WHICH MICRO? & SOFTWARE REVIEW

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DECEMBER 1982

85p

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EXTENDING YOUR MEMORY

MICROWRITER v NEWBRAIN

COMPUTER BLUFF: PART ONE

VIC ADVENTURE

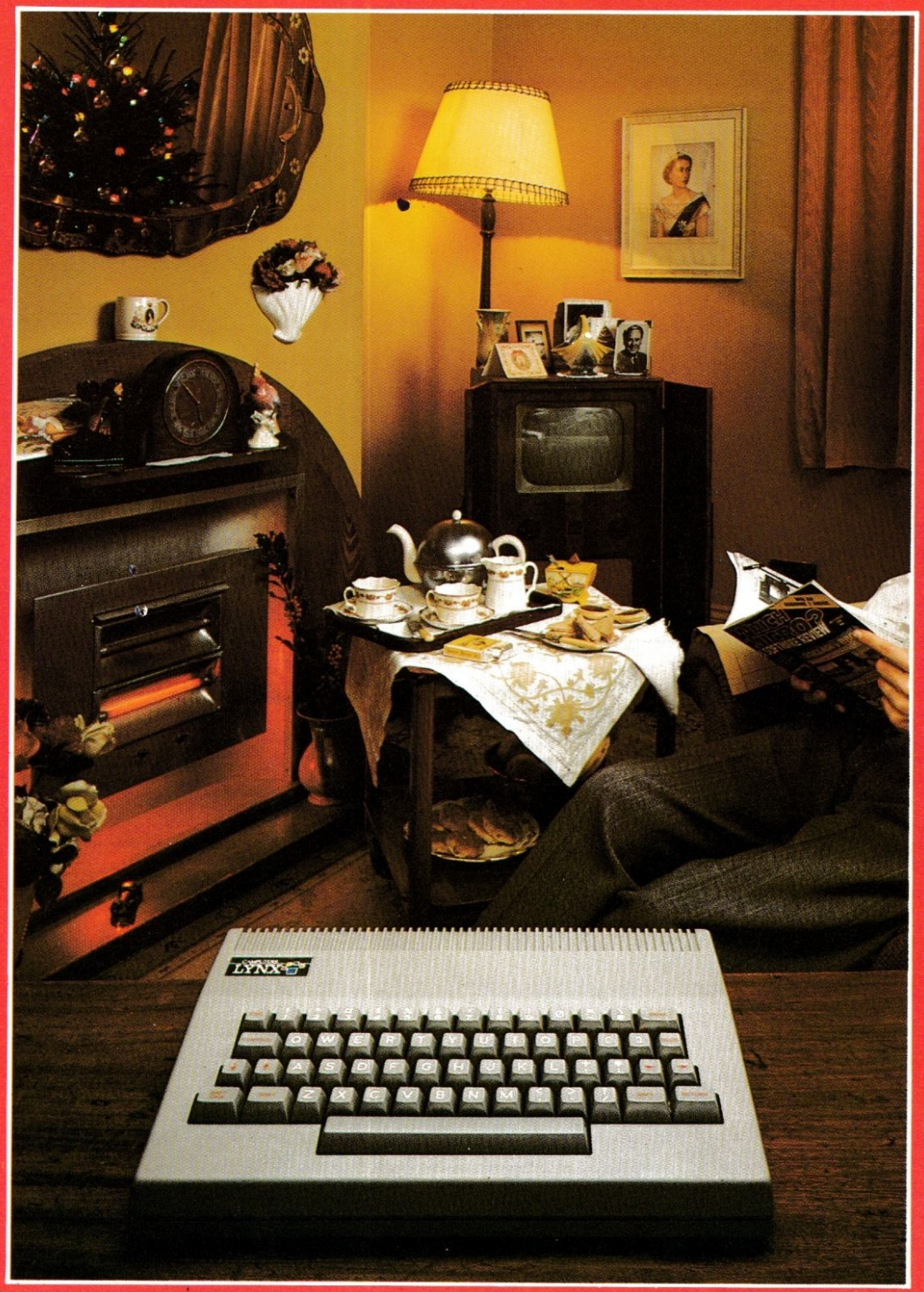
SUPPLEMENT:
ATARI 400 & 800, SPECTRUM, ZX81, BBC A & B, TI 994/A, DRAGON 32, ATOM, VIC 20

REVIEWS:
HARDWARE:
LYNX, COLOUR GENIE, XEROX 820, MICROWRITER, EPSON MX80 PRINTER

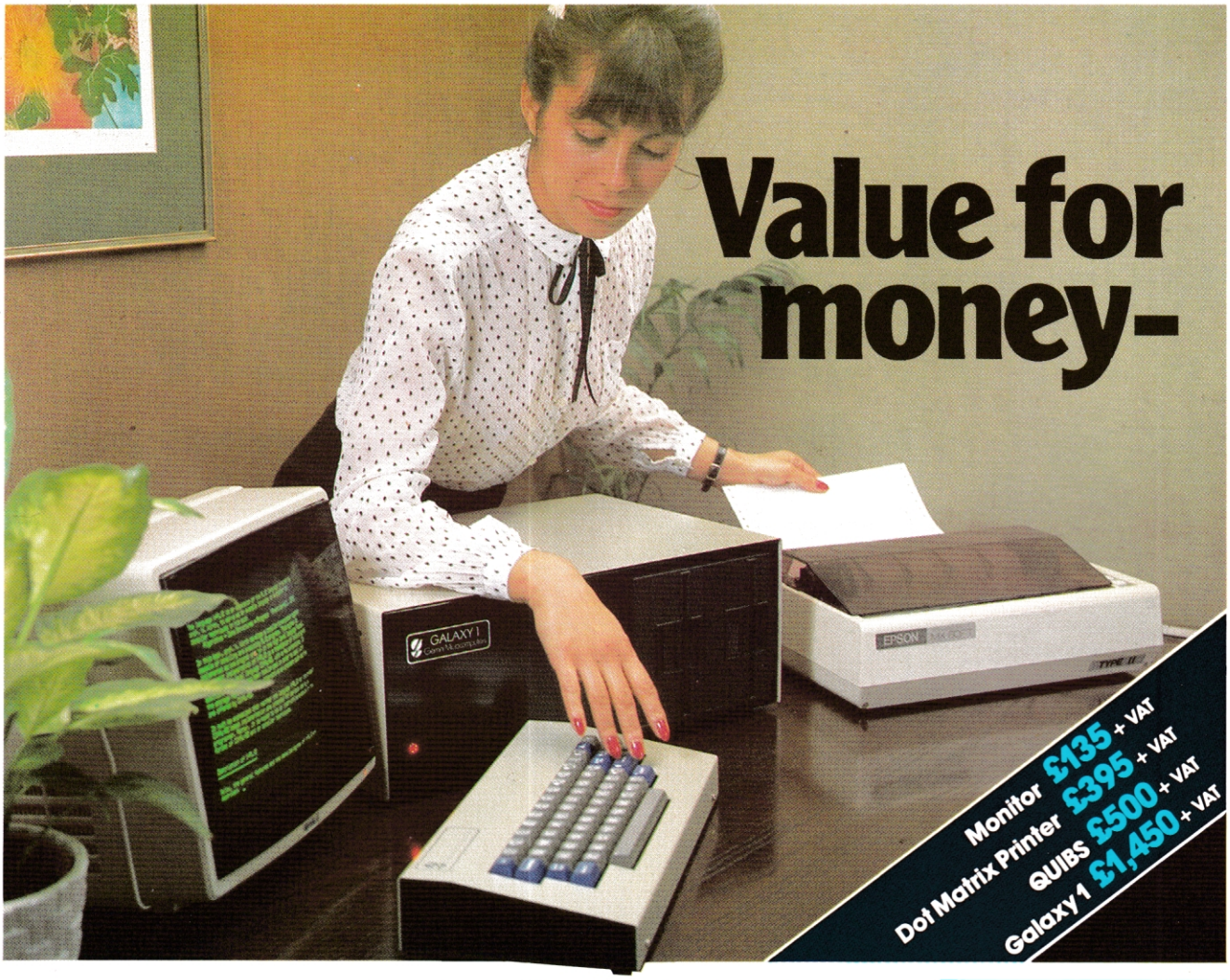
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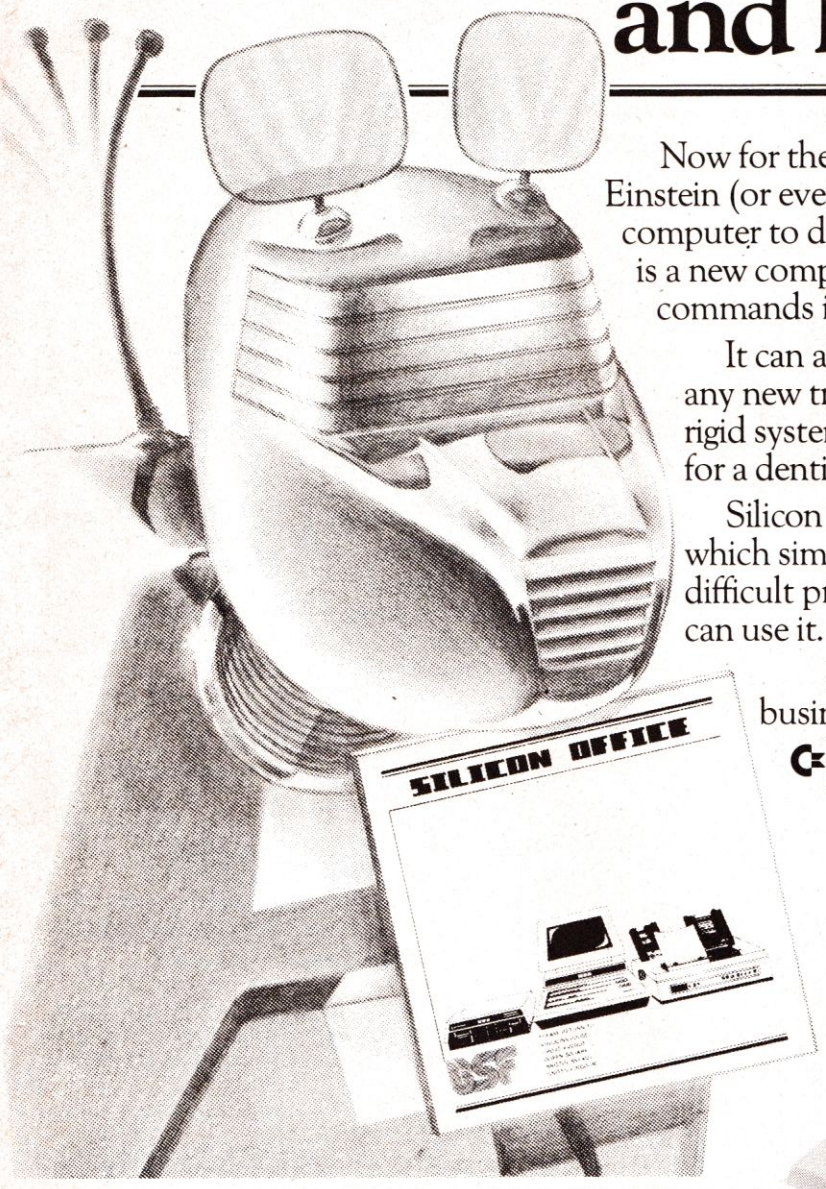
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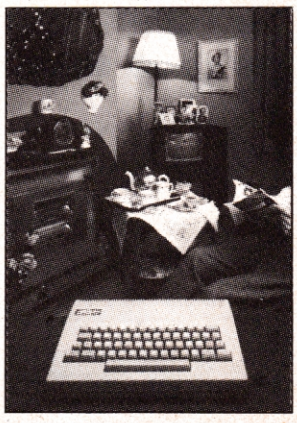
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DECEMBER 1982

