOR yy% = 0 TO 1
127    PRINT TAB( across%, down%+yy% );
128
129    IF flash% THEN PRINT CHR$( 136 );
130
131    PRINT CHR$( 141 ); hours%;":";
132
133    IF minutes% < 10 THEN PRINT "0";
134
135    PRINT; minutes%; ":";
136
137    IF seconds% < 10 THEN PRINT "0";
138
139    PRINT ; seconds%; noon$
140    NEXT yy%
141
142 ENDPROC :REM***( print )***
143
```

109	Procedure to display real time on screen
111-113	Used in this procedure only
115-120	Convert time% into 24 hour clock to 1/10 second
122-124	Convert to 12 hour clock and append appropriate indicator
126	Start of display cycle
127	Align display
129	Flash display if flag set true
131-139	Set double height characters and display time
140	Do twice only
142	Return to main-line

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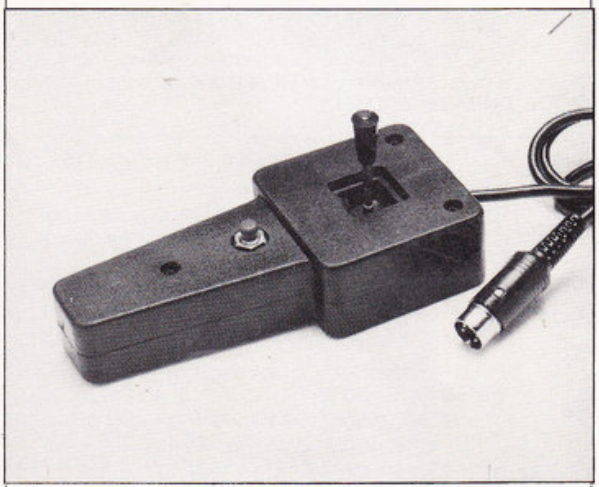

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Computer Set Up Card 5 of 6

8307CSU5/6

```
144       REM************************
145
146 DEF PROC_UpDate
147                 REM *** updating  date$ & D%
148
149       LOCAL  possible$
150       LOCAL  pos1%, pos2%
151
152  CLS
153  PRINT TAB( 3, 14 ); "Date [dd/mm/yy] ";
154  INPUT possible$
155
156   IF possible$ = "" THEN PROC_oldate ( D% ) ELSE date$ = possible$
157
158  D% = 0
159  pos1% = 0
160  pos2% = 0
161
162    FOR L% = 1 TO LEN( date$ )
163      char$ = MID$( date$, L%, 1 )
164      IF ( char$ < "0" ) OR ( char$ > "9" ) THEN pos1% = pos2% : pos2% = L%
165    NEXT L%
166
167    FOR L% = 1 TO pos1%-1
168      PROC_alterD ( MID$( date$, L%, 1 ) )
169    NEXT L%
170
171  IF pos2% - pos1% < 3 THEN D% = 10 * D%
172
173    FOR L% = pos1%+1 TO pos2%-1
174      PROC_alterD ( MID$( date$, L%, 1 ) )
175    NEXT L%
176
177  IF LEN( date$ ) - pos2% < 2 THEN D% = 10*D%
178
179    FOR L% = pos2%+1 TO LEN( date$ )
180      PROC_alterD ( MID$( date$, L%, 1 ) )
181    NEXT L%
182
183 ENDPROC :REM***( UpDate )
184
```

146	Procedure to store new date (or old) in *D%* and print string
149-150	Used in this procedure only
152	Clear screen
153	Prompt
154	Accept date input
156	If no date input then assume old date
158-160	Set variables to initial values of zero
162-165	Find '/' in date entry. Set pointers
167-169	Extract day number and store in *D%*
171	Deal with single digit day number
173-175	Extract month number and store in *D%*
177	Deal with single digit month number
179-181	Extract year number and store in *D%*
183	Return to main-line

PCNProgramCards

Computer Set Up Card 6 of 6

8307CSU6/6

```
185       REM************************
186
187 DEF PROC_CheckTIME ( flash%, tX%, tY% )
188
189       LOCAL  reply$
190
191   PRINT TAB( 1, tY%+4 );"Correct time ? ";
192
193     REPEAT
194       PROC_printTIME ( flash%, tX%, tY%, TIME )
195       reply$ = INKEY$(10)
196     UNTIL reply$ <> ""
197
198   IF (reply$ ="N") OR (reply$ ="n") THEN  PROC_setclock
199
200 ENDPROC :REM***( CheckTIME )
201
202       REM=========================
203       REM===        done         ===
204       REM=========================
```

187	Procedure to verify the stored time is correct
189	Used in this procedure only
191	Prompt
193-196	Loop to wait until a key hit
198	Any key other than 'N' or 'n' will assume OK
200	Return to main-line

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Access

PCN ProgramCards

Wacky Racers Card 8 of 9

8307WR8/9

```
3000 REM*DRAW MAP.*
3010 RESTORE
3015 SL=SD(ST)
3020 READA$:IFA$<>"@"THEN3020
3030 IFSL=1THEN3100

3040 FORI=2TOSL
3050 READA$:IFA$<>"@"THEN3050
3060 NEXT
3100 CLS

3110 GOSUB4000
3120 PRINTCHR$(30)CHR$(10);
3130 READA$:IFA$="£"THENREADX1,Y1,MW:RETURN
3140 PRINTA$;:GOTO3130
4000 REM PRINT SCORES
4002 IFSC<0THENSC=0
4003 PRINTCHR$(30)TAB(35)CHR$(134)"HI SCORE "HS
4007 PRINTCHR$(30)TAB(26)CHR$(132)"STAGE "ST
4010 PRINTCHR$(30)CHR$(133)" SCORE "SC
4030 PRINTCHR$(30);:FORI=1TO26:PRINTCHR$(10);:NEXT
4035 PRINTCHR$(130)"LIVES "LI;
4040 RETURN
4050 IFSC<0THENSC=0
4060 PRINTCHR$(30)CHR$(133)CHR$(32)"SCORE "SC:RETURN
5000 CLS
5001 REM*REVIEW*
5010 PRINT"WHICH SCREEN DO YOU WANT TO SEE "
5020 PRINT"(1 TO "MS") ";:INPUTST
5030 IFST>MSORST<1ORST<>INT(ST)THEN5020
5040 GOSUB3000
5050 PRINTCHR$(30)"     PRESS SPACE TO END REVIEW.    "
5060 GETH4$:IFH4$=" "THEN RETURN
5070 GOTO5000
```

3010 Set pointer to 1
3015 Select correct circuit number
3020 Read data until first circuit found
3030 If first circuit selected skip to display it

3040-3060 Read circuit data until correct circuit is found
3100 Start of circuit display section. Clear screen
3110 Print score lines
3120-3140 Routine to display circuit data until exhausted

4000-4040 Routine to print score lines

4050-4060 New score routine

5000 Routine to deal with Review facility. Clear screen
5010-5020 Prompts and input

5030 Get it right!
5040 Display circuit selected
5050-5060 Prompt for end of review and return to main-line
5070 Again?

PCN ProgramCards

Wacky Racers Card 9 of 9

8307WR9/9

```
6000 REM*INSTRUCTIONS*
6001 CLS
6010 PRINT"            WACKY-RACERS"
6015 PRINT"            ------------"
6030 PRINT"
6040 PRINT
6050 PRINT"  DRIVE THE CAR (b) ROUND THE MAZE."
6055 PRINT
6060 PRINT"PICKING UP THE (i)s WITHOUT CRASHING"
6065 PRINT
6070 PRINT"INTO THE WALL (*)."
6080 PRINT
6090 PRINT"USE THE CURSOR CONTROL KEYS TO STEER"
6095 PRINT
6100 PRINT"THE CAR AND SPEED UP AND SLOW DOWN."
6110 PRINT
6120 PRINT"  MAZES ARE TAKEN IN ORDER OF DIFICULTY."
6130 PRINT"IF YOU ENTER 0. ANY OTHER NUMBER GIVES"
6136 PRINT
6140 PRINT"THE CORRESPONDING MAZE ALL OF THE TIME"
6145 PRINT
6150 PRINT"  PRESSING R WILL ALLOW YOU TO REVIEW"
6156 PRINT
6160 PRINT"THE MAZES. PRESSING R AT THE END OF"
6167 PRINT
6170 PRINT"YOUR DRIVE WILL ALLOW ANOTHER REVIEW."
6173 PRINT
6174 PRINT"ENTER YOUR OPTION.";
6180 RETURN
```

6000-6180 Routine to display the instructions for the game.

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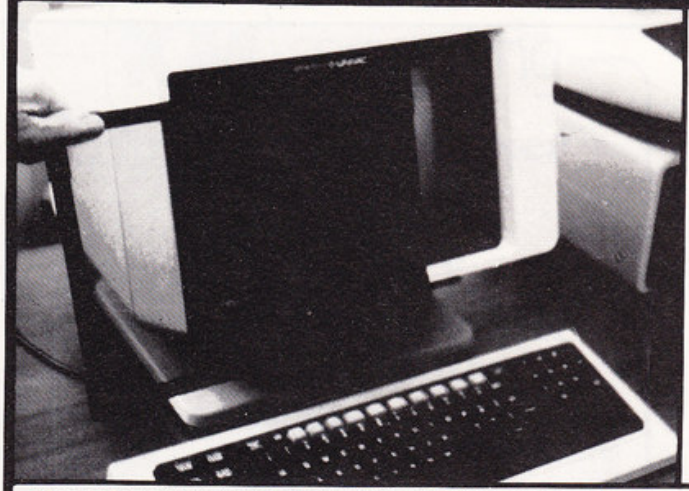

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PCNProgramCards

Julian Date Card 1 of 1

8307SubJD

A set of subroutines to convert Gregorian dates to and from Julian format and also flag leap years

```
5000 JR$ = "000031059090120151181212243273304334"

5010 DM$ = "312831303130313130313031"
5020 DEF FNGJ(AY) = AY*365 + INT((AY+3)/4) - INT((AY+51)/100) + INT((AY+151)/40
0)

5030 J% = 0: GJ% = 0

5040 IF Y% < 1752 THEN RETURN

5050 IF M% < 1 OR M% > 12 THEN RETURN

5060 GOSUB 5130: IF M% = 1 THEN L% = 0
5070 J% = VAL(MID$(DM$,(M%*2-1),2))
5080 IF M% = 2 THEN J% = J% + L%
5090 IF D% < 1 OR D% > J% THEN J% = 0: RETURN

5100 J% = D% + L% + VAL(MID$(JR$,(M%*3-2),3))
5110 GJ% = FNGJ(Y%-1752) + J%: J% = J% + Y%*1000

5120 RETURN
5130 L% = 0: IF Y%/4 = INT(Y%/4) THEN L% = 1
5140 IF Y%/100 = INT(Y%/100) THEN L% = 0
5150 IF Y%/400 = INT(Y%/400) THEN L% = 1
5160 RETURN

5170 Y% = INT(J%/1000): J% = J% - Y%*1000

5180 GOSUB 5130
5190 FOR N = 12 TO 1 STEP -1
5200   IF N < 3 THEN L% = 0
5210   IF J% > VAL(MID$(JR$,(N*3-2),3)) + L% THEN M% = N: N = 1
5220   NEXT N
5230 D% = J% - (VAL(MID$(JR$,(M%*3-2),3)) + L%)
5240 GOTO 5110
```

Written in Microsoft Basic, but can be modified to run on all machines

5000 Subroutine to calculate Julian format. Number of days into the year by month
5010 Number of days in each month
5020 Function to calculate the number of days from the inception of the Gregorian calender
5030 J% — Julian date (YYYYDDD), GJ% — days from 31/12/1751
5040 Check year not too early — Error returns J% as zero
5050 Month valid — Error returns J% as zero
5060 Flag leap year, modify for January
5070 Extract days in month for checking
5080 Adjust for February
5090 Check day number valid — Error returns J% as zero
5100 Calculate days elapsed in year
5110 Calculate Gregorian days elapsed, full Julian format
5120 Return to main line
5130-5160 Subroutine to check for leap year. L% = zero for not, 1 = yes

5170 Subroutine to calculate Gregorian from Julian. Strip year off
5180 Flag leap year
5190-5220 Loop to calculate month number

5230 Calculate day number in month
5240 Update GJ% and J%, return to main line

PCNProgramCards

Date Utility Card 1 of 1

8307DU

A program to offer options to perform calculations on dates