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Neville Ash, Martin Banks, Colin Barker, Richard Howell, Barry Miles, Hedley Voysey, David Babski, David Bannister, Debra Carruthers, Steve Langford, Ron Stewart, Deborah Wise

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In our next issue we take a close look at micros and education and ask whether our education system can actually cope with new technology.
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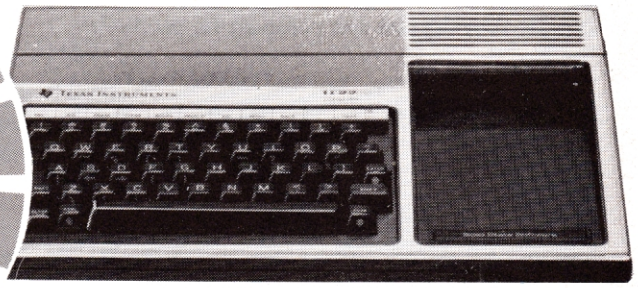
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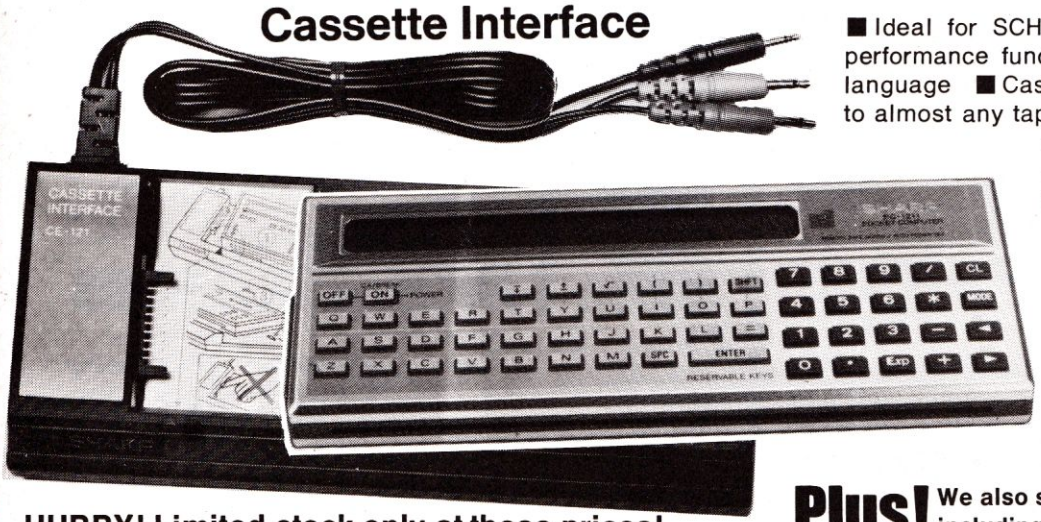
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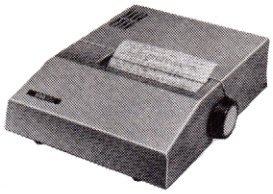
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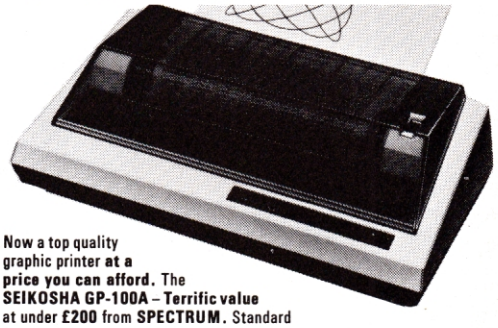
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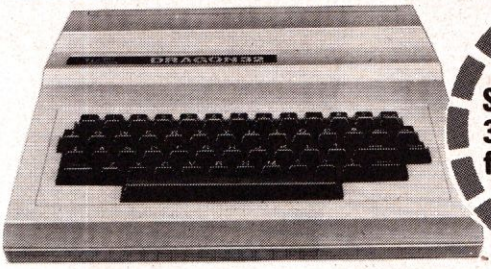
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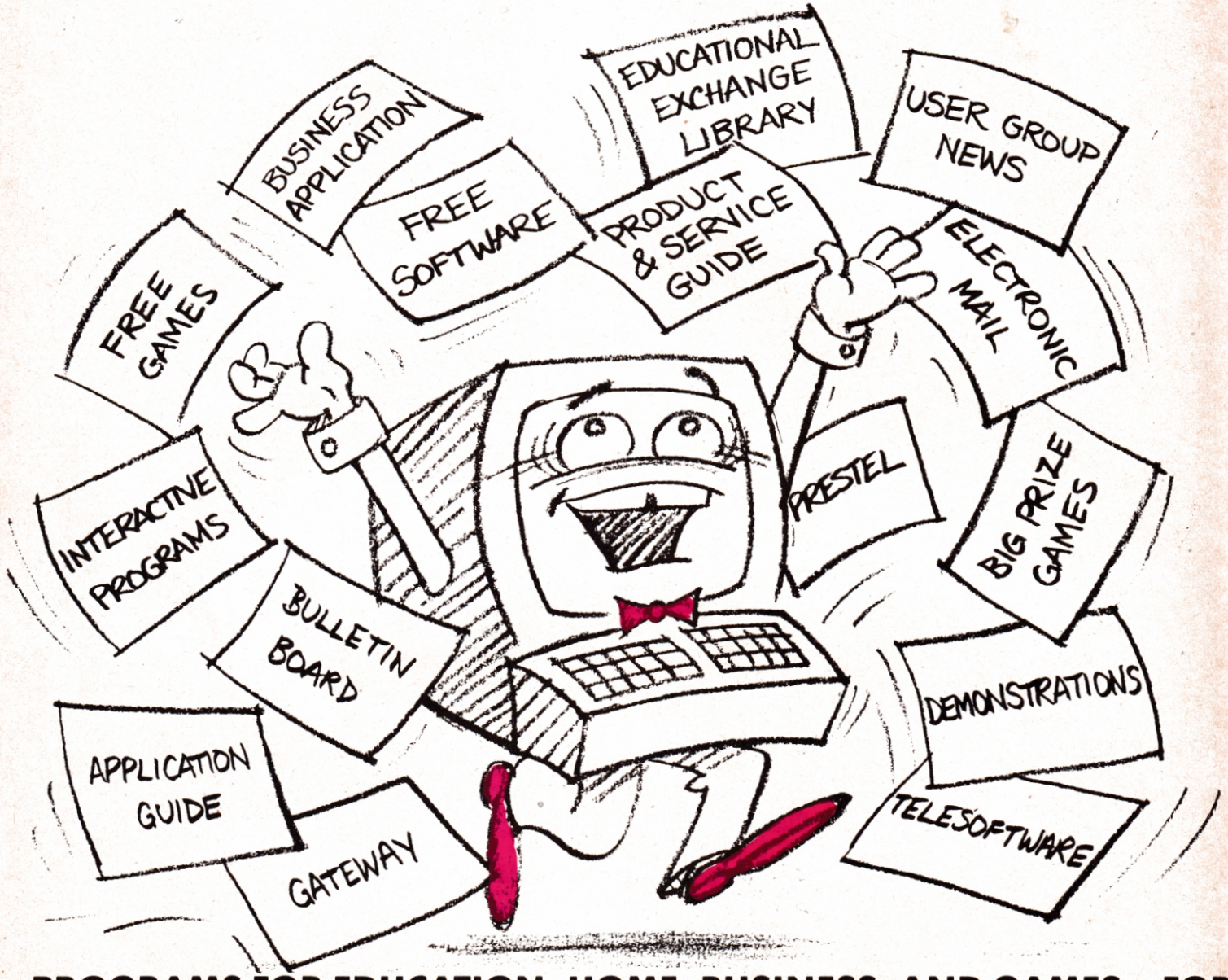
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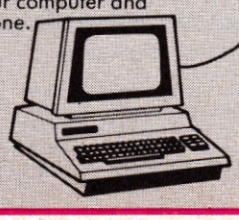
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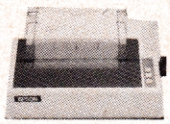
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NEWS

8v 16-bits

Digital Research has made a lot of money from its operating system CP/M. It's more or less the standard operating system for 8-bit machines.

The only problem is that more and more machines coming onto the market use 16-bit processors, and the version of CP/M designed for those is not doing as well as its predecessor.

But are they worried? Apparently not, according to the Boss, a fellow called Gary Kildall — a man we hope to be interviewing shortly. He reckons that 8-bit machines are going to be around for quite a while yet — and given the amount of money invested in them, he could be right.

So the company has introduced a new version of the operating system, called CP/M Plus.

Plus what? Well, all sorts of things really. You can add date and time stamps to files; there's a help facility for when you forget how to do things; and there's a lot of things to interest serious programmers, like a console I/O redirection facility and error trapping and recovery.

If those things don't mean anything to you, it doesn't really matter. The whole point is that the software packages you will be able to buy that have been written for CP/M Plus will be a lot better than those written for the current versions of CP/M.

If they did mean something to you, you probably already know where to get in touch with Digital Research, if not ring 0734 868711.



Rumbled

If you are one of the many people thinking of buying a VIC 20 in the near future then Rumbelows Xmas offer could well be for you.

In theory this allows owners of Sinclair ZX80s and ZX81s to trade in their old machines for a sparkling new VIC 20 at £30 below list price.

With suitable Xmas charity Rumbelows will then donate the old machines to Dr Barnardo's homes.

But as one cynical salesman told *Which Micro?* the discount — which reduces the price of VIC 20s to £139.99 — is effectively available to anybody regardless of whether they enter the shop clutching a Sinclair machine or not.

Still — it was a nice idea.

Super South

What happens to old computer journalists? They go away and join the industry and sell things, apparently.

That's what Peter Laurie has done. He used to be the editor of *Practical Computing* (and *long* ago wrote a fine book on drug abuse). Now he is the force behind Southdata.

Southdata are a software outfit and they have introduced "a completely new approach to the problem of data storage" for microcomputers, in the form of a package called *Superfile.*

Essentially, *Superfile* is a database management system. It's completely new in the way it works, not in what it does, so let's skip over the technical stuff and get down to why you might want it.

It runs under CP/M, which gives it a potentially large customer base. The capacity is something in the range of 15,000 hundred-word documents on a hard disc. All of this is indexed for easy retrieval, as you would expect. Pretty useless if it just goes on the disc and gets lost.

More cleverly, there is a facility for looking around the database for things which sound similar, something that sounds pretty useful if you can't spell or remember things. What it does is pick up on things like Smythe by looking for things that sound like Smith.

It costs £325 from Southdata Software: 01-994 6477

Terminal Intelligence

An intelligent terminal is one which does a lot of work on the data you put in it before it sends it off to the machine it's wired to.

The trouble is, the more intelligent the terminal is, the nearer it becomes to a microcomputer, and eventually it *is* a microcomputer.

Zentec are a company which makes intelligent terminals, and this has happened to them. The Series '2000, which the company has just introduced, is actually a computer.

It has a processor all of its own (the 8MHz 16-bit 8086, jargon buffs), uses the Unix operating system (this certainly isn't meant for playing Space Invaders or Pac-Man), and can actually handle up to six other intelligent terminals.

If that sounds like what you're after, call Zentec on 01-647 8816

Characters

One of the things computer users sometimes get the urge to do is change the type of characters displayed by their machines.

They may want to do this to add extra characters like italics or Greek maths characters. Or they may just not like what the machine comes with.

Doing this is not always easy, but a software package from Kuma Computers might help. Called *Chedit* (for character edit, you see) it displays the character in a magnified form and you can move the cursor around adding and deleting bits, as you will . . .

The program is only available to run on the Sirius machine under either MSDOS or CP/M-86.

Kuma Computers: Maidenhead (0628) 71778

ZX81 £10,000 'treasure Hunt'

If you can solve 12 clues of an adventure game a Hull company will, they say, pay you a minimum of £10,000.

***Krakit* is an adventure/hunt game for the ZX81 and TS1000 which comes on tape for 16K RAM users.**

The company claim that solving 12 clues will "enable the entrant to learn where his prize is, and how to claim it."

Krakit costs £9.95. Call Artic Computing on 0482 75284. We will be attempting to substantiate this offer so stay with us.

Adventure Apology

Last issue we boldly claimed that we would be running a full *Which Micro?* Adventure games program listing. Astute reader you may have noticed it's not here. Due to illness and debugging our man has not completed his masterpiece. I can assure you it will be worth waiting for.

in brief...

Talking Spectrum

There must be some among you who want to make your Sinclair Spectrum talk, so you'll be glad to hear that someone has produced an add-on to let you do just that.

Simply called the Spectrum Speech Pack, this box is actually a development of a similar device originally developed for the ZX81.

All you do is plug the pack into the back of the Spectrum and words are spoken by using the OUT command followed by the number of the word you want it to say. Applications range from scoring in games through to talking typewriters for the blind.

DCP Microdevelopments: Norwich (0603) 712482

Compatible

The appearance of the two biggest computer companies in the microcomputer market has brought about some interesting changes, not least of which is the number of machines coming out with the label "IBM PC compatible".

Computer Devices, something of a dark horse in the business has gone one better and brought out a machine that is both IBM PC and DEC-compatible.

This is perhaps not surprising, since half of the top people in the company used to be in charge of the research programme which led to the introduction of the DEC machines.

More details next month.

Texas cash rebate

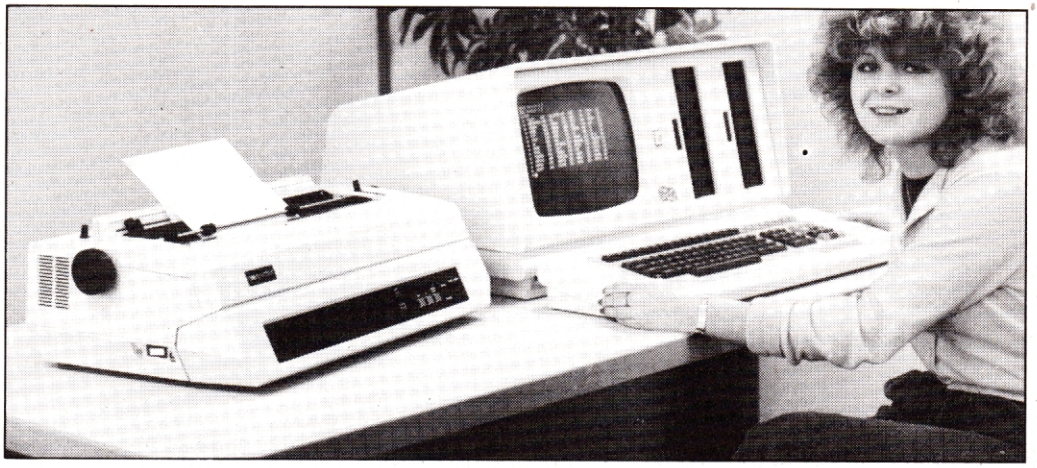
Texas Instruments is offering a cash rebate of £50 on its 99/4A home computer until the end of January, effectively bringing the price down to £150.

You still have to pay the list price of £200, and then fill in assorted forms. Once you've sent these to TI, they will send back a cheque for £50.

This is just one of the ways TI will be plugging the machine between now and Christmas. They are also going to be haranguing potential customers in various stores with large volumes of glossy promotional material.

(See our special *Home Computing* Supplement.)

Texas Instruments: Bedford (0234) 67466



M-Four 8 and 16-bit by LSI

M-Four from Woking

LSI Computers is the latest company to introduce a microcomputer with both 8 and 16-bit capability.