```
1000 REM A Program to demonstrate the use of subroutines Gregorian to Julian
1010 REM Julian to Gregorian and Leap year indicator
1020 CLS: PRINT "DATE UTILITY PROGRAM"
1030 PRINT "THE OPTIONS ARE :- "
1040 PRINT "     DIFFERENCE BETWEEN TWO DATES - D"
1050 PRINT "     ADD NUMBER OF DAYS TO DATE - A"
1060 PRINT "     SUBTRACT NUMBER OF DAYS FROM DATE - S"
1070 PRINT "     QUIT PROGRAM - Q"
1080 INPUT "SELECT OPTION => ", A$
1090 IF A$ = "Q" THEN PRINT "PROGRAM ENDED": END
1100 IF A$ = "D" THEN GOTO 1140
1110 IF A$ = "A" THEN GOTO 1200
1120 IF A$ = "S" THEN GOTO 1240
1130 GOTO 1080
1140 GOSUB 1160: DY% = GJ%: GOSUB 1160

1150 PRINT "DIFFERENCE IS "; ABS(GJ% - DY%); " DAYS": GOTO 1080

1160 INPUT "ENTER DATE AS DD,MM,YYYY ", D%, M%, Y%
1170 GOSUB 5000: IF J% = 0 THEN PRINT "DATE INVALID  - RETRY": GOTO 1160
1180 RETURN
1190 INPUT "ENTER NUMBER OF DAYS ", DY%: DY% = ABS(DY%): RETURN

1200 GOSUB 1160: J% = J% - Y%*1000: GOSUB 1190: J% = J% + DY%
1210 GOSUB 5130: IF J% > 365 + L% THEN J% = J% - (365 + L%): Y% = Y% + 1: GOTO
1210
1220 J% = J% + Y%*1000: GOSUB 5170: GOSUB 1230: GOTO 1080
1230 PRINT "NEW DATE IS "; D%; "/"; M%; "/"; Y%: RETURN

1240 GOSUB 1160: J% = J% - Y%*1000: GOSUB 1190: J% = J% - DY%
1250 GOSUB 5130: IF J% < 1 THEN J% = J% + 365 + L%: Y% = Y% - 1: GOTO 1250
1260 GOTO 1220
```

BBC Model B
BBC Basic

General interest

1020-1070 Clear screen and display prompts

1080 Accept selection
1090 "Q" ends program
1100 "D" for difference
1110 "A" for additions to date
1120 "S" for subtractions from date
1130 No other entry allowed
1140 Perform date input routine and calculation of Julian, store, input second date and calculate
1150 Display the difference in days, re-select option
1160-1180 Routine to deal with date input

1190 Routine to input number of days to adjust by
1200-1220 Routine to perform additions of days

1230 Routine to display newly calculated date DD/MM/YYYY
1240-1260 Routine to perform subtractions of days

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DATABASICS

This week PCN Databasics lists a selection of add-ons for your micro. PCN keeps you up to date in three-week cycles, listing peripherals, then software, followed by micros.

Printers are best categorised by print-head type. The two most common methods of transferring type to paper are the **Dot matrix** and **Daisywheel** techniques.

A dot matrix printer uses a row of pins which are programmed to strike the paper through a ribbon and form the character as a pattern of dots.

The daisywheel acts more like a conventional typewriter, the character set being pre-formed on a wheel with each character on a separate spoke. As the interchangeable wheel rotates it is struck by a hammer to form the character impression.

Dot matrix printers tend to be faster than daisywheel but offer lower print quality.

In selecting a printer make sure the **interface** on your computer is compatible with those available as standard or at extra cost on the printer.

The ● sign means the interface is included in the price; O means you have a choice of interfaces included in the price; + means the interface will cost extra.

Max Baud rate indicates the approximate characters-per-second rate as they are fed into the printer.

The **buffer** stores characters sent by the computer. The printer can take characters in chunks, at a rate quicker than they are able to be printed, sometimes allowing the computer to be freed for further use.

Lines per inch indicates the maximum number of lines printed in a vertical inch. **Characters per inch** can be varied on some printers as the typesizes themselves can be adjusted.

Maximum print speed as indicated by the manufacturer tends to be a little optimistic. **Maximum print positions** tells you the optimum number of characters that can be printed in one line by the smallest character size on the printer. **Maximum paper width** is the widest paper the printer can take.

Size represents the space the printer takes up on a desk top. **The weight** of the printer is given in kilogrammes.

Maximum copies indicates the number of carbon copies that can realistically be produced at one time.

Underlining puts a line under characters while **bold type** thickens the characters to make them stand out. **True descenders** indicates that the print method allows for fully formed tails on letters such as p,g or q.

Proportional spacing puts the same space between characters whether they are a long 'm' or a short 'i'. **Block graphics** builds up pictures using rectangular blocks, while **High Resolution Graphics** uses smaller dots.

Bidirectional means the printer can save time by printing left to right and then doing the next line backwards right to left. Similarly, **Logic Seeking** enables the machine to save more time by printing the short lines without sweeping over the whole width of the page.

Feed methods comprise **fanfold** which uses continuous stationery sheets folded road-map style drawn into the printer by a tractor mechanism. The tractor cog fits into holes in the fanfold paper and takes the paper past the printer mechanism. **Roll** is a roll of paper that feeds into the printer, usually using **friction feed** where the paper is gripped between two rollers, typewriter-style. **Cut sheet** indicates the printer uses single sheets like a typewriter.

Distributor: to find which company distributes a particular add-on, use the code listed in this column to refer to the distributor table.

The table is at the end of the listings, and gives the distributor's name and telephone number.

PERIPHERALS

Make & Model	Price inc VAT	Printhead type (M = matrix)	INTERFACES ● inc in price, ○ = options at extra cost (+)						Max baud rate	Buffer Memory Size (in characters)	Lines per inch	Characters per inch	Max print Speed (CPS)	Max print positions	Max paper width in inches	Size (base area in cms)	Weight (in kilos)	Max Copies	Underlining	Bold Type	True Descenders	Proportional Spacing	Block Graphics	High Resolution Graphics	Bi Directional	Logic Seeking	Feed Method					Distributor
			I-EEE	Centronics	20ma	RS232	Others ●	Others (+)																			Fan Fold	Roll	Cut Sheet	Tractor	Frictional	
PRINTERS																																
Adler TRD 170	£833	Daisywheel		●		●			9600	256	6,8	10,12,15	17	198	15.5	56×37	13	6	●	●	●	●			●	●	●	●	●	●	●	T2
Anadex DP 9000A	£1,397	M 7×9, 9×9		●	●	●			9600	2700	6,8	10,12.5,15,16.7	200	106	9.5	40.9×57	13.6	6	●	●	●			●	●	●	●			●		I1
Anadex DP 9001A	£1,397	M 7×9, 11×9		●	●	●			9600	2700	6,8	10,12.5,15,16.7	200	132	9.5	40.9×57	13.6	6	●	●	●			●	●	●	●			●		I1
Anadex DP 9500	£1,397	M 9×9		●	●	●			9600	700	6,8	10,12,13.3	200	176	15.5	39×59.9	16	6	●	●	●			●	●	●	●			●		I1
Anadex DP 9500A	£1,397	M 7×9, 9×9, 13×9		●	●	●			9600	2700	6,8	10,12,13.3	200	176	15.5	40.9×70.3	16	6	●	●	●			●	●	●	●			●		I1
Anadex DP 9500L	£1,295	M 7×9, 9×9		●	●	●			9600	700	6,8	10	150	132	15.5	39×59.9	16	6			●				●	●	●			●		I1
Anadex DP 9501	£1,397	M 7×9, 11×9		●	●	●			9600	700	6,8	10,12.5,15,16.7	200	220	15.5	39×59.9	16	6	●	●	●			●	●	●	●			●		I1
Anadex DP 9501A	£1,397	M 7×9, 11×9		●	●	●			9600	2700	6,8	10,12.5,15,16.7	200	220	15.5	40.9×70.3	16	6	●	●	●			●	●	●	●			●		I1
Anadex DP 9620A	£1,489	M 7×9, 9×9, 13×9		●		●			9600	1500	6,8	10,12,15,16.4	200	216	15.5	40.9×70.3	16	6	●	●	●			●	●	●	●			●		I1
Anadex WP 6000	£2,616	M up to 18×20		●		●			19200	4500	6,8,12,16	10,12,16.7	285	220	15.5	46.7×74.9	25	6	●	●	●	●		●	●	●	●		●	●	●	I1
ASP 3500	£977	M 9×7, 9×9		○		○			9600	80	6,8	10,12,16.5	180	217	14	61.5×40.5	19	6	●	●	●		●	●	●	●	●					M1
Brother HRI	£747	Daisywheel		○		○	○		9600	2000	4,5,6	10,12,15	35	198	16.5	38.1×71.2	16	8			●				●	●			●		●	J1
Canon AP400	£1,140	Daisywheel	●			●		1	19200	4000	4,6,8	10,12,15	25	197	15.5	50.8×48.2	18.5	6	●	●	●	●	●		●	●	●	●	●	●	●	D1
Centronics 159/4	£962	M 9×7				●			9600	768	6	5,8.18,10,16.36	150	80	10	38×35.6	10	5							●	●	●			●	●	B1
Centronics 150/4	£682	M 9×7				●		1	9600	768	6,8	10,12,16.36	150	132	9.5	38.1×35.5	9.1	3	●		●	●				●	●	●		●	●	R1
Centronics 152/4	£788	M 9×7				●		1	9600	708	6,8	10,12,16.5	150	217	9.5	38.1×35.5	9.1	3	●		●	●			●	●	●	●		●	●	R1

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			I-EEE	Centronics	20ma	RS232	Others ●	Others (+)																			Fan Fold	Roll	Cut Sheet	Tractor	Frictional	
PRINTERS																																
Centronics 154	£869	M 11×8		●		●			9600	2000	6,9,12,18	5,10,16.5	120	132	15	52.6×37.1	13	5	●		●			●	●	●	●				●		C1
Centronics 159/2	£881	M 9×7		●					N/A	768	6	5,8.18,10,16.36	150	132	10	38.1×35.6	10	5							●	●	●			●	●	●	B1
Centronics 351	£1,891	M 7×9		●	+	●			19200	2000	6,8	5,6,8.25,10,12,16.5	200	192	15	45.7×55.9	18	6	●	●	●		●		●	●	●	●	●	●	●	B1
Centronics 352	£1,966	M 7×8		●	+	●			19200	2000	6,8	5,6,7.5,8.25,13.2,15,16.5	200	218	14.5	55.9×45.7	18.1	6	●					●	●	●	●		●	●	●	C1
Centronics 353	£2,420	M 7×8			+	●			19200	4000	3,4,6,8,12	10,12,13.2,15,16.5	200	218	15	55.9×45.7	18.1	6	●		●			●	●	●			●	●	●	C1
Centronics 739/2	£710	M 11×9		●					2200	132	6	5,8.3,10,16.7	100	132	9	36.8×27.9	5.4	5	●			●		●			●	●	●		●	C1
Centronics 739/4	£786	M 11×9				●			9600	512	6	5,8.3,10,16.7	100	132	9	36.8×40.6	7.2	5	●			●		●			●	●	●		●	C1
Commodore 4022P	£454	M 6×7	●						N/A	N/A	2	5,10	40	80	10	36.8×33	9.9	3					●	●	●	●	●	●		●		C2
Commodore 8023	£1,029	M 5×8	●						N/A	N/A	2	5,10	150	250	15	51.4×36.8	11.6	3		●			●	●	●	●	●	●	●	●		C2
Data Products DP55	£1,687	Daisywheel				●		2	9600	1000	6,8	10,12,15	55	198	15	44.4×60.4	24	6	●	●	●	●		●	●	●	●	●	●		●	S1
Data Products M100	£1,790	M 9×9		+		+	1		N/A	N/A	6,8	5,8,10,16.5	140	218	16	67.5×59.4	27	6	●	●	●	●	●	●	●	●	●			●		S1
Data Products M120	£1,741	M 7×7		+		+	1		N/A	N/A	6,8	5,10,16.7	180	220	16	67.5×59.4	27	6							●	●	●			●		S1
Data Products M200	£1,979	M 7×7		+		+	1		N/A	N/A	6,8	5,10.8,16.7	340	340	16	67.5×59.4	27	6							●	●	●			●		S1
Data South DS180	£1,604	M 9×7		●		●		1	9600	2000	6,8	10,12,16.5	180	217	15.5	60.9×40.6	16	6	●	●	●		●	●	●	●	●			●		D2
Diablo SP1/P11	£2,127	Daisywheel				●			9600	256	6,8	10,15	40	198	16	56.9×46.3	27.2	6	●	●	●	●			●	●			●		●	M2
Diablo 630	£2,127	Daisywheel				●			9600	768	6,8,12	10,12,15	40	198	16.5	56.9×46.3	27	6	●	●	●	●			●	●	●			●	●	M2
DMP 100	£249	M 5×7		●		●			1200	2000	6,8	10.5	50	80	9.5	40.6×20.9	3.9	1	●	●	●		●	●		●	●			●	●	T1
DMP 200	£499	M 9×23		●		●			1200	2000	6,8	10	120	120	9.5	41.9×34.3	7.5	3	●	●	●	●	●	●	●	●	●	●		●	●	T1
DMP 400	£699	M 7×9, 9×9		●		●			1200	2000	6,8	10,12,16.7	140	220	15	61.9×40.4	19	5	●	●	●	●	●	●	●	●	●		●	●		T1