Given that the other machines with this exceptionally useful facility come from large American corporations with years of experience in the computer industry, the LSI machine is the more interesting, as it comes from a British company based in Woking.

Regular readers of this magazine will have heard of the company, since its previous offering, the M-Three was featured in last month's issue.

Like its predecessor, the M-Four comes as a unit with the screen and floppy disc storage in one box and a detachable keyboard.

Used as an 8-bit processor, which will be the initial role for a machine like this, the M-Three uses the Zilog Z80B processor. This is a relatively new version of one of the most popular chips found in microcomputers, and operates at a faster rate. The reason for including it here is that software written for the CP/M operating system (ie most software written for microcomputers) is designed to work with the Z80 family of processors.

Used as a 16-bit machine it uses the Intel 8088 chip, as used in the IBM Personal Computer.

Why you should want to have a machine that is both 8 and 16-bit is really very simple, mainly because you don't unless you already have an 8-bit machine. If you have, you've not only paid a couple of thousand pounds for the thing, you've also spent a good few hundred on software for the thing to work, and you obviously would rather not have to spend that money again.

However, you *would* have to spend the money again if you went out and bought a new 16-bit machine, because your old software wouldn't work. Many companies try to catch you on this one, including some very well-known ones.

So machines having both processors are rather attractive when you're in that position. Also, there still isn't as much software around for 16-bit machines, so rather than waiting for it, you can buy your 16-bit machine now and run the current software.

LSI already has something of a reputation of value for money with its equipment. The price of the M-Four starts at £2000.

There are a number of options which would increase this price, the most obvious of which is in the choice of mass storage (the bits that remember things when you've gone away, like paper files). The company also happens to be the UK distributor for disc drives made by Shugart, a big name in the business, so they offer a number of storage devices — $5\frac{1}{4}$ inch floppies, 8 inch floppies or $5\frac{1}{4}$ inch hard discs. This gives a storage range between 350 Kbytes and 10 Mbytes — or roughly 100 A4 pages of text to 250,000 pages.

LSI says that it doesn't expect to sell many of the smaller configurations, but if you want one they won't turn you away.

LSI Computers: Woking (04862) 23411.

A taste of PC Honey

The next big computer company to bring out a microcomputer will be Honeywell, with a release timed for about the same time as IBM will be bringing its Personal Computer to the UK market probably February '83.

Expect it to be a sophisticated device capable of connecting to mainframe computers if you want it to. Honeywell will certainly want you to, since they mainly sell mainframe computers.

On the subject of the IBM PC, you may have heard rumours that it will actually be made in this country. If you are a big IBM user you'll probably have heard them from IBM itself, for the company's workforce have apparently been telling some potential customers that this will be the case.

More than this, they have been telling these select few that the machine to be made in its Greenock plant will not be entirely the same as the one coming into this country through assorted grey importers.

IBM, as you'd expect, refuse to comment either way.

Hire an Auditor

Clearly there is some attraction in buying a microcomputer the name of which has something to do with your occupation.

Working on that theory, the Star Computer Group has introduced a machine called the Auditor 3906.

Actually, it's a cheat to mention it in the pages of this magazine, because it costs slightly over £10,000. The only reason I do is because you don't have to buy it outright — Star will hire you the machine for £75 a week. For some that may be more attractive than actually buying, at any price.

As you've probably already guessed the machine is aimed at accountants, so if you're not one of those don't bother reading any more, unless you just happen to be taken by the strangely exhilarating prose style.

For the system price, you get, as you'd expect, the option of using more than one screen at a time. This is a typical option, even on much cheaper machines.

The processor is a 16-bit device. What this means is that it is faster at doing the work than most machines, which are of the 8-bit type (there are at present many 16-bitters coming on the market ie IBM PC, DEC etc).



The Auditor 3906 from £75 a week

For the accounting profession, where there is a good deal of numerical calculation involved, this is probably a good thing, especially if you are using more than one screen.

As standard, there is also a Winchester hard disc. These are devices used to store information, in a way roughly analogous to files in a conventional office.

Again, for the accountant this is a sensible provision, since there will be a good deal of material to file, and all of it for a considerable time. Winchester drives are notoriously reliable.

Star have also produced a range of software, without which the machine would be useless. You get to choose among packages like incomplete records, accounts production, time recording and fees ledger, payroll and financial modelling. If you're an accountant (and if you're not why are you reading this?) these things probably mean something to you.

Star Computers: 64 Great Eastern Street, London EC2A 3QR. Tel: 01-739 7633



This is the Oric I mentioned in last month's issue. It's intended to be a competitor for the Sinclair ZX81 and the Spectrum, with a selling price of £99 including VAT for the basic machine. We're currently in the process of getting our hands on one and hope to publish a review quite soon but the machine has production delays.

Board and aid for VIC 20

Stack Computer Services have a couple of new bits for the Commodore VIC-20.

First off is a cartridge called *Supercharger Plus,* which is a programming aid for people who want to mess about with the graphics of the machine. It includes the memory (3 Kbytes) you need for the graphics and costs £49.

Secondly, there is an add-in board to change the machine between 40 and 80 column display. It only works with black and white displays and costs £99.99 plus VAT.

Phone Stack on 051-933 5111.

in brief...

Sheffield Centre

Sheffield City Polytechnic has opened a free microcomputer workshop and advice centre.

Called the South Yorkshire Microsystems Centre, it is open between 9.30 and 4.30. All you do is turn up and they will let you have demonstrations and "hands on" experience with assorted microcomputers.

There is also an information centre where you can browse through *Which Micro?* instead of buying it like honest citizens.

SYMC: Sheffield 738621

Apple colour

An interface for connecting Apple machines to an IDS Prism colour printer is now available from Pete & Pam Computers.

Using the interface it is possible to print any screen in colour, if that's what you want to do. They say you could add colour to your word-processing. Can't really see why you should want to do that, but there you are — unless you like to send invoices in red. Anyway, it costs £169.

Pete & Pam Computers: (0706) 227011/2/3

Key overlays

Ever the innovators, Quicksilva have just come up with an idea for the Spectrum that is so simple that we are surprised that no one has thought of it before.

Like us you have probably been playing a game and halfway through it forgotten what key does what. Quicksilva's answer to this dilemma is a keyboard overlay that fits neatly over the keys of the Spectrum.

Printed on the overlays are the functions of the keys used in the game. The overlays are made from plastic with the key function and the name of the game stamped in silver.

Quicksilva will be including them with all copies of their *Meteor Storm* and *Space Intruders* as from 1st of November. All future arcade games will be provided with them as a matter of course.

You can read our thoughts about *Meteor Storm* and *Space Intruders* on the ZXSOFT page next month.

16

SPECTRUM COMPETITION WINNERS

Section A — Winner

DUAL

So many people today have Microcomputers and it's a pity that they should be playing against mindless, skilless machines. The games described below may change all that, and revolutionise computer games.
The game requires two computers to be coupled together via PORTS (one each).
Each player would see a different view of the same three dimensional planet, maze etc.
They would be able to see one another's ships, tanks etc. and be able to shoot, chase or dodge one another.

BASIC STRUCTURE OF GAME

Players would have the same data about the playing area.
100 per cent machine code.
Position and status of opponents ship would be constantly fed between the computers. Visual/sound.
Warnings would be given when the opponent nears or fuel is low etc.
D Linsdell, Little Hulton,
Manchester

Runner-up

PARTY WARM-UP

On arrival each guest types in his or her name together with their partner's name (if applicable).
The computer then prompts for the answer to a series of questions. e.g. Girl or boy. Favourite — Pop Star, Film, Drink, Food, Colour, TV programme etc. etc.
Guests then mingle and chat whilst others arrive and enter their answers. When all the guests have arrived the computer issues each with a copy of another guest's answers, choosing from opposite sex and excluding own partner. (ZX printer would be handy here.)
Each guest must then find whose answers they have been given. A variant would be to give each guest a copy of every set of details and give a prize to the first person to correctly identify all of the guests.
A super variant for Microdrive users would store data in a file as it is entered so that the game can't be killed by switching off at the mains.
R Q Silvester
Lingfield, Surrey

Runner-up

MODEL DESIGN

Anyone who has tried to develop the skills required to fly model aircraft will have discovered the unforgiving way with which they react to mistakes. Having to rebuild each time makes it almost impossible to teach yourself.
I would therefore like to try a program which would simulate the actions of a model aircraft. To practice with a simulator would develop the required instinctive reactions in the beginner whilst more complex programs could be developed for the competent 'pilot'.
The basic requirements of the software would be for the plane (image) to rotate 360° through X and Y axes simulating rudder/elevator controls whilst maintaining correct airspeed. Depth of field, upwind and downwind distances from the take off point and altitude are all parameters that the ZX Spectrum could handle.
This may seem ambitious for a beginner but I understand the Spectrum manuals are excellent tutors.
Neil Batty
Redcar, Cleveland

Games Section A — Near Misses

Robert D Craythorne, Sanders Road, Brixham, Devon was one of the very few program ideas which intended to bring a moral response from the user.

J S Morley, Gresham Close, Whitefield, Manchester. This game combined blank screen memory with submarine warfare. It required players to remember just where a sub had submerged.

Kevin Thacker, Upper Park Street, Cheltenham, Gloucestershire. An educational game which would help children distinguish between various parts of speech.



Section B — Winner

INFORMATION ORGANISER FOR THE SPECTRUM

Most important decisions, at work and at home involve a lot of different ideas which are difficult to hold on to and to fit together, all floating around in the mind of the person who has to decide.
Spreadsheet programs help a little, but they are best with quantative ideas, and the most important factors are qualitative. This program would prompt and help a person to say what were the most important factors about a decision (up to 200 factors in 48K), help them to say how those factors linked and interrelated, and enable them to build up their ideas over several sessions.
The program would also group the factors and ask the decision maker about some of the links not mentioned. The program would feed the emerging structure and some tentative conclusions back to the decision maker, for further reaction.
Such a program would do for qualitative decision making what *VisiCalc* did for quantative.
Dr David Sims
Bath

Runner-up

FAULT FINDER

Consider a piece of equipment e.g. car, plumbing system, electronic circuit, TV set.
A random selection is made by the program of a list of faults. The relevant symptoms are displayed on the screen.
The user can select data/block diagrams for the history of operation or can carry out tests to prove satisfactory operation of sub-systems.
The process continues until the fault is diagnosed. Levels of difficulty can be incorporated by having the availability of spares for replacement purposes, limiting the test equipment available and operating against a clock.
The situations should be real and the theory of operation should be correct enabling the user to learn about the system and test his understanding.
M Inman
Isle of Wight

Runner-up

GARDEN PLAN

Theme A program for the home gardener, endorsed and designed by a famous personality, sold via usual software outlets and also in gardening shops and departments.
Plan 1) Vegetable section Drawing a plot of land-area calculation, Division of plot for different vegetables and/or varieties (colours and graphics). Calculation of amount of seed and tubers required. Time of planting, length of time until cropping. Calculation of plot rotation.
2) Greenhouse section Similar to veg section, reminders for sprays. Record of temperature and humidity. Note of fuel consumption (calculations of cost etc) for heated greenhouse.
3) Flower section Drawing of plot. Visualisation of different plants (graphics, colours) on the area. Plans of garden at different times of the year as flowering periods vary. Also shrubs and trees — colour, flowering etc.
4) Show section Calculation of dates of planting for shows at certain dates, allowances for differences in weather conditions. Notes of special treatment given etc.
5) Data Record Crop weights, flowers chosen, plot rotation, fertilisers used, costs, sources of information etc.
6) Diary Daily, weekly, monthly reminder of tasks to be done, temperature and sunshine chart, any other useful tasks.
This program would show the Spectrum's graphics and even amplified sound could be used as a bird-scarer!
Gareth Roberts
Llanfairpwll, Gwynedd

Business/Home Software Section B — Near Misses

Richard Cockram, Wood House, Sarn, Newtown, Powys — A driving instruction program.

Bjorn Smith, Sofrebergsvägen, 47B S-141 38 Huddinge, Sweden — His family recipe software.

Mrs S Nam, Corntown, Bridgend, Mid Glam. — For her problem solving solution which was very similar to our winner Dr Sims' program. The judges felt he took the idea a little bit further.

Noel Williams, Buttermere Road, Sheffield for his text analysis idea, which would "assess the suitability of a chosen (writing) style for a chosen purpose".

Screen a type of Lexicon

There seems to be a growing realisation among computer manufacturers of the number of electronic typewriters in the world's offices.

Some of them have even tied this together with the fact that most word processing will be done by the users of these machines, the secretary.

For a manufacturer this is significant, since it means that they can make word processing systems without keywords for you to connect to your electronic typewriter.

One such company, Office and Electronic Machines has produced a thing called *Screentyper* along these lines. Unfortunately the device only works with Adler and Imperial typewriters, but there's a lot of those about.



Linking the Screentyper to an Adler

Apart from the lack of keyboard, the machine is rather standard: a Z80 processor, 64Kbytes of memory and a single floppy disc to store documents on permanently. The monitor is from Philips, the same one used on the British Micro Mimi 802, which was reviewed last month.

Software for the system is a package called *Lexicom*. This is quite a clever beast, for it interprets the keyboard commands as word processing commands.

For the user all this is good news — you just use the typewriter as you would if it were a typewriter. There are also the kind of features you buy word processors for in the first place, like automatic formatting, storing standard paragraphs, swopping bits round and so on.

And, of course you have a letter quality printer in the shape of your typewriter.

The company will sell the machine with or without the typewriter. Without, it costs £1495, and depending on which of the models you want, with typewriter it costs either £1995 or £2150. *Office & Electronic Machines: 01-407 3191*

East of TMK

Latest, but by no means the last of the Japanese microcomputers to arrive in the country from Nippon-Univac, a company that has more than a few ties with the mainstream computer industry.

With the imaginative titles TMK320 and TMK330, the machines should start appearing through computer dealers just about as you're reading this. They're being distributed to dealers by Peripheral Hardware Ltd, based in Solihull.

According to PHL, the only difference between the two is the size of the floppy disc units. The TMK320, at £1995, has two 5¼ inch drives horizontally mounted, where the 330, at £3350, has a pair of 8 inch drives vertically mounted.

In terms of the storage difference, the 320 has around 600Kbytes of storage (about 450 pages of A4 text) while the 330 has 2.4 Mbytes (- about 6000 pages). If you don't know already, by the way, this is the amount you can get on a single pair of discs, and you could have as many pairs as you like.

PHL go into a lot of detail about the number of tracks per inch, the number of bytes per sector, and so on. It's all pretty irrelevant. You'll get a better idea of what the machine's like if Editor Rolington has passed the picture for printing.

Nowadays its pretty standard to have 64Kbytes of memory in a microcomputer, and that's what they've got. There doesn't seem to be any chance of increasing this.

An enhanced version of CP/M is the chosen operating system, and one wonders whether enhanced means that a great deal of CP/M software won't work. It often does.

The language of the machine is also an enhanced version of another industry standard, Microsoft Basic. It seems to be a fairly powerful language, but that's of more interest to the programmer than the user.

Application software includes a thing called Micro-Rep, which is described as a combination of word processing package *Wordstar* and the financial modelling package *Visicalc* (so that you can write letters with numbers in them.)



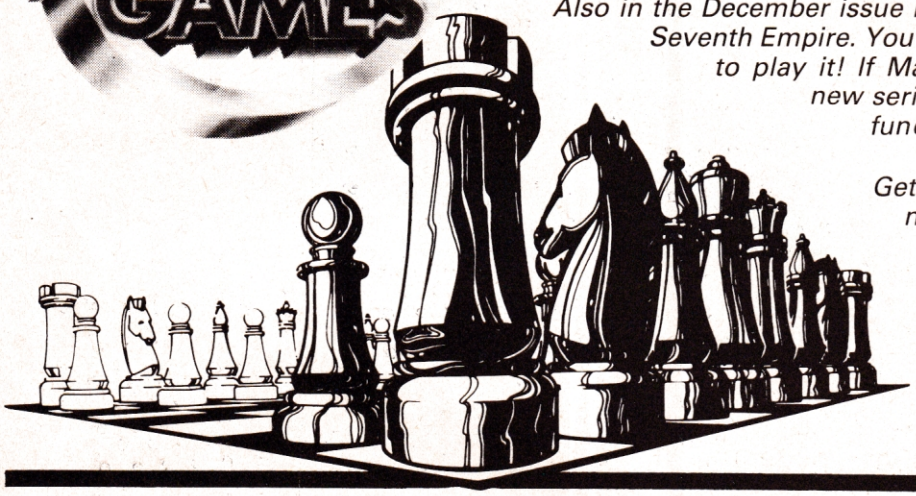
The Nippon-Univac TMK300 series 64K

If you want to be a dealer for the machine, or you just want to know who is, call PHL. *Southampton (0703) 39133* ■

YULETIDE INVADERS

THIS CHRISTMAS chess looks to be heading for the top of the electronic games shopping list. *Computer & Video Games* magazine looks at the expensive coffee table versions through to the travelling companion sets. Completing the list for Santa, the December issue has a pick of software selections for T.V. games centres and the more popular computers. We have also sifted through the latest bleeping, burping and talking creations which are chipping away at the established toy market.

COMPUTER & VIDEO GAMES



Also in the December issue is a game with a difference — The Seventh Empire. You don't even need a home computer to play it! If Machine Code baffles you then our new series will help get to grips with the fundamentals.

Get set up for Christmas, invade your newsagent now, and find out how much fun can be found in computers.

COMPUTER & VIDEO GAMES — your fun computer monthly

December issue out now!

CIRCLE NO 109

MICHAEL ORWIN'S ZX81 CASSETTES

The best software (by various authors) at low prices

QUOTES

"Michael Orwin's £5 Cassette Two is very good value. It contains 10 stolid well designed games which work, offer plenty of variety and choice, and are fun."
from the ZX Software review in Your Computer, May '82 issue.

"I had your Invaders-React cassette . . . I was delighted with this first cassette."
P. Rubython, London NW10

"I have been intending to write to you for some days to say how much I enjoy the games on 'Cassette One' which you supplied me with earlier this month." *E. H. London SW4*

" . . . I previously bought your Cassette One and consider it to be good value for money!"
Richard Ross-Langley, Managing Director, Mine of Information Ltd.