DMP 500	£1,099	M 23×9		●					9600	2000	6,8	10,12,16.7	220	220	15	58.4×33	12.7	5	●	●	●	●	●	●	●	●	●		●	●		T1
DMP 2100	£1,399	M		●		●			1200	2000	6,8,12	10,12,16.6	160	232	15	55.2×38.1	20	8	●	●	●	●	●	●	●	●	●			●		T1
DRE 8820	£895	M 9×7		○		○			9600	500	6,8	10,12.5,15,16.7	150	266	15.5	64.7×47.6	23	5	●		●				●	●	●	●		●	●	G1
DRE 8830	£1,300	M 9×7		○		○			9600	500	6,8	10,12,13.3,15,17	180	226	15.5	64.7×47.6	23	5	●		●				●	●	●	●		●	●	G1
DRE 8840	£1,370	M 9×7		○		○			9600	500	6,8	10,12,13.3,15,17	240	226	15.5	64.7×47.6	23	5	●		●				●	●	●	●		●	●	G1
DRE 8910	£1,585	M 9×7, 9×11		○		○			9600	500	6,8	10,12,13.3,15,17	160	226	15.5	64.7×47.6	23	5	●		●				●	●	●	●		●	●	G1
DRE 8925	£1,660	M 12×8, 12×20		○		○			9600	500	6,8	10,12,15,16.7	120	226	15.5	64.7×47.6	23	5	●		●				●	●	●	●		●	●	G1
DRH 80	£621	M 7×9		○		○			9600	256	6,8	10,12.5,15,17.5	80	140	8	41.5×30	7.5	4	●	●	●		●		●	●	●	●	●	●	●	T1
DRH 136	£776	M 7×9		○		○			9600	2000	6,8	10,12,15,16.5	120	224	15.5	48.6×30.3	10.5	3	●	●	●		●	●	●	●	●	●		●	●	T1
DRS 250	£1,431	M 7×9		○		○			19200	512	6,8	10,12,15	250	198	6	61×45	25	5	●	●	●		●	●	●	●	●			●		T1
DWP 410	£995	Daisywheel		●					9600	2000	6,8	10,12	25	160	16	60.3×19.6	16	5	●	●	●	●			●	●	●		●	●	●	T1
Epson MX80	£401	M 9×9		●	+	+		1	19200	256	6,8	5,8.25,10,16.5	80	132	10	40.6×38.1	5.5	3	●	●	●		●	●	●	●	●			●		E1
Epson MX80 FTT/3	£447	M 9×9		●	+	+		1	19200	256	6,8	5,8.25,10,16.5	80	132	10	40.6×38.1	7.7	3	●	●	●		●	●	●	●	●			●		E1
Epson MX82	£470	M 9×9		●	+	+		1	19200	256	8	17.2	80	159	10	40.6×38.1	7.7	3	●	●	●	●	●	●	●	●	●	●	●	●	●	E1
Epson MX100FT/3	£574	M		●	+	+		1	19200	256	8	16.5	100	233	15.5	59.7×40	10	3	●	●	●		●	●	●	●	●	●	●	●	●	E1
Facit 4510	£672	M 9×7		○	○	○			9600	712	6,8	6,12,16,17.5	100	132	11.5	42.5×34.8	9	5	●	●	●	●		●	●	●	●	●		●	●	A2
Facit 4525	£1,150	M 9×9		○	○	○			9600	512	6,8	5,8.5,10,17	280	132	11.5	46.5×35.6	13.5	5	●	●	●				●	●	●			●		A2
Facit 4542	£2,300	M 9×14		●	+	+			9600	800	6,8	10,12,15	250	232	18	64×45.7	40	5	●	●	●	●	●	●	●	●	●			●		A2
Fujitsu 830	£2,179	Daisywheel		+	●	●			1200	256	3,6,8	10,12,15	80	204	15	59.7×44.9	18	6	●	●	●	●		●	●	●	●		●	●	●	Z1
General Electric 2030	£961	M 9×7				+	1		1200	640	2,4,6,8,12	10,13,16.5	60	218	15.5	54.6×47.6	9.9	2	●						●	●	●	●		●	●	Z1
General Electric 2120	£1,751	M 9×7				+	1		1200	640	2,4,6,8,12	10,13,16.5	150	218	15.5	54.6×47.6	9.9	2	●						●	●	●	●		●	●	Z1
General Printer GP300	£2,287	M 9×9, 18×25				●		2	19200	380	6,8	10,12,15	300	120	13.5	52×44.5	20	5	●	●	●	●	●	●	●	●			●		●	I2
General Printer GP300L	£2,490	M 9×9, 18×25				●		2	19200	380	6,8	10,12,15	300	132	13.5	63.5×51.5	24	5	●	●	●	●	●	●	●	●			●		●	I2
Integrex	£914	M 7×5, 9×6	+	●		+			N/A	37	6,8	10	125	80	10	38.7×32.5	9.6	1					●	●			●			●		D3
ITT Swift 3342	£1,719	M 9×7			○	○			1200	640	2,3,4,6,8,12	10,13,16.5	150	240	15.5	56×47	10.4	6	●		●			●	●	●	●		●	●	●	I3
ITT Swallow	£914	M 9×7		○	○	○			1200	640	2,4,6,8,12	10,13,16.5	60	240	15.5	56×47	10	6	●		●				●	●	●	●			●	I3
Lear Siegler	£1,667	M 9×9		○	○	○			19200	2000	6,8	10,12	180	218	16	68.6×50.2	22.7	5	●		●	●	●		●	●	●			●		I4
Logabax LX213	£1,840	M 9×9		+		●			9600	4000	6,8	10,12,16.5	180	218	15	57.1×43.2	17	5	●	●	●				●	●	●			●		T3

Logabax LX217	£2,242	M 9×9		+		●			9600	400	6,8	10,12,16.5	180	218	15	57.1×43.2	17	5	●	●	●			●	●	●		●	●		T3
Micro Peripherals 99G	£517	M 9×7, 11×9		●		●			9600	2048	6,8	10,12,16.5	100	136	9.5	41.1×27.3	6.7	2	●	●	●		●	●	●	●	●	●	●		T3
Micro Peripherals 150G	£918	M 9×7, 11×9		●		●			9600	8192	6,8	10,12,16.5	150	226	15	58.4×39.9	11.2	2	●	●	●		●	●	●	●	●		●		T3
MT120 I	£600	M 9×7	+	●	+	+			9600	132	6,8	10,12.5,16.6,20	160	132	10	34.3×24.1	7.5	4		●	●		●	●	●	●	●	●	●	●	M3
MT120 L	£765	M 9×7	+	●	+	+			9600	132	6,8	10,12.5,16.6,20	160	132	10	34.3×24.1	7.5	4		●	●		●	●	●	●	●	●	●	●	M3
MT1802 I	£1,845	M 7×9	+	○	+	○			9600	218	6,8	10,16.6	200	218	16	55.9×76.2	8.6	5			●			●	●	●			●		M3
MT1802 L	£2,205	M 7×9	+	○	+	○			9600	218	6,8	10,16.6	200	218	16	55.9×76.2	8.6	5			●			●	●	●			●		M3
MT440 I	£1,966	M 9×7		●	+	+			9600	220	3,4,6,8,12	10,12.5,16.6	400	220	16	66×45.7	36	5			●			●	●	●			●		M3
MT440 L	£2,185	M 9×7		●	+	+			9600	220	3,4,6,8,12	10,12.5,16.6	400	220	16	66×45.7	36	5			●			●	●	●			●		M3
MT420 I	£882	M 9×7		●	+	+			9600	220	3,4,6,8,12	10,12.5,16.7	200	220	16	66×45.7	36	5		●	●	●		●	●	●	●		●		M3
MT420 L	£954	M 9×7		●	+	+			9600	220	3,4,6,8,12	10,12.5,16.7	200	220	16	66×45.7	36	5		●	●	●		●	●	●	●		●		M3
MT140 I	£1,593	M 9×7	+	●	+	+			9600	218	6,8	10,12.5,16.6,20	160	218	16	48.3×24.1	7.5	4		●	●		●	●	●	●	●	●	●	●	M3
MT140 L	£1,869	M 9×7	+	●	+	+			9600	218	6,8	10,12.5,16.6,20	160	218	16	48.3×24.1	7.5	4		●	●		●	●	●	●	●	●	●	●	M3
Newbury Labs 1550	£747	M 9×7		○		○			9600	2000	6,8	5,6,8.5,10,12,17	120	230	15.5	55.9×30.5	11	3	●	●	●	●	●	●	●	●	●	●		●	N1
Newbury Labs 8510A	£552	M 9×7		○		○			9600	3000	6,8	5,6,8.5,10,12,17	120	132	10	55.9×28.6	8.5	3	●	●	●	●	●	●	●	●	●	●		●	N1
Newbury Labs NL40	£1,478	Daisywheel		○	○	○			2400	2000	6,8	10,12	40	163	15.5	55.9×43.2	14	2	●	●	●	●			●	●	●	●	●	●	N1
OKI Microline 80	£242	M 5×7		●		+			9600	256	6,8	5,10,16.5	80	132	9.5	34.2×24.5	6.5	4					●				●	●		●	●	X1
OKI Microline 82A	£425	M 9×7		●	●	+			1200	132	6,8	5,8.3,10,16.5	120	132	9.5	36.1×32.8	8.9	4	●		●		●		●	●	●		●	●	X1
OKI Microline 83A	£608	M 9×7		●	●	+			1200	132	6,8	5,8.3,10,16.5	120	132	15	51×32.8	14	3	●		●		●		●	●	●		●	●	X1
OKI Microline 84	£975	M		○	○	●			4800	132	6,8	5,8.3,10,12,17	200	231	15	51×32.8	14	3	●	●	●	●		●	●	●	●		●	●	X1
Olivetti DM5050	£575	M 7×9		●	+	+		4	9600	1000	6	10,12.5,16.5	100	132	9	11.6×30	7.5	2	●	●	●			●		●	●		●	●	B2
Olivetti DM5100	£1,033	M 7×9	○	○	○	○			9600	256	6	10,12,16.5	140	220	14.75	59.2×40.1	17	4	●	●	●		●		●	●	●			●		B2
Olivetti DM5200	£1,351	M 7×9	●	+	+	+			9600	256	6	10,12,16.5	200	220	19.75	59.2×40.1	17	4	●	●	●		●		●	●	●			●		B2
Olivetti DY-211	£862	Daisywheel	+	●	+	●			9600	1000	6	10,12,15	29	198	17	54.1×32.8	16.3	4	●	●	●	●			●	●	●	●	●	●	B2
Olivetti DY-311	£1,322	Daisywheel	+	○		○			9600	1000	6	10,12,15	39	225	17.25	60×50	17	4	●	●	●	●			●	●	●			●	B2
Olivetti JP101	£420	Dry Ink Jet		●	+	+			9600	1000	6,8	10,12,18	50	147	9	39×26.8	5.2	1	●				●	●	●	●	●	●		●	B2
Olivetti TH240	£661	Thermal 5×7				+	●		9600	1000	6	10	240	80	8.75	40.1×34	7.5	1	●	●				●		●		●			●	B2
Olympia ESW102RO	£1,917	Daisywheel	+	+	+	●			19200	4000	6	10,12,15	24	141	17	52.8×37	13	6	●	●	●	●			●	●	●		●	●	●	I5
Olympia ESW103KSR	£1,263	Daisywheel	+	+	+	●			19200	4000	6	10,12,15	24	212	17	52.8×43.1	14.5	6	●	●	●	●			●	●	●		●	●	●	I5
Olympia ESW3000RO	£1,306	Daisywheel	○	○		○			19200	4000	3,4,6	10,12,15	50	225	17	60.4×40.8	19.5	6	●	●	●	●			●	●	●		●	●	●	I5
Phillips Mullard GP300	£2,287	M		+		●			19200	512	3,4,6,8,12	10,12,15	300	180	14.4	64.5×52.3	24	6	●	●	●	●	●		●	●	●	●	●	●	●	R2
Printex 920	£2,012	M		+		●			9600	1792	6,8,12,16	10,12,13.3,16.7	340	227	16	59×42.5	20	4	●	●	●		●	●	●	●	●			●		T3
Qume Sprint 9/35	£1,892	Daisywheel				+	1		9600	500	6,8	10,12,15	35	198	15	61.3×49.9	19	3	●	●	●	●	●		●	●	●			●	Q1
Qume Sprint 9/45	£1,966	Daisywheel				+	1		9600	500	3,6,8	10,12,15	45	198	15	61.7×42.5	20.4	3	●	●	●	●	●	●	●	●	●			●	Q1
Qume Sprint 9/55	£2,403	Daisywheel				+	1		9600	500	3,6,8	10,12,15	55	198	15	61.7×42.5	20.4	3	●	●	●	●	●		●	●	●			●	Q1
Rair Decwriter III	£2,261	M 7×7			+	●			9600	1000	2,3,4,6,8,12	5,6,6.6,8.25,10,13.2,16.5	180	132	15	69.9×60.9	46.4	3	●					●	●	●		●			R1
Rair Decwriter IV AA	£1,200	M 7×9			+	●			300	256	2,3,4,6,8,12	5.6,6.6,8.25,10,13.2,16.5	30	127	15	57.1×39.4	11.3	3				●			●	●				●	R1
Rair 630	£1,940	Daisywheel			+	●			9600	768	6,8	10,16.5	40	196	15	59.9×46.4	27.2	2	●		●	●			●	●	●	●	●	●	R1
Rair 820	£1,529	M 9×7			+	●			9600	1280	6,8	10,16.5	150	132	15	66×53.4	18.2	6	●		●				●	●	●		●	●	R1
Rair Centronics 150/4	£722	M 9×7		+		●			9600	N/A	6	10	150	132	10	38.1×35.6	9	2		●					●	●	●	●	●	●	R1
Rair/Texas Instruments 743	£1,437	Thermal				●			300	N/A	6	10	30	80	8.5	39.1×40.6	6.1	1	●								●			●	R1
Ricoh RP1300 Flowriter	£1,144	Daisywheel	○	○		○			9600	200	8	10,12,15	37	163	15	59.3×33.2	14	7	●	●	●	●	●	●	●	●	●	●	●	●	A1
Ricoh RP1600 Flowriter	£1,782	Daisywheel	○	○		○			9600	2000	8	10,12,15	60	163	15	62.5×35.5	22	7	●	●	●	●	●	●	●	●	●	●	●	●	A1
Ricoh RP1600S	£1,667	Daisywheel	+	+		●			9600	4000	6,8	10,12,15	65	204	13.5	63.5×36.2	27	7	●	●	●	●		●	●	●	●	●			●	M4
Sanders S700	£2,875	M		●		●			9600	2000	6,8	6,10,12,15,17,18	450	234	14.5	47×56.9	23.6	5	●	●	●	●	●	●	●	●		●		●	●	A2
Seikosha GP100A	£247	M 5×7	+	●	+	+			9600	256	6	6,12	50	80	10	42.7×23.8	4.5	3		●				●			●		●		D4
Smith Corona TP1	£557	Daisywheel		○		○			19200	N/A	3,4.5,6	10,12	120	126	13	49.5×31.5	8.4	5	●	●	●					●	●	●		●	D1
Sord SLP160	£724	M		●					9600	136	6,8,9	10,12	120	136	15	51×36	13	5	●	●	●		●	●	●	●	●			●	●	S12
Sord SWP20	£1,444	Daisywheel		●		+			9600	2000	6,8	10,12,15	16	132	15	66×44.7	22	5	●	●	●	●			●	●	●		●		●	S2
Star DP-8480	£251	M		●		+			2400	132	6,12	10,12,16.7	100	132	10.5	39.4×32.4	8.5	2	●		●		●		●	●	●		●	●	●	S3
Systime Systerm	£1,909	M				●			9600	256	6,8	10	120	132	16	71.7×61	53	6			●		●		●	●	●		●			S4
Systime Sysprint-P	£1,714	M		●					9600	256	6,8	10	150	132	16	71.7×61	50	6			●		●		●	●	●		●			S4
Systime Sysprint-S	£1,599	M				●			9600	256	6,8	10	120	132	16	71.7×61	53	6			●		●		●	●	●		●			S4
Tandy TRS 80 DW2	£1,299	Daisywheel		●					9600	2000	6	10,12	43	163	16.5	62.4×20.4	27	4	●	●	●	●			●	●	●	●	●	●	●	T1
Texas Instruments 743	£1,271	Thermal 7×5			●	●			300	N/A	6	10,17	30	80	8.5	39.1×40.6	6	1										●			●	D5
Texas Instruments 745	£1,470	Thermal				●			300	256	6	10,17	30	80	8.5	39.1×40.6	13.5	1										●				R1