CASSETTE 1

(eleven 1k programs)

machine code:
React, Invaders, Phantom aliens, Maze of death, Planet lander, Bouncing letters, Bug splat.
Basic:
IChing, Mastermind, Robots, Basic Hangman.
PLUS Large screen versions of Invaders and Maze of Death, ready for when you get 16k.
Cassette 1 costs £3.80

CASSETTE 2

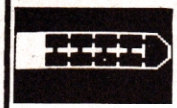
Ten games in Basic for 16k ZX81

Cassette Two contains Reversi, Awari, Laser Bases, Word Mastermind, Rectangles, Crash, Roulette, Pontoon, Penny Shoot and Gun Command.
Cassette 2 costs £5.

CASSETTE 3

8 programs for 16k ZX81

STARSHIP TROJAN



Repair your Starship before disaster strikes. Hazards include asphyxiation, radiation, escaped biological specimens and plunging into a Supernova.
STARTREK This version of the well known space adventure game features variable Klingon mobility, and graphic photo torpedo tracking.
PRINCESS OF KRAAL
An adventure game.
BATTLE Strategy game for 1 to 4 players.
KALABRIASZ World's silliest card game, full of pointless complicated rules.
CUBE Rubik Cube simulator, with lots of functions including 'Backstep'.
SECRET MESSAGES This message coding program is very txlp qexi jf.
MARTIAN CRICKET A simple but addictive game (totally unlike Earth cricket) in machine code. The speed is variable, and its top speed is very fast.
Cassette 3 costs £5.

CASSETTE 4

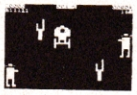
8 games for 16k

ZX-SCRAMBLE (machine code)



Bomb and shoot your way through the fortified caves.

GUNFIGHT (machine code)



INVADERS (machine code)



FUNGALOIDS (machine code)
GALAXY INVADERS (machine code)
Fleets of swooping and diving alien craft.
SNAKEBITE (machine code)
Eat the snake before it eats you. Variable speed (very fast at top speed)
LIFE (machine code)
A ZX81 version of the well known game.
3D TIC-TAC-TOE (Basic)
Played on a 4×4×4 board, this is a game for the brain. It is very hard to beat the computer at it.
7 of the 8 games are in machine code, because this is much faster than Basic. (Some of these games were previously available from J. Steadman).

Cassette 4 costs £5.

Recorded on quality cassettes, sent by first class post, from:
Michael Orwin, 26 Brownlow Rd., Willesden, London NW10 9QL (mail order only please)

SPECTRUM SOFTWARE WANTED

CIRCLE NO 110

AMERICAN REPORT...

Our regular Stateside report comes from Deborah Wise, East Coast Editor,* Infoworld, *a newsweekly for the US microcomputer industry.



Labor Day, paradoxically, is a holiday here, and if you happened to be in San Bernadino, California (with or without a flower in your hair) for this year's September Labor Day weekend you might have dropped in on the US Festival — a 1980s Woodstock with a touch of technology.

Steve Wozniak, famed co-founder of Apple Computer, spent $12 million dollars (don't worry he has more) on this three-day event to promote technology, his own philosophy, Apple computers and, of course, what everyone really came to hear, rock 'n roll.

The US philosophy, by the way, is a mixture of sixties community spirit with a touch of 80s pragmatism — "Cooperation and teamwork with a feeling of what's in it for us?" Wozniak has explained.

Somehow, I don't think the 200,000 odd people who paid $37.50 for the three-day event had either philosophy or technology on their minds. They came to hear the 20 featured bands which included such crowd pullers as Cars, The Greatful Dead, Fleetwood Mac and Police.

The technology exhibits housed in three large air-conditioned tents weren't quite such a draw. Thousands rather than hundreds of thousands did pass through during breaks in the rock show.

Kids played video games, watched robots, saw light shows and fiddled with a bunch of computers on display. The air-conditioned tents were probably a sought-after refuge in the 100 degree heat and prevailing dust storms.

All in all everyone seemed to have had a good time. Wozniak may even make money in the long run when film and record rights are sold. Current losses stand at about $3 million. However, during the week of the festival Wall Street stock exchanges went wild (no connection, I assure you) and Wozniak's holdings of Apple shares went up in value by $18 million.

But besides all the pzazz and fun, one feeling wrankled — if you want to promote technology and you're willing to spend $12 million to do it, why blow it on a three day pop festival? Surely investing the money in an education project would be more worthwhile. The interest alone on a $12 million investment would pay for a few college bills.

Who or what could follow such a showbiz event? Try IBM and its recent Hollywood-style undercover activities. Earlier this year IBM joined forces with the Federal Bureau of Investigation (FBI) to nail several companies for stealing trade secrets for its mainframe computers.

Just recently it launched its own undercover operation to root out company employees who it said were trying to sell IBM Personal Computer trade secrets.

From court affidavits, the story can be pierced together as follows:

In July this year Tecmar, Inc., a small company in Cleveland, Ohio that makes IBM PC peripheral products, was approached by William Erdman, an IBM product line manager.

Erdman said he was selling product specifications for future IBM PC peripherals. Erdman said he planned to leave IBM to set up a design company for peripheral products.

Tecmar's president, Martin Alpert became suspicious. He thought Erdman's specs might contain confidential IBM trade secrets. He contacted IBM's security department and then agreed to cooperate with an internal investigation.

He continued negotiations with Erdman and his associates, this time taping them with IBM-supplied equipment.

After a month of so of monitoring meetings between Alpert, Erdman and two other IBMers, IBM made the investigation public, fired the three employees and filed a civil suit against them and the company they started.

The message went out loud and clear: IBM means business — don't think you can break the law and get away with it. The hearings will continue and though no verdict has yet been reached if you believe IBM's affidavits, the former employees don't stand a chance.

News this month has been full of events rather than products. Even in the video game field no new smashes have been introduced. But video games are receiving their share of attention in cities across the country.

Local authorities have been putting Pac-Man games in state owned parks to generate revenues for ailing local government budgets strapped by the current tight economic conditions. In one town near Seattle in Washington nine video games brought in $20,000 last year.

Some towns, however, dislike the idea of promoting video games on public property. Boston, San Francisco and Baltimore have flatly refused to use video games to increase city funds.

At one town meeting the item was hotly debated and defeated because residents felt video games would promote drugs and truancy among the children. Afterwards one man said, "I guess they think juvenile delinquency would disappear if video games were abolished."

One thought, if the schools were as entertaining and challenging as the games, where do you think the children would be?

Next month I'm off on another trip to the West Coast where I hope to drop in on Microsoft and Digital Research to find out what those two software duellists will be offering for the Christmas season. ■



The Police helped to 'promote Apple's pragmatism'

PROBLEMS

Moving data

In swapping from a 3000 series Pet to a Sirius 1 I am trying to avoid re-entering extensive data. Transfer from diskette to diskette would be simpler.

Do you think that I can ask for the means to do this as part of the deal in buying a Sirius?
Alan Arnold, Bradford.

The Sirius dealer *should* be interested. All dealers should be much more concerned, in fact, than they are at the moment in making file conversions possible as users switch machines.

It is doubtful whether this should be seen as a 'free' service, because, in some cases, very large files may turn up wanting to transfer over. However, it should be a simple and cheap service, which can be offset against the profit of the sale to be made in instances where the work involved is not too great.

There are many ways of arranging transfers of data and most users of such a service also need to change identifiers a little while doing it. The controller signals can always be tapped to provide a source.

For the dealer providing a service it is best if the data is read via a hard disc before being sent on to the new machine. This enables checks to be made on possible suspect source media, and/or controllers. One stage transfer may look simple but it could mean that the files could not be relied on.

This question reveals how some sides of the new software publishing game have to cope with hundreds of different layouts to suit most of the market.

Portability

I still see very few portable products in dealers showrooms, and I wonder if I am looking in the right places?
Clive Angel, Darlington.

There are few useful and portable products available currently — Osborne, HP85 and Epson's HX20.

The obvious way of using a portable piece of electronics is as a terminal to a larger machine, rather than as a self-contained micro also able to work back at your own desk. The result is that the portable products seem to specialise almost to excess.

Even the recent releases in the US seem to each point at a rather narrow slice of use with some concentrating on lightweight terminal usage and a very limited calculator type keyboards.

In the UK there are problems in attaching cheap modems (the link between the digits of the micro and the varied signals of the telephone system) which delays the portable market here from its full growth.

Since it was easy to put many micros in a case, the obvious move would seem to be to dream up a complementary case providing some battery power supplies, a form of disc drive and a usable display screen. So far I have not seen much of this animal yet, but it must come along — don't you think?

List process

I have built up files in the form of simple lists. Recently someone advised me to look at 'list processing features' when choosing a new system.

Does this mean anything different from file processing? Or am I the victim of a con-trick?
K. J. Jefferson, Newcastle.

You are a charming example of the computer jargon meaning almost the exact opposite of what it seems to be saying.