Make & Model	Price inc VAT	Printhead type (M = matrix)	INTERFACES ● inc in price, ○ = options at extra cost (+)						Max baud rate	Buffer Memory Size (in characters)	Lines per inch	Characters per inch	Max print Speed (CPS)	Max print positions	Max paper width in inches	Size (base area in cms)	Weight (in kilos)	Max Copies	Underlining	Bold Type	True Descenders	Proportional Spacing	Block Graphics	High Resolution Graphics	Bi Directional	Logic Seeking	Feed Method					Distributor
			I-EEE	Centronics	20ma	RS232	Others ●	Others (+)																			Fan Fold	Roll	Cut Sheet	Tractor	Frictional	
Texas Instruments 781	£1,259	Thermal 7×5			●	●			9600	256	6	10,17	120	80	8.5	40.6×15.24	8.5	1							●	●		●			●	D5
Texas Instruments 810	£1,369	M 9×7		+	+	●			9600	256	6,8	5,8,10,16.5	150	132	15.5	65.4×50.8	25	9							●	●	●			●		D5
Texas Instruments 820	£1,438	M 9×7			○	○			9600	2000	6,8	5,8,10,16.5	150	218	15.5	64×45.7	40	5							●	●	●			●		D5
Texas Instruments 840	£847	M 9×9			+	●			9600	256	6,8	10,16.5	75	220	15	57.6×43.2	11.3	3							●	●	●	●		●	●	R1
TRD 170S	£834	Daisywheel		○		○			19200	256	6	10,12,15	17	132	15.5	50.8×33	13	6	●	●	●	●			●	●	●				●	T2
Toshiba T1350	£1,898	M		○		○			9600	256	6	10,12	192	192	15	55×38	19.9	3	●	●	●	●	●	●	●	●	●	●	●	●	●	T4
Walters WM2000	£477	M 9×9	+	●	+	+			19200	750	6,8,12	5,6.6,8.3,10,13.3,16.6	128	132	10	43.9×33.5	12	4	●	●	●		●	●	●	●	●			●		W1
Walters WM4000	£713	M 9×9	+	●	+	+			19200	1500	6,8,12	5,6.6,8.3,10,13.3,16.6	150	220	15	63×39	13	5	●	●	●		●	●	●	●	●			●		W1
ZX Printer	£60	Electrical						1	N/A	N/A	9	32	50	32	4	14×4.6	N/A	1			●		●	●				●				●	S5

MONITORS

These have been split into **colour** and **monochrome**.

Screen size is a diagonal measurement in inches. Nearly all monochrome monitors accept a **composite video** signal from the computer and most computers are equipped with composite video output. Colour monitors feature a wider range of **signal** systems than mono and it is important to match the output of your computer to the input of the monitor.

An **audio channel** will enable sound to be output from a speaker inside the monitor. **Mono tint** refers to the colour of the text on a mono monitor. Some monitors come with an **anti-glare filter** to relieve operator discomfort.

Band width refers to the frequency range of signals to which the monitor can respond in MegaHertz. **Dot resolution** indicates the number of dots which can be displayed across the screen: the more dots, the sharper the picture.

Dimensions indicates the area the unit occupies on the desktop.

COLOUR MONITORS

Make & Model	Price inc VAT	Screen size (in inches)	Signal					Audio channel	Anti-glare filter	Band width (in MHz)	Dot resolution	Dimensions (cms)	Weight (kilos)	Distributor
			Modulated PAL	Unmodulated PAL	TTL RGB	75 Ohm linear	32 bit 4 bit TTL							
Crofton C1401	£300	14			●					10	600	37×42	10	C4
HM 2713	£3,120	13			●					25	720	54×40	36	B1
HM 2719B	£2,553	19			●					25	960	50×49	46	B1
HM 2719C	£3,042	19			●					25	960	50×49	46	B1
HM 3619	£3,548	19			●					45	1280	50×44	48	B1
Lion Cub 1431-TTL	£286	14			●					7	585	65×57.5	11.5	S6
Lion Cub 1436	£316	14					●			7	585	65×57.5	11.5	S6
Lion Cub 1439	£339	14				●				7	585	65×57.5	11.5	S6
Lion Cub 1441-TTL	£546	14			●					15	585	65×57.5	11.5	S6
Lion Cub 1445	£633	14				●	●			15	895	65×57.5	11.5	S6
Lion Cub 1449	£604	14				●				15	895	65×57.5	11.5	S6
Lion Cub 1451-TTL	£430	14			●					10	653	65×57.5	11.5	S6
Lion Cub 1455	£483	14				●	●			10	653	65×57.5	11.5	S6
Lion Cub 1459	£459	14				●				10	653	65×57.5	11.5	S6
Lion Cub 2031-TTL	£344	20			●					7	585	65×57.5	11.5	S6
Lion Cub 2035	£431	20				●	●			7	585	65×57.5	11.5	S6
Lion Cub 2036	£390	20					●			7	585	65×57.5	11.5	S6
Lion Cub 2039	£371	20				●				7	585	65×57.5	11.5	S6

Make & Model	Price inc VAT	Screen size (in inches)	Signal					Audio channel	Anti-glare filter	Band width (in MHz)	Dot resolution	Dimensions (cms)	Weight (kilos)	Distributor
			Modulated PAL	Unmodulated PAL	TTL RGB	75 Ohm linear	32 bit 4 bit TTL							
Lion Cub 2051-TTL	£646	20			●					10	940	65×57.5	11.5	S6
Luxor Digital	£574	14			●			●	●	25	800	N/A	15.7	P1
Luxor Linear I	£597	14				●		●	●	25	800	N/A	15.7	P1
Luxor Linear II	£643	14			●			●	●	25	800	N/A	15.7	P1
Microtech 14	£402	14		●	●	●		●		18	585	33.7 × 40.8	12.6	M6
TM 22	£329	6				●		●		5.5	N/A	22×34.5	4.1	J3
VM 14 PSN	£378	14				●		●		5.5	300	47×40	13.6	J3
Wolf Cub 1435-TTL	£358	14				●	●			7	653	65×57.5	11.5	S6
Wolf Cub 1446-TTL	£587	14					●			15	895	65×57.5	11.5	S6
Wolf Cub 1456	£454	14					●			10	653	65×57.5	11.5	S6

MONOCHROME MONITORS

Make & Model	Price inc. VAT	Screen size	Composite video	Audio channel	Mono tint	Anti-glare filter	Band width (MHz)	Dot resolution	Dimensions (cms)	Weight (kilos)	Distributor
AVT DM 210G	£138	12	●		Green	●	12	750	30.8×29.6	9.5	L1
EG 100	£77	12	●		Green		8	700	37.5×29	8	L1
EG 101	£91	12	●		Green		12	700	37.5×29	8	L1
LEDM 091D	£99	9	●		B&W	●	12	750	22×24	5.4	L1
LEDM 0910	£121	9	●		Green	●	12	750	22×24	5.4	L1
Luxor 10	£212	10	●		Orange	●	22	625	N/A	8	P1
Luxor 15	£283	15	●		Orange	●	22	625	N/A	13	P1
M9	£131	9	●		Green		15-22	650	22.4×25.7	5.7	P1
M12	£144	12	●		Green		15-22	800	29.3×30	9.3	P1
Novex	£114	12	●		Green		12	750	N/A	N/A	P1
N12 1003	£112	12	●		Green		24	800	23×26.5	7	P1
Prince	£126	12	●		Green		24	800	33×50	7	C4
PM 102	£126	9	●		Green	●	24	800	22×28	7	C4
PM 1201	£138	12	●		Green		24	800	33×50	7	C4
Zenith ZVM121	£99	12	●	●	Green	●	15	N/A	29×29	6.5	P2

DISK DRIVES

This section is divided into categories covering 5¼in and 8in floppy disks.

Disk data **capacity** is measured in kilobytes (K): one kilobyte = 1,024 characters. A **no of disks** column is included because some disk units contain two disk drives.

Manufacturers can vary the number of disk data **tracks** and these are divided into sectors. This **sectoring** system allows the information to be stored and retrieved by reference to a timing mark on the disk so the computer can keep track of its rotation. The system can be hard, where reference is kept by a hole in the disk, or soft, where the disk position is monitored by magnetic signals.

Some drives have one read/write head for each side of the disk so the buyer has a choice between **single or double-sided** drives. **BS** means that the drives are both single and double-sided.

As disk technology advanced it became possible to cram more data onto the floppy so drives will feature either **single or double** (data) **density. BD** means that the drives are both single and double density.

The interface acts as an interpreter so the computer and disk can exchange information. Each device must have the same interpreter before a useful cable connection can be made. The **connect to** column allows you to match the disk interfaces to those included in the disk drives or available at extra cost.

5¼" DISK DRIVES

Make and Model	Price inc VAT	Capacity	No. of disks	Tracks	Sectoring	Sides and density	Connects to: I-EEE	RS232	BBC	Apple II	St. Shugart	Nasbus	Gemini	20ma	Others	Distributor
Atari	£299	90K	1	40	Soft	SS.SD									●	A4
BASF 6106	£195	500K	1	48	Both	SS.BD					●					B6
BASF 6108	£240	500K	1	48	Both	DS.BD					●					B6
BASF 6118	£279	1Mb	1	96	Both	DS.BD					●					B6
Canon X8300	£600	640K	2	80	Soft	DS.DD									●	C5
CD 40	£679	400K	2	40	Both	SS.BD									●	C6
CD 50A	£424	500K	2	40	Both	SS.BD					●					C6
CD 50E	£569	1Mb	2	80	Both	SS.BD					●					C6
CD 50F	£712	2Mb	2	80	Both	DS.BD					●					C6
CD 80	£765	800K	2	80	Both	SS.BD									●	C6
CD 80D	£949	1.6Mb	2	80	Both	DS.BD									●	C6
Commodore 2031	£454	171K	1	35	Soft	SS.DD	●									C2
Commodore 4040	£799	343K	2	35	Soft	SS.DD	●									C2
Commodore 8050	£1,029	1Mb	2	77	Soft	SS.DD	●									C2
Commodore 8250	£1,489	2Mb	2	154	Soft	DS.DD	●									C2
Commodore VIC 1541	£345	171K	1	35	Soft	SS.DD									●	C2
Control Data 9408	£221	250K	1	40	Both	SS.BD					●					C7
Control Data 9409	£272	500K	1	40	Both	DS.BD					●					C7
Control Data 9409T	£420	1Mb	1	80	Both	DS.BD					●					C7
Control Data ZL141	£225	250K	1	40	Both	SS.DD			●							M5
Control Data ZL141B	£175	250K	1	40	Both	SS.DD			●							M5
Control Data ZL142	£360	500K	2	40	Both	SS.DD			●							M5
Control Data ZL241B	£240	500K	1	40	Both	DS.DD			●							M5
Control Data ZL291	£380	1Mb	1	80	Both	DS.DD			●							M5
Control Data ZL291*	£405	500/1Mb	1	40/80	Both	DS.DD			●							M5
Control Data ZL291B	£320	1Mb	1	80	Both	DS.DD			●							M5
Control Data ZL292	£640	2Mb	2	80	Both	DS.DD			●							M5
CS 40	£482	200K	1	40	Both	SS.BD									●	C6
CS 50A	£229	250K	1	40	Both	SS.BD					●					C6
CS 50E	£305	500K	1	80	Both	SS.BD					●					C6
CS 50F	£397	1Mb	1	80	Both	DS.BD					●					C6
CS 80	£523	400K	1	80	Both	SS.BD									●	C6
CS 80D	£627	800K	1	80	Both	DS.BD									●	C6
Cumana AS100	£252	200K	1	35	Soft	SS.BD				●						C6
Cumana DA8035	£857	655K	2	80	Soft	SS.BD				●						C6
EG 401AT	£370	102K	2	40	Soft	SS.BD					●					L1
Gemini 825	£403	400K	1	80	Soft	SS.DD						●				G2
Gemini 825	£518	800K	1	160	Soft	DS.DD						●				G2
Gemini 825	£661	800K	2	80	Soft	SS.DD						●				G2
Gemini 825	£776	1.6Mb	2	160	Soft	DS.DD						●				G2
Lowe EG 400AT	£426	200K	2	40	Soft	SS.BD					●					L1
Lowe EG 400T	£253	102K	1	40	Soft	SS.BD					●					L1
M 4853	£311	1Mb	1	80	Soft	DS.DD					●					A3
M 4854	£368	1.6Mb	1	77	Soft	DS.DD					●					A3
Megastore MIOS	£1,034	1.2Mb	2	80	Soft	DS.DD				●					●	V1
Multi Floppy Drive	£592	8Mb	5	770	Soft	SS.DD	●									H1
RM MDS-1	£1,950	144K	1	40	Soft	DS.SD		●							●	R3
RM MDS-2	£2,147	288K	2	40	Soft	DS.SD		●							●	R3
Scorpio 8	£863	8Mb	5	770	Soft	SS.DD	●									H1
Sharp MZ80 FB	£856	560K	2	70	Soft	DS.DD									●	S7
Tandy Colour	£449	175K	1	40	Soft	SS.DD									●	T1
Tandy 26-1160	£299	75K	4	40	Soft	SS.SD					●					T1
Tandy 26-3023	£299	156K	4	35	Soft	SS.DD					●					T1
Tandy Model 1	£389	90K	1	35	Soft	SS.SD									●	T1
Tandy Model 111	£369	175K	2	40	Soft	SS.DD									●	T1
TM 101-4	£282	1Mb	1	160	Soft	SS.DD	●									H1
TM 102-2	£393	2Mb	1	160	Soft	SS.DD	●									H1
TM 848-1	£389	800K	1	77	Soft	SS.DD	●									H1
TM 50-1	£147	250K	1	40	Soft	SS.DD	●									H1
TM 100-1	£158	250K	1	40	Soft	SS.DD	●									H1
TM 100-2	£221	500K	1	80	Soft	DS.DD	●									H1
TM 100-4/4M	£247	1Mb	1	160	Soft	DS.DD	●									H1
Tracker 1	£373	1Mb	2	80	Soft	SS.DD					●					D7
Tracker 2	£497	2Mb	2	80	Soft	DS.DD					●					D7

8" DISK DRIVES

Make and Model	Price inc VAT	Capacity	No. of discs	Tracks	Sectoring	Sides and density	Connects to: I-EEE	RS232	BBC	Apple II	St. Shugart	Nasbus	Gemini	20ma	Others	Distributor
ACP 700 (AC)	£293	1Mb	1	77	Soft	DS.DD									●	E2
ACP 750 (DC)	£316	1Mb	1	77	Soft	DS.DD									●	E2
ACP 1500 (DC)	£403	2Mb	1	77	Soft	DS.DD									●	E2
Caldisk 142M	£465	500K	1	77	Both	SS.BD									●	E2
Caldisk 143M	£522	1.2Mb	1	77	Both	DS.BD					●					F1
Caldisk 143M-1	£465	500K	1	77	Both	SS.BD					●					F3
Commodore 8280	£2,760	987K	2	77	Soft	DS.DD	●									C2
Canon X 8330	£1,200	2Mb	2	153	Soft	DS.DD									●	C5
Control Data 9404B	£684	800K	1	77	Both	SS.BD					●					M5
Control Data 9406-4	£1,144	1.6Mb	1	77	Both	DS.BD					●					M5
Eicon FD8/1D/DD	£1,438	1Mb	1	77	Soft	SS.DD				●						E3
Eicon FD8/1D/SD	£1,397	500K	1	77	Soft	BS.SD				●						E3
Eicon FD8/2D/FBR	£1,740	1Mb	2	77	Soft	DS.SD									●	E3
Eicon FD8/2D/DD	£2,013	2Mb	2	77	Soft	SS.DD				●						E3
Eicon FD8/2D/SD	£1,972	1Mb	2	77	Soft	SS.SD				●						E3
Eicon FD8/1D/FBR	£1,240	500K	1	77	Soft	DS.SD									●	E3
F 311	£1,725	1.2Mb	2	76	Soft	DS.SD									●	B5

8" DISK DRIVES

Make and Model	Price inc VAT	Capacity	No. of disks	Tracks	Sectoring	Sides and density	Connects to: I-EEE	RS232	BBC	Apple II	St. Shugart	Nasbus	Gemini	20ma	Others	Distributor
F 320	£2,300	2.4Mb	2	76	Soft	DS.DD									●	B5
M 2894	£499	1.6Mb	1	77	Soft	DS.DD					●					A3
M 2896	£493	1.6Mb	1	77	Soft	DS.DD					●					A3
Megastor 11 DD	£1,133	2Mb	2	77	Soft	DS.DD				●						V1
Megastor 11SD	£1,018	1Mb	2	77	Soft	DS.SD				●					●	V1
Megastor 111	£1,121	2Mb	2	77	Soft	DS.DD				●					●	V1
R.M. FDS-2	£3,789	1Mb	2	77	Soft	DS.SD		●							●	R3
Tandy Model 11	£999	486K	1	77	Soft	DS.SD.									●	T1
Tandy Model 16	£949	1.2Mb	1	77	Soft	DS.DD									●	T1
Tandy Model 16	£1,549	2.5Mb	2	77	Soft	DS.DD									●	T1

MODEMS

A modem interfaces a computer and the telephone system so computers can communicate over long distances. It converts data to electrical pulses or sounds that can be sent down the line. A modem can be connected to the line directly or acoustically. A **D** in the **connection** column represents direct link, while **A** indicates acoustic. The acoustic coupler is like a female telephone handset with a speaker in the coupler opposing the phone's mouthpiece and a microphone opposing the earpiece. A **B** in this column indicates that both methods of attachment are available. **Baud** rate shows the speed with which the data is transmitted.

The modem must be connected to the computer through an interface. The **interface** column lists the main interfaces featured on each modem. **Asynchronous** means that data may be transferred at intervals as available or as needed. **Synchronous** data is transmitted at regular intervals. **Simplex** transfers data in one direction, while **Half duplex** can transmit/receive in either direction, but not simultaneously. **Full duplex** transmits and receives information in both directions at once.

Some modems can **originate** a call or start a two-way conversation. **Answer** means they can respond to a call from another computer.

Make and Model	Price inc VAT	Connection	Data Rates (baud)	Interface	Others	Capabilities: Asynchronous	Synchronous	Simplex	Half Duplex	Full Duplex	Originate	Answer	Distributor Code
AJ 311	£320	B	300	RS232		●			●	●	●	●	A5
AJ 1222	£736	D	1200	RS232		●	●			●	●	●	A5
AJ A211	£263	A	300	RS232		●			●	●	●		A5
AJ 1234	£684	A	1200	RS232		●	●			●	●		A5
AJ 1256	£684	B	1200	RS232		●	●			●	●	●	A5
AM 211	£387	B	300	RS232		●			●	●	●		A5
Bermac 1200/1 Model A	£414	D	1800	RS232		●			●		●		B3
Bermac 1200/1 Model B	£460	D	1800	RS232		●			●		●	●	B3
CCITT CAT	£228	A	300	RS232/V24		●			●	●	●	●	D8
CDSV22	£719	D	1200	RS232/V24		●	●			●	●	●	D8
DSL2123	£329	D	300/1200	RS232/V24		●			●	●	●	●	D8
Sendata 700 Series A	£253	A	300	RS232, 20ma	1	●				●	●	●	B4
Sendata 700 Series B	£224	A	300	RS232, 20ma	1	●				●	●		B4
Sendata 700 Series C	£309	A	600-1200	RS232, 20ma	1	●			●		●	●	B4
Sendata 700 Series D	£309	A	75-1200	RS232, 20ma	1	●				●	●	●	B4
Sendata 700 Series E	£149	A	300-1200	RS232, 20ma	1	●		●			●		B4
Racal 126 LS1	£782	D	2400	V24			●			●	●	●	R2
Racal MPS 3021	£295	D	300	V24		●				●	●	●	R2
Racal MPS 1222	£678	D	1200	V24		●	●			●	●	●	R2

PLOTTERS

Plotters use a pen to put graphics or characters on paper under the command of a computer. They are usually one of two types—flatbed or drum. A **flatbed** holds the paper flat while the pen draws on it in two dimensions. A **drum** plotter turns the paper vertically on a cylinder while the pen moves horizontally. Most plotters can change pens during operation so a variety of colours and line thicknesses are available. **Max pens** indicates the number of pens in operation or on standby. Dimensions of the paper to be used are listed under **paper size. Maximum plotting speed** measures the distance in millimetres per sec covered by the pen. **Interfaces** are included in the basic price or come at extra cost.

Make and Model	Price inc VAT	Type	Max Pens	Paper Size	Maximum Plotting Speed in secs.	Interface (+ at extra cost)	Distribution
Calcomp 81	£3,392	Flat	8	A3	30cm	RS232 or IEEE	C3
HP 7470A	£1,317	Drum	2	A4	38.1cm	RS232 (IEEE+)	H2
PD4	£585	Flat	1	A4	700mm	(IEEE+)	J2
Strobe 100	£662	Drum	1	A4	7.6cm	(RS232, Parallel+)	D6
TRS-80 Pen Plotter	£1,399	Flat	6	A4	6.8cm	RS232	T1
Watanabe WX 4633	£2,772	Flat	10	A3	250mm	(Centronics, RS232, IEEE+)	E4
Watanabe WX 4634	£2,515	Flat	2	A3	250mm	(Centronics, RS232, IEEE+)	E4
Watanabe WX 4635	£2,301	Flat	1	A3	250mm	(Centronics, RS232, IEEE+)	E4
Watanabe 4636	£3,074	Flat	10	A3	400mm	(Centronics, RS232, IEEE+)	E4
Watanabe 4637	£2,862	Flat	2	A3	400mm	(Centronics, RS232, IEEE+)	E4
Watanabe 4638	£2,635	Flat	1	A3	400mm	(Centronics, RS232, IEEE+)	E4
Watanabe WX 4671	£1,129	Flat	1	A3	50mm	Parallel (RS232, IEEE+)	E4
Watanabe 4675	£1,638	Flat	6	A3	50mm	Parallel (RS232, IEEE+)	E4
Watanabe 4731	£1,761	Drum	4	A3	200mm	(Centronics, RS232, IEEE+)	E4

DISTRIBUTORS

A1 Appropriate Technology, 01-625 5575 **A2** Advent Data Products, Melksham 706289 **A3** Altex Microcomputers Ltd, Reading 791579 **A4** Atari International (UK), Slough 33344 **A5** Anderson Jacobson Ltd, Slough 25172
B1 Bytech, Reading 61031 **B2** British Olivetti, 01-785 6666 **B3** Barron McCann, Biggleswade 316286 **B4** Bencom Sendata (UK), 01-940 1386 **B5** Baydel Ltd, Leatherhead 378811 **B6** BASF, 01-388 4200
C1 Centronics, 01-581 1011 **C2** Commodore Business Machines, Slough 79292 **C3** Calcomp Ltd, Bracknell 50211 **C4** Crofton Electronics, 01-891 1923 **C5** Canon (UK) Ltd, 01-680 7700 **C6** Cumana, Guildford 503121 **C7** CBL, Reading 792097
D1 Discom, Evesham 3591 **D2** Datatrade Ltd, Northampton 22289 **D3** DNCS Ltd, 061-643 0016 **D4** DRG, Weston-super-Mare 415398 **D5** Data Systems Division, Bedford 223889 **D6** Data Efficiency, Hemel Hempstead 63561 **D7** Data Track Technology, New Milton 619650
E1 Epson (UK), 01-900 0466 **E2** Elecomatic, 041-881 5825 **E3** Eicon, Barhill 81825 **E4** Environmental Equipments Northern Ltd, Nantwich 625115
F1 Fastcol, Reading 791557
G1 Geveke Electronics, Woking 26331 **G2** Gemini Micros, Amersham 28321
H1 HAL Computers Ltd, Farnborough 517175 **H2** Haywood Electronic Asoc. Ltd, 01-428 0111
I1 Informex Ltd, 01-318 4213 **I2** Intac Data Systems, Rotherham 547170 **I3** ITT Business Systems, Brighton 507111 **I4** ITT Consumer Products, Basildon 3040 **I5** Intelligent Interfaces, Stratford-upon-Avon 296879
J1 Jones & Brother, 061-330 6531 **J2** J J Lloyd Instruments, Locksheath 4221 **J3** JVC, 01-450 2621
L1 Lowe Electronics, Matlock 4995
M1 Mitsui & Co Ltd, 01-600 1777 **M2** Modata, Tunbridge Wells 41555 **M3** Mannesmann Tally Ltd, Reading 788711 **M4** Micropute, Macclesfield 615384 **M5** Microware, 01-272 6237
N1 Newbury Data Recording, Newbury 48864
P1 Phoenix Technology, 01-737 3333 **P2** Pete & Pam Computers, Rossendale 227011
Q1 Qume (UK) Ltd, Reading 584646
R1 Rair Ltd, 01-836 6921 **R2** Riva Terminals, Woking 71001 **R3** Research Machines Ltd, Oxford 249866
S1 Sintron Electronics, Reading 875464 **S2** Sord, 01-930 4214 **S3** Stotron, Coventry 613521 **S4** Systime, Leeds 702211
S5 Sinclair Research, Camberley 681666 **S6** Silicon Express, Leicester 374917 **S7** Sharp Electronics, 061-205 2333