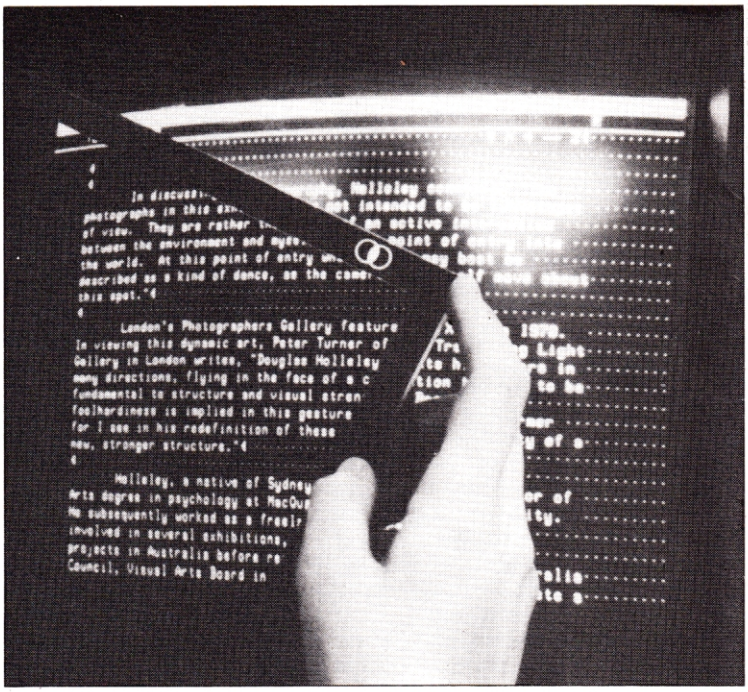
List processing in the computer world means dealing with data which is scattered all over the place as if it was in a tidy list.

If you have organised a continuous list of data this is regarded as a 'file' or a 'block' or a 'segment' or some such term which implies that having started at the front you can chew through to the end if you wish.

List processing, in the computer sense, is a description of a 'data structure' and it is very useful. Briefly put it means that as you deal with one 'piece' you use a pointer, which is part of that piece, to tell you where to find the next 'piece'. This enables you to make easy changes to what is in a list, by merely disconnecting some pointers and adding some others.

List processing therefore suits a very volatile processing form, which is why it is used in 'adaptive' computing, where what is done changes because of what has happened. Where a list of items has to be processed regularly in a fixed way there is, paradoxically, no need for list processing.

You should listen carefully to your adviser because you may be getting very good advice — but there is always the chance that someone is just trying to drown you in high-sounding phrases.



The Polaroid CP-70 Contrast Enhancement Filter has been designed to absorb harsh reflections and ambient glare. Call 01-828 6771 speak to Elizabeth Robinson and ask for Cave Tab.



A high speed tape streamer back-up for the Profile the Apple III hard disc. Known as the *Image* it will, so it is claimed, back-up Profile's entire contents in three minutes. Ring 07842 47271.

PROBLEM



Letters to: **Hedley Voysey** *(above), EMAP Computer Publications,* **Which Micro & Software Review,** *Petersham House, 57A Hatton Garden, London EC1N 8JD*

Renting

I want to rent a micro to find out what kind best suits me. Do you have any ideas on the best way of going about this?
Harry Murray, Clapham, S. London.

There is beginning to be a better set of choices for this very sensible way of going about 'getting-to-know' the micro.

For someone willing to select from the limited range stocked, the established rental service from Hamilton Rentals is very experienced in the game. There are also several other rental suppliers gradually entering the market.

However, I must also mention the fact that many dealers will weigh up an individual request for 'trying out' a machine.

First, do not sound as if you want something for nothing. If the dealer clearly understands that you will pay a reasonable sum (make it clear that an advance payment is all right by you) for a given period, then in many cases they will meet you more than halfway if, for instance, you suspect that you will wish to 'have-a-go' at two, or three machines in a tryout period. Few dealers can do this for many people at any one time, and much depends on the relationship you can establish with a dealer.

What I can assure you about is that most dealers are quite aware of the fears people have before actually spending the full amount on a micro. Put an open face on and go out and talk to them.

16 v 8 bits

I keep hearing that the 16-bit machines are faster than my 8-bit, and then I hear that they are not as fast. Which side is right?
J. C. Daniels, Louth, Lincolnshire.

Both are right. First, the software written for 8-bit machines often transfers over to 16-bit processors rather poorly, unless changes are made to adjust to the different processing flow involved.

This, by the way, tends to get worse when you try moving from 16 to 32 bit designs. It is always possible to let processing power run to waste by simply swapping programs across. Tuning to suit machines is always important if performance matters.

Secondly, the Zilog designed Z80, in particular, does in a couple of instructions what some other machines take five or six to do.

As a matter of interest, there will always be some gains and losses between different designs, which is why designing machines is fun.

But the point here is that for a specific computing operation some specific 8-bit machines are already quite fast. If this operation is at the heart of an important program you use, then you may gain nothing, or even lose, when moving machines.

Thirdly, the speed of the processor chip is not always the key to all aspects of the performance of the total 'box' that you are using.

Hard store

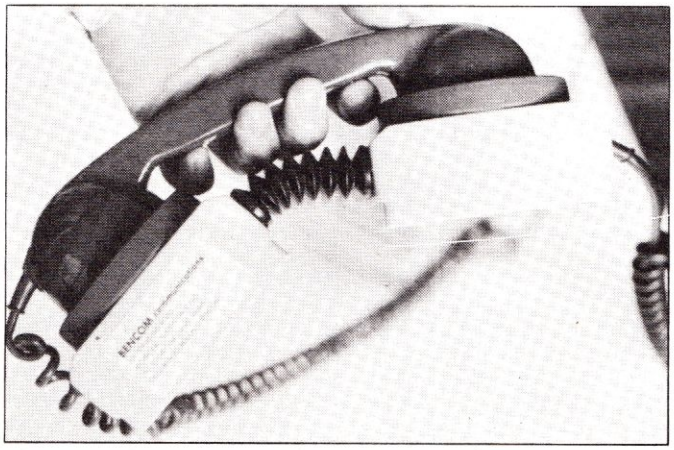
I am being advised to buy a system with a 'hard' disc, but I am worried as to what happens when I exceed its capacity. Do I have to buy another disc?
Dai Renick, Hertford, Herts.

The growth of files often implies general growth so there may be a future need for more keyboard availability. If this is so, then you must realise that capacity alone will not satisfy the need, because sharing the capacity will be part of the future.

This might indicate that a start would best be made with a type of disc which could have more than one micro attached to it. In some cases this leads into a look at a 'local' network of micros, printers and discs.

In other cases a simple division of files could easily fit your operations.

What you must think about is the nature of your use and try not to get confused because a 'feature' seems to be a good idea to the dealer who is selling to you.



This is one of the Lendata 7000 range of portable acoustic couplers originally made in Australia. Call Bencom on 01-940 1386 and ask for a demonstration.

File level

I am told that because I wish to make enquiries to my files that I shall need a 'two-level' file. What on earth is all this about?
Simon Davies, Maidstone, Kent.

There are at least four well tried ways of mitigating the problem.

The choice of method depends on things like the volumes of pending material, the tolerability of not always being quite certain that queries are fully answered, the amount of store available to keep an abbreviated map of records which could be potentially affected by pending material, and the nature of the queries asked of file items.

One well accepted way of doing this is to do the proper updates in the evening when there are no queries going on. This helps to maintain auditable means of processing for business files because if something nasty happens you can always start again with the processing 'pending' tray of transactions for updating — such as orders, supplies, cash and so on.

If every query on the files means that all that is pending in update material has to be looked at as well, then the queries may take an age or two.

People hold entire meetings on these topics, but I am sure that is what you are being advised about. ■



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On Atari, VIC 20, Commodore 64 and

If your order contains over £120 worth of computer hardware apply now for interest free credit by telephoning: Mail-order: (0702) 552911. London Shop: 01-748 0926. Birmingham Shop: 021-356 7292. Southend Shop: 0702 554000 or write to P.O. Box 3, Rayleigh, Essex SS6 8LR.

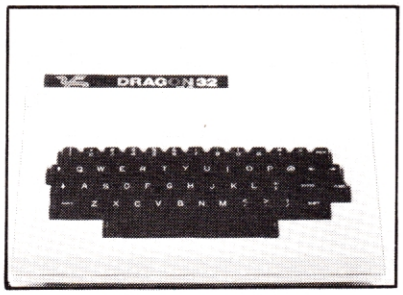
You pay 10% down, then 10% per month for a further nine months (to nearest penny). Example: VIC20 Colour Computer. Cash Price £169.99. Credit terms: £16.99 down then £17 per month for nine months: Total £169.99. Credit quotations on request.

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The incredible new computer from Commodore comes with 64K RAM fitted! Plus 16 colours, hi-res graphics, 320 x 200 pixels, 40 columns by 25 lines, Z80 micro processor can be added — that means you can run CP/M software, 8 independently movable Sprites with collision detection, and a sound generator with 3 voices, 4 wave-forms, envelope and filter to rival some dedicated music synthesisers. And all this at the most incredible price ever.