T1 Tandy Company, Walsall 648181 **T2** Triumph Adler, 01-250 1717 **T3** Technology For Business, 01-837 1271 **T4** Toshiba Office International, Sunbury-on-Thames 85666
V1 Vlasak, High Wycombe 448633
W1 Walters Microsystems Int Ltd, High Wycombe 445175
X1 X-Data Ltd, Slough 723331
Z1 Zygal Dynamics, Bicester 3361

QUESTION: WHERE CAN I BUY . . .

OFFICIAL NEWBRAIN DEALERS

NEWBRAIN 'A'	for £225·50
NEWBRAIN 'AD'	for £260·00
SINCLAIR ZX81	for £48·00
SINCLAIR SPECTRUM 16K	for £121·00
SINCLAIR SPECTRUM 48K	for £171·00
ORIC 1 48K	for £168·00
SINCLAIR ZX Printer	for £58·00
SINCLAIR ZX 16K Ram pack	for £28·50
SEIKOSHA GP-250X Printer	for £260.00
SEIKOSHA GP-100A Printer	for £215.00
BMC BM12E Green monitor	for £100·00
SANYO SCM12H Green monitor	for £100·00
SANYO SCM12N Green monitor	for £85·00

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Post and Packing: Please add £3 for one item, 2 items £4 each, 3 items £4.50 each any more than three items Post and Packing Free.

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PLEASE SEND ME YOUR FULL PRICE LIST

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Please debit my Access Account ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

ITEMS REQUIRED	PRICE
TOTAL	
POST AND PACKING	
TOTAL ENCLOSED	

PCN Billboard

TRS80, Level 2, expansion interface, Tabdy monitor, Tandy disk drive. TRS-DOS, NEWDOS, £450 or swap, good Epsom printer. Baljay, office 0446 704488, home 044086 434 (Suffolk).

ZX81 16K + keyboard + printer + spare rolls for printer + learning lab. Books and software including Chess and 3-D Defender. Ideal "starter" kit. Offers around £135. Tel: 01-363 6075 (evenings).

ZX81 32K RAM, ZX printer with 5 rolls paper, book and tape 'ZX81 Programming for Real Applications', card index, spreadsheet and utilities programs, several other books, tapes, magazines. £150. Tel: Bristol 500892.

Vic 20, brand new, 12 months guarantee, Super expander Cartridge, Vic Programmer's Guide, joystick, cassette and various magazines, £150. Tel: G. Johnson, 083-483 677 (after 6pm).

Acorn Atom, 12K+12K, regulated PSU, BBC board, toolbox, Willow utility ROM, soft VDU, Invaders and Peeko-Computer cassettes. Two Atom books. Worth new £400, price £260 ono. Tel: 0742 339003 after 7pm.

Video Genie E3003 32K, lower case, sound, joysticks, two General Northern Feature ROM's, 50+ games/utilities included. EDTASM W4W Adventures Arcade, £400. Tel: Bedford (0234) 51497 after 4pm.

Centronics printer, full size, 132 cols tractor feed, 15in paper max width, double headed bi-directional 160cps standard interface, will run on Dragon, BBC, Oric etc, complete with stand, £150. Tel: 01-856 1198 eves.

Apple IIe Executive System, brand new, 12 month warranty, changed mind for bigger system after purchase, cost £1,840, will accept £1,600. Tel: 25-53668 (evenings).

2 × 81 + 16K, excellent condition, boxed and still under guarantee, plus £20 of games, all for £55 ono. Tel: Weybridge 47888.

Acorn Atom, 12K 12K, colour encoder, floating point, ROM, PSU, manual, games, book, programs including Breakout, others, just £200 for this fully internally expanded computer. Tel: 01-680 evenings. B J Godwin.

Sharp MZ80K, plus manual, books and software including machine code manual + tape and Space Invaders etc, worth £440, will accept £360 ono, excellent condition. Tel: Southampton 551119 after 6pm.

Swap Stereo amplifier, cash value £30 for Vic-20 software or Super Expander or m/c monitor or Programmers Ad cartridge etc, or ZX81. Urgent, phone: evenings or weekends, Richard 021-459 6800.

Sharp MZ80A, Epson interface card, Wordpro, Database, invoicing and statements, commercial accounts, stock control programs etc, 6 months old, bargain at £550 ono. Tel: Downham market 382614.

Nascom 2, attractive rack system, professionally built, 32K RAM (B) board, 16K RAM, 8K Basic, 3APSU, toolkit, ROM GRAPHICS, ROM with keyboard, case, cassette, TV, tapes, manuals for business/home, offers. Tel: (0977) 82138.

ZX81 sound box, almost brand new, £15, over 35 games including Space Invaders, Scramble, Galaxians, Puckman, Asteroids, Defender and Centipede, over £100 worth, £35 ono or £2.50 each game. Tel: Egham 35853.

Star Trek, 48K MZ-80K, superb non-graphical game, contains many problems to overcome, including crew discontent, all standard features plus much more, £6. M Riley, 105 Rea Valley Drive, Birmingham B31 3XN. 478 1563.

TRS-80, 16K level 2 with manuals and books plus editor/assembler and TBUG plus TV and cassette leads, a snip at £120. Tel: 01-398 5081 anytime.

Commodore 64, C2N cassette unit, Programmers, Reference manual (bought separately for £15), 7 weeks old, cost £403, sell £320. Tel: Alan on Blackburn 55161. ext 2268 during working hours.

Wanted — Personal computer — Apple, BBC, CBM, Newbrain or similar considered — also printer wanted. Send details: Hardacre, 24 Southernhay East, Exeter, Devon. Tel: (0626) 862455.

Apple II Europlus, disk drive, controller, RAM card, colour card together with 12in b/w TV, some software, excellent condition, home use only, list over £1,300, for sale at £950 ono. Tel: 051-424 8974.

Wanted Sinclair ZX81 in exchange for BBC software Snapper, Planetoid, Sphinx, Adventure, Meteors, BBC computer programs Volume One and Two. Value if bought new, £60. For details phone Camberley 64246.

Tangerine Microtan with upper/lower case graphics and chunky graphics, Tanbug V1.1, V1.2, keypad and PSU. With manual, £40. Tel: 37 71416 after 7pm.

Micro wanted. I'll exchange my BSA Starfire motorcycle (with accessories) worth £350 for your Spectrum 48K or Dragon 32. Alternatively foregoing plus £150 for your BBC B or Commodore 64. Tel: Flitwick Beds 0525 714673.

Wanted Vic-20 cartridges. Tel: 01-954 4548 ask for Gavin.

Sinclair ZX81, 16K RAM, full size keyboard, 20 software tapes, Chess, Invaders, Breakout etc. Fully enclosed in custom case. As new, 8 months old. £70. Paul Evans 58 Westwood Road, Portswood, Southampton. Tel: (0703) 558398.

Tantel Prestel adaptor. As new (unwanted competition prize). Numeric keypad. Best offer secures. Please telephone Brookwood (048 67) 4755 after 6pm or at weekends.

32K Pet, excellent condition including cassette deck, dust cover. New ROM version with additional toolkit, Pic-chip, Super-chip ROMs. Many games and educational programs. Manuals. £550 ono. Tel: (04626) 2094.

CBM 64, as new, £370. Plus extras, willing to part exchange for BBC Model B plus extras. Tel: 01-673 0219 after 6pm, ask for D Scott. Or C2N cassette unit for £60. And 800 Atari 48K, £300, plus extras.

16K ZX81 (with 6 months guarantee) + carrying case + £30 of software, inc 3D Monster Maze and Flight Simulation. All worth £130. Sell for £70. Tel: Burgess Hill 2760 after 6pm.

Epson MX-80FT type 3, two months old, good condition, including cable for BBC micro, paper and dust cover, only £310 ono. Phone evenings: 01-959 6707. Fouad Katan, 5 Selvage Lane, Mill Hill, London NW7.

Vic-20 with cassette player, Super Expander, 3K Rampack, joystick, books, £60 of software, vgc, £175. Tel: Portsmouth 753266.

ZX81, 16K games for sale, Scramble, Asteroids, Flight Simulation. Cost approx £14 in shops, selling for £5. Ring 332477 after 5pm and ask for Andrew.

Star DP 8480 printer 80cps bidirectional logic seeking tractor with friction feed. 80/96 132 columns. High resolution graphics. Screen dump program. Upgrading. As new. £200. Tel: Newbury 44508 evenings.

Sinclair ZX-printer with five printer rolls. Four months old, excellent condition, £40. Tel: Manchester 747 6184.

Dragon 32 and Tandy Colour Computer machine code address finder. Send £3 and SAE for listing to: 1 Greet Park Close, Southwell, Notts. Tel: Notts 814743 after 4pm.

Atari 400 with Basic, manual cassette deck, joystick plus Submarine Commander, Jet Pilot, Star Raiders, Pacman, Airstrike, B1 Bomber, Crossfire, £300 ono. Phone 021-360 5321 between 6 and 7 evenings.

For Sale, 48K Lynx, only 5 weeks old, £175 ono. Phone 0785 814736.

Swap BBC software including Acornsoft for your ZX81 add-ons, Rampak etc. Tel: 05827 66053.

Atari video console CX2600, complete with nine Atari cartridges including, Pacman, Chess, Defender, Missile, Command, Space Invaders, Casino, Warlord, Night Driver, Combat. Todays cost £300. Bargain at £125. Tel: 090484 271 (York).

Newbrain wordprocessor. Options include save/load to tape, paged organisation, uncrashable, directory look-up, all normal W/P functions, manual, cassette, £5. Could pay 10 times. K. Polston, 9 Bouchier Walk, Rainham, Essex RM13 7HL.

Swap Imagic cartridge Dragonfire (for Intelivision) for Demon Attack or Atlantis. Also several other Mattel cartridges to swap. Ring: Southampton (0703) 785699.

Programs for sale — TRS-80: Labyrinth, Voodoo Castle, Life Game, Personal Finance, Text Editor, T-save, E-Z Sounds. Also for Sinclair Spectrum: Timegate, Music 1, Viewpoint. Tapes cost less than £5 each. Tel: 074-571 3835.

ZX81. Unused Bugbyte ZXAS, ZXDB tapes. Also Illustrating Basic, ZX81 Pocket Book, Mastering Machine Code on ZX81, Understanding ZX81 ROM, ZX81 Companion, Games Book. Hardly used, half price. Brookwood (048 67) 4755 (evenings).

Spectrum 48K, as new over £100 of software including Hobbit, Time Gate, Intruders, Black Crystal, Orbitor, Assembler, and many more. £180. Tel: Mark on Ruislip 35966 evenings.

T199/4A games on cassette: Spacedodge (Ext. Basic), Roadrunner (Ext. Basic), Town Blast (standard), all £4 each or any two for £7.50. Tel: (Telford) 461555 5pm-10pm, ask for Jimmy (more games will also be available).

Commodore 64 software. Tape 1 home banking system. Tape 2 Startrek, Mars, Race Chase. Tape 3 Biorhythm, Pontoon, Wraptrap. £6.50 each. Tel: 0325 480298 after 5pm.

Vic-20, C2N cassette recorder, 3K RAM Super-Expander, joystick, machine code package and over £70 worth of software. £200 ono. For quick sale. Tel: 0734 784506.

Commodore 64K and 1541 disk drive. Joystick and Gridrunner Game. Two manuals offers. Still boxed. Unwanted gift. Wentworth 4193.

ROCKWELL AIM 65 micro 6502 CPU 20— column display and printer. 8k monitor including editor. Three additional ROM sockets and 4K RAM. Boxed as new £165. Tel: Egham 33500.

Atari video computer TV game, £65. Cartridges: Asteroids, Pac-Man. Star Raiders, Superman, £15 each. Combat Air Sea Battle, £10 each, £130 the lot or swap plus cash Spectrum 48K or similar. Tel: Liverpool 051-227 5511 Alan (work).

Seikosha GP-80A printer and paper boxed as new hardly used. £140. Contact William McLuckie, Bellshill, Scotland. Phone: 747831.

Sharp MZ80K 48K as new. Various software, manual and extras, £280. Sharp MZ8T70B. Basic compiler, £30 ono. Tel: 041-647 4977.

Wanted: Vic-20 C2N cassette unit. Willing to pay £20-£25. Phone: 01 485 2786.

Software (Spectrum) one each of the following. Collectors pack, £5. Club controller, £5. Chess (Sinclair), £4. Spectres, £4. Ship of the Line, £3. Tel: Peter 01-229 8541 daytime.

16K ZX81 with leads manual and over 80 games including Mazogs 3D Defender and Monster Maze and many more, all for £80 ono. Ring: T Mustafa on 228 9008.

For Sale Atari video computer game with Space Invaders, Combat and Human Cannonball cartridges, £80 or will swap for 16K Spectrum Computer. Tel: 0472 751263.

TRS-80 level 2 16K VDU tape recorder all leads, plugs, power supply, manuals, many books, plenty of software (Invaders, Pacman, Asteroids, Chess, etc). Good condition, £250, genuine bargain. Tel: 01-346 0095 after 6pm.

16K ZX81 5 months old. £20 of software incl. Psion Flight Simulation. All leads etc included. Price £55. Buyer collects. Tel: (0286) 870379 anytime.

Acorn Atom 12K+12K, leads, manual, PSU, Atom chess, adventures. Hardly used. Selling to buy BBC Model B, £170 ono. Tel: Watford (0923) 41526 or Watford 50618.

MZ80K, Aslan's Sceptre, adventure with graphics and sound, includes concealed games inside main program, send £6 to Alexander Balfour, 50 Freemans Close, Stoke Poges, Bucks.

Video Genie 16K with manuals, various games. One year old, £100. Tel: Windsor 67892 after 7pm.

ZX Spectrum 48K complete with custom carrying case and lots of programs, including Timegate, Flight Simulator, Ground Attack. Price includes books and magazines. Same price as new 16K, £125. Tel: (York) 090484-271.

25% off. BBC user guide, Welcome (unopened), Monsters (Acornsoft), Chess, World Geography, Junior Mathspack, Spacemaze, Where (program power), Tantel/Prestel adaptor (under guarantee), bargain, £90. Write L. Ratna, 22 Elmcroft Avenue, NW11 0RR.

32K CBM computer. New ROM, green screen, tape deck, tool kit, dust cover, much software and books, all in excellent condition, only £395 ono. Tel: 0632 324449 (days) 745771 (eves).

Vic-20 computer with 16K RAM and cassette recorder, over £85 software, including Gorf, Rat-race, Chess, Skramble, Orb, etc. Also over £20 of books. £250 for a quick sale. Tel: Leyland (0772) 23177.

Atari VCS, good condition, 5 cartridges: Pac-Man, Asteroids, Air-Sea Battle, Space War, Combat. Cost £230, sell for £130. Tel: 044-282 2647.

Seikosha GP-100A printer, perfect condition, hardly used, £160. No offers. Tel: Paul 01-876 0521 anytime.

TRS80 LII 16K VDU, green filter, CTR-80 tape recorder, manuals (LI & LII), books and software, including editor, assembler, monitor, enhanced Basic, sound, adventures, etc. Tel: Sittingbourne (0795) 22859 and make me an offer.

16K ZX81 with Redditch keyboard, B/W TV, 3 books, magazines, many games, including Defender, Trader, Monster Maze, Chess. Worth over £200, for quick sale only £105 ono. Tel: Alex Segre 01-485 6010 (eves).

Spectrum software for sale/swap, e.g. Hobbit, £12; Black Crystal, £5.50; Pimania, £7; Arcadia, £3.50; Winged Avenger, £3; Escape, £3; Draughts, £5; Nightflite, £4. Many more, all originals. Tel: 0825 2514 (eves).

For sale or swap. Games Pack 5 + 6 for Acorn Atom. Also Hyperfire Buy, £10, swap for any good games or other software. Tel: Ian 01-959 2093 after 5pm or w/end.

Spectrum Adventures completed, swap for others. Other Spectrum programs for

PCN Billboard

sale or swap. Tel: Tony, Chorley, Lancs 70816.

Atari VCS plus 6 cartridges, very good condition, all for £100 or VCS console for £40, cartridges £10 each. Tel: 01-402 8570.

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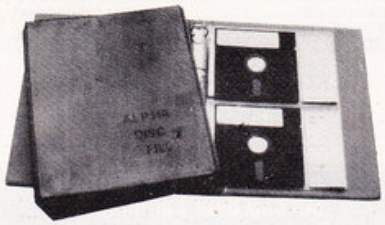

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Rouble trouble

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Nothing daunted, Rediffusion Computers is happily filling an order from the Soviet Ministry of Gas for £9m worth of systems to be used for spares and maintenance planning on the Siberian gas pipeline.

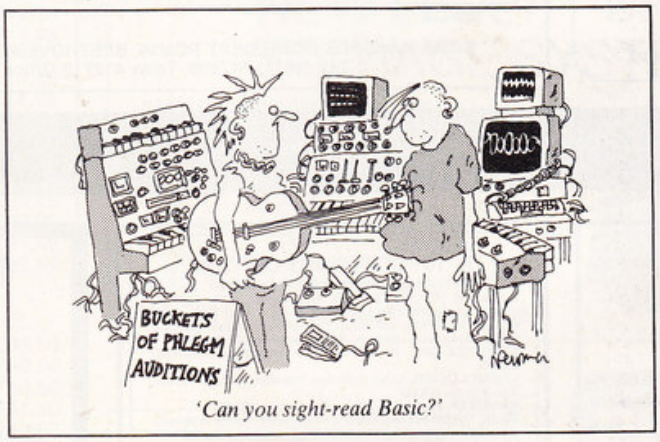
And according to Rediffusion's sales and marketing director Ken Coulter, its Teleputer terminals 'are getting rave reviews'.

Life behind the Iron Curtain must be truly dull if viewdata-type terminals get rave reviews. Perhaps the Russians will express their gratitude by paying in hard currency.

Soft flannel

PR person for Informatics General at launch of new product to link the IBM PC to IBM mainframes: 'The user friendly software lets you determine what it is that you want it to achieve. We call this the task.'

THE IT MAN — The guy with the big grin has good reason to chuckle as he gets a congratulatory message on the ICL micro. For Ivan Newman, second left, won the ICL Personal Computer in an IT Year competition. The only thing is, he works for one of ICL's arch rivals, Burroughs. Well done Ivan . . . tough luck ICL . . .



'Can you sight-read Basic?'

SYNTAX ERRORS

Forth figured

A few errors crept into the FIG-Forth/Forth 79 compiler comparison table (*Micropaedia, Go Forth part 2, PCN April 15*). The way to read it now is this. Swop the headings FIG-Forth and Forth-79. Under the heading Comparison, change '≥' to '>'. In the Memory section, include the word 'BLANKS' under 'ERASE'. Finally, under 'Terminal I/O' change '.r' to '.R'

Bigger Dragons

According to Computer Rentals we got the memory space wrong in Gameplay's review of St George and the Dragon for the Dragon 32 (*PCN April 8*). Our reviewer said it takes up about 8K. Computer Rentals says it takes up 29K.

Initial mistake

In PCN Charts we printed the wrong distributors for the IBM PC. It shouldn't be KGB Micros, but IBM. KGB is currently applying for an IBM dealership and was, therefore, all the more embarrassed by the error. Sorry.

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
Manchester Home Computer Show	April 21-23	Midland Hotel, Manchester	Peter Freebrey, ASP Exhibitions, 01-437 1002
HP 1000 Users Exhibition & Conference	April 26-28	Heathrow Penta Hotel, London	Conference Services, 01-584 4226
Computer Trade Show	April 26-28	Wembley Conference Centre, Wembley	John Cole, Reed Exhibitions, 01-643 8040
Midland Computer Show	April 28-30	Bingley Hall, Birmingham	Roy Bratt, Reed Exhibitions, 01-643 8040
RIBA Computer Conference &	May 10-12	Bloomsbury Crest Hotel, London	Joe Hunting, RIBA Services Ltd, 01-637 8991
Micro City '83	May 10-12	Bristol Exhibition Complex	Stephen Hybs, Tomorrow's World Exhibition, 0272 292156
Computer Open Day Exhibition	May 12	The Post House, Southampton	Tony Kaminiski, Couchmead Communications, 01-778 1101
Compec Scotland	May 17-19	Kelvin Hall, Glasgow	Tracey Cannon, Reed Exhibitions, 01-643 8040
International Word Processing Exhibition	May 24-27	Wembley Conference Centre, Wembley	Philip Le Masurier, BETA, 01-405 6233
Computers In The City	May 24-26	Barbican, London	Mario Meoli, Online Conferences, 0927 28211
Computer Open Day	May 26	Strathmore Hotel, Luton	Tony Kaminiski, Couchmead Communications, 01-778 1101

OVERSEAS EVENTS

Event	Dates	Venue	Organisers
Information Management Exhibition & Conference	April 26-28	McCormick Place, Chicago, USA	Tony May, Clapp & Poliak, 021-384 3384
Compec Europe Exhibition	May 3-5	Centre Rogier, Brussels	Tracey Cannon, IPC Exhibitions, 01-643 8040
National Computer Conference & Exhibition	May 16-19	Anaheim, USA	American Federation of Information Processing Societies, 1815 N Lynn Street, Arlington, VA 22209
Computers, Communications & Electronic Technology Exhibition & Conference	May 31-June 3	Melbourne, Australia	CETIA, PO Box 259, Roseville, Sydney, N S W 2069
International Computer Technology	June 7-10	Hong Kong Exhibition Centre, Hong Kong	Terry Hill, Industrial & Trade Fairs International Ltd, 021-705 6707

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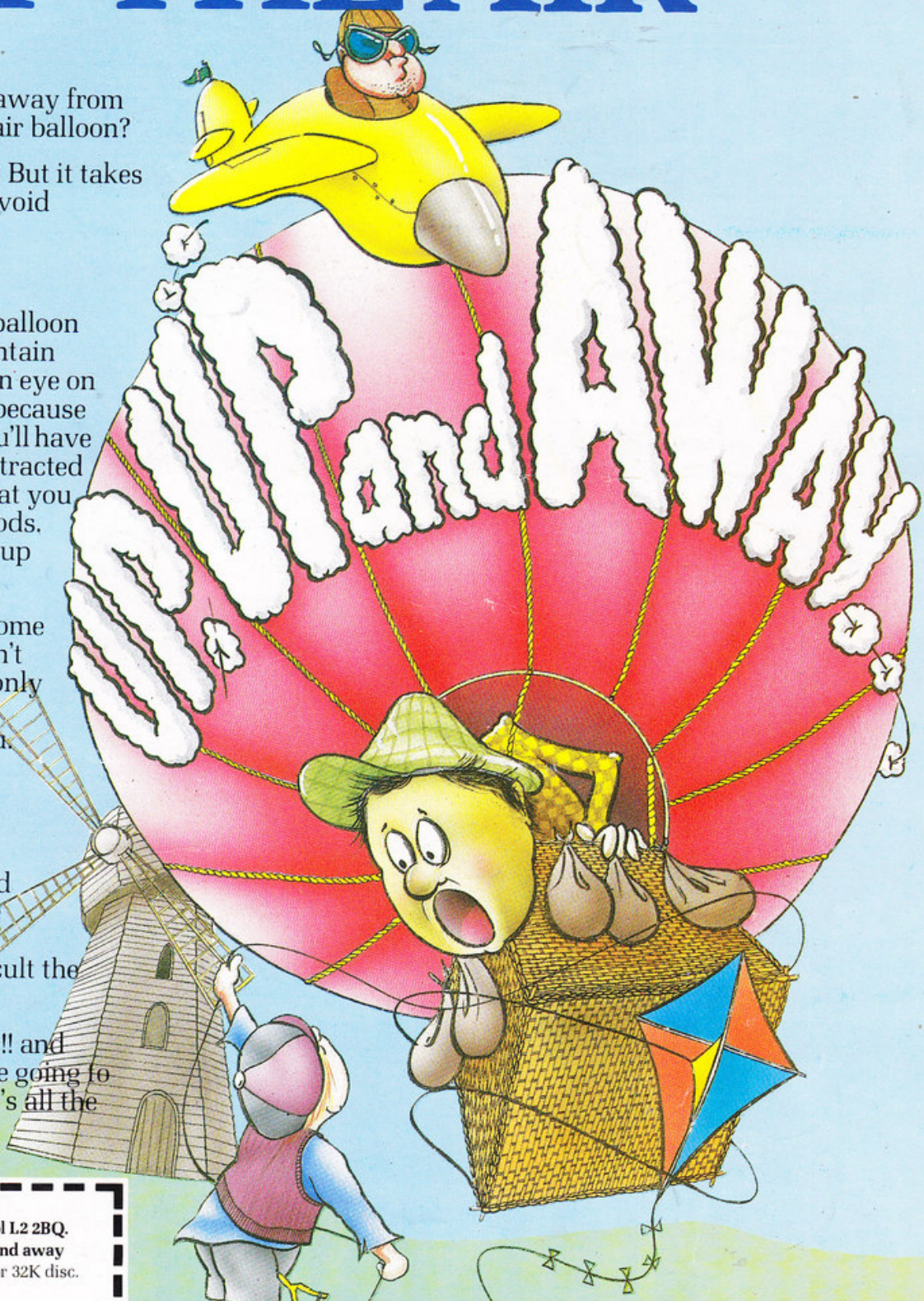

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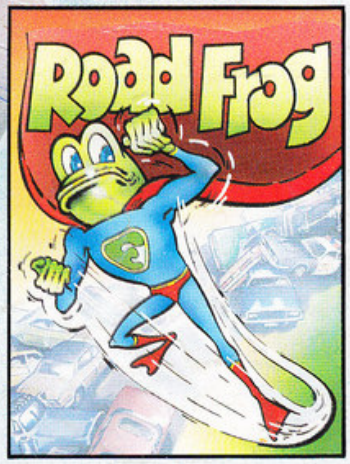

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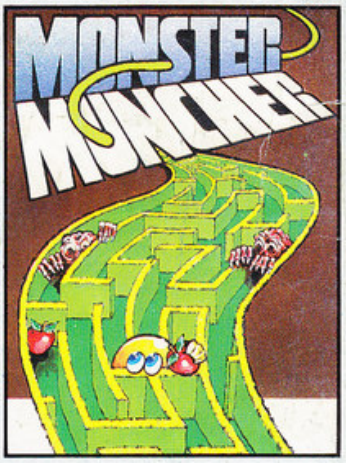

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