(AF56L) Only £339.00

DRAGON 32



The amazing new British computer with a full-travel standard keyboard, a 16-bit microprocessor, 32K RAM fitted (expandable to 64K and later to 256K!!), 9 colours, hi-res graphics and Microsoft extended colour BASIC (the very best BASIC to learn with). It can be used with virtually any ordinary cassette recorder, it has a printer interface (Centronics-type), joysticks are available and it's incredible value for money. **(AF57M) Only £199.50**

THE AMAZING ATARI COMPUTERS

4 Consoles Available:

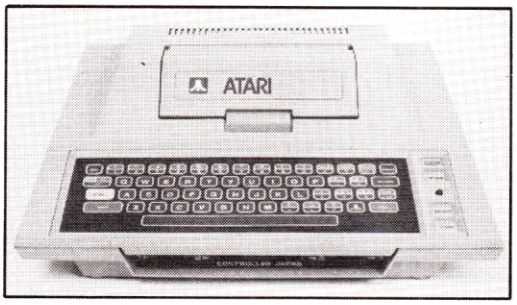
Atari 400 with 16K RAM (AF36P) £249.95

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For full details ask for our hardware leaflet (XH54J) SAE appreciated

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An independent users' group. Four issues of the club magazine for only £3.00! Address your subscription to Ron. Issue 1 of the club magazine featured a tutorial on character set redefinition and contained a collection of demonstration and games programs and lots more. Issue 2 featured a tutorial on player/missile graphics, an article about graphics on computers, a selection of members' contributions to the program library and much more.

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Arcade Games

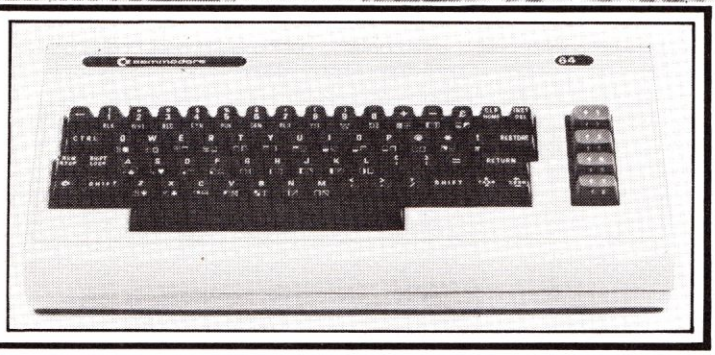
Star Raiders	-1E-8K-YG66W	£29.95

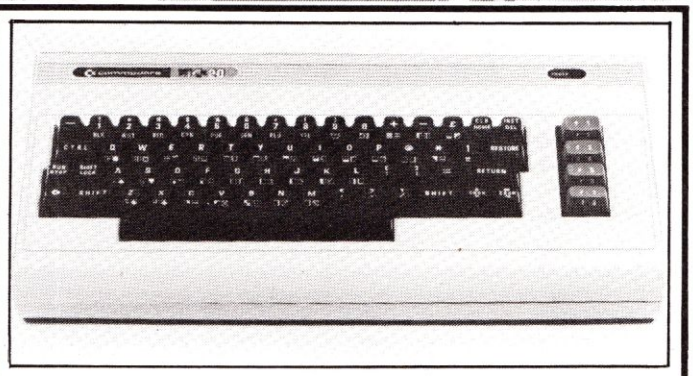
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Dragon 32 computer hardware







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Reversi	-1D-16K-BG54J	£19.95
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Poker Solitaire	-1D-16K-BG53H	£14.95
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Macro Assembler	-1D-32K-BQ73Q	£59.95
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Pilot (Educator)	-1E & 2C-16K-BQ75S	£79.95
Pilot (Consumer)	-1E-8K-YG69A	£54.00
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Programming Aids Package 1	-1C-16K-BG60Q	£ 9.95
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Order As XH52G — Issue 3.

Key: C = Cassette. D = Disk. E = Cartridge. 2C = 2 Cassettes etc. 8K, 16K shows minimum memory requirement.

Note: Order codes shown in brackets. Prices correct at time of going to press. (Errors excluded).

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Programming Aid: Additional commands, function Key programming etc.	(AC55K)	£34.95
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Reading for 9 to 11 year olds	(BC08J)	£9.99
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Spelling for 9 to 11 year olds	(BC10L)	£9.99

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Quizmaster	(BC11M)	£9.99
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Junior IQ	(BC13P)	£9.99
Know Your Own Personality	(BC14Q)	£9.99
The Robert Carrier Family Menu Planner	(BC15R)	£9.99
VIC Money Manager	(BC16S)	£9.99
VIC Road User & Highway Code	(BC17T)	£9.99
Garden Planner	(BC18U)	£9.99
Interior Designer	(BC19V)	£9.99
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BBC "Mastermind"	(BC21X)	£9.99
"Mastermind" additional General Knowledge		
Data 1	(BC22Y)	£2.50
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Data 4	(BC25C)	£2.50
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Sport & Games	(BC28F)	£2.50
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Books About VIC

Learn Programming on the VIC	(WA31J)	£2.50
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VIC Graphics	(WA48C)	£10.00

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OPINION

How important is extra memory? Which way is future memory going to be stored? Barry Miles of North London Poly gives some radical possibilities

MANY expensive technological items are bought as status symbols.

Do all those Hewlett Packard HP 41C's really get used to their fullest extent, for long programs and the use of ROM libraries of fancy programs, or are they really left on the executive's desk to say "I'm so important that I can justify a purchase of the state-of-the-art programmable calculator".

The advent of really large RAM sizes means that we should have a drastic rethink about the relationship between RAM and disc storage. Fanaticism consists of redoubling your efforts when you have forgotten your original aim.

We have for a long time lived with the idea that one should use RAM sparingly. This probably stems from the need to conserve RAM usage in a mainframe environment so that as many users as possible may access the machine at once, and so that the queueing problem is reduced to a minimum.

Programmers are likely to continue to think in this way, when the need has evaporated.

Perhaps a leaf should be taken from the approach used in managerial economics. In budgeting for the future, businessmen seek to identify the Principal Budget Factor, which is that factor which prevents the business from expanding to infinity. They then seek to make the very best use of that scarce resource, so as to maximise profits.

They usually make strenuous efforts to remove the bottleneck which that resource represents, by increasing the amount of it which is available: if you are short of skilled labour, you seek to take on more people for instance. The successful businessmen are the ones who, having removed the constraint which was holding them back, correctly identify the new constraint, and seek to optimise the use of that, and so on.

What I am saying is that once RAM ceases to be a scarce resource, we should cease to try to economise in its use, especially as it becomes progressively cheaper, and particularly when it becomes cheaper than similar amounts of secondary storage, i.e. discs and/or tapes.

A potential buyer of the Sirius machine has an interesting choice before him, and with a limited budget, will be wishing to decide between various amounts of RAM, and whether to go for double-sided discs to increase secondary storage capacity.

He may choose to go for the very largest size of RAM, out of habit, without really considering whether he will really make effective use of the extra memory.

Again, economics may come to our aid. The Diminishing Marginal Utility theory says in this context that every extra 1K of RAM is less important to us than the previous one, to the point where any more is really of no interest.

Surely we must examine whether what we are doing now will become easier, faster, or more efficient if we have more RAM, and whether there are other things which we could do with more RAM but which are impossible at present, and finally whether we should adopt a whole new approach.

There is a danger of misleading ourselves or of being misled by a salesman into thinking that more RAM must be a good idea, without thinking out why. There is even a danger of rationalising our thought processes so as to seem to justify what is really only wish-fulfilment!

We might make an analogy with buying a fast car. Some say that you are much safer in a fast car, than in a slower car, regardless of the speed at which you are travelling.

We might make an analogy with buying a fast car. Some say you are safer in a fast rather than a slower car. Does this work for micro memories?

The braking system and suspension of such a car have been designed to cope with the effects of travelling quickly, and these systems are therefore working very much within their capacity, and therefore very efficiently at slower speeds.

A similar argument can be made out for extremely powerful Hi-fi systems, in that distortion is less if you do not have to turn up the wick very far to get the volume you require.

Do these arguments carry through to microcomputer memories? I'm afraid not. The trouble is that your are merely getting more of the same, and if you do not use it, then it just lies idle.

Are you really going to write massive Basic or machine code programs, or are you really going to handle vast amounts of data? Probably not, at least not unless you change your way of doing things, to optimise the use of your principal Technological factor.

What I am suggesting is that the use of discs came about because of limited RAM, and that now that RAM limitations are a little unreal, we should explore the new freedom this gives. What follows may seem a little far fetched, but may also be just around the corner.

Firstly we may take it as read that a one megabyte RAM is not likely to be filled with a Basic or machine code program of anything like that length. The debugging would take too long! This leaves us with other possibilities.

We could fill a lot of the RAM with a wide range of programs, and call up any of the whole suite, instantaneously, from a special menu program.

We could have as many programming aids in our machine as we could conceivably wish for, and barely scratch the surface of our new-found capacity.

We could have a vast range of help screens available for instantaneous recall when in trouble.

We could call in a whole succession of high resolution pictures, which are usually slow to load from disc, so rapidly that even animation would be possible.

We could have split processing in one machine. After all, it is common for two processors to be in one machine, so why not a schizoid machine with each part operating independently?

We could have a really enormous amount of text in our word processor at any one time, and have many different text areas, and our word processor could perhaps interact with our accounting and database programs in RAM!

Accounting suites of programs could be truly integrated, so that final accounts were updated after every transaction!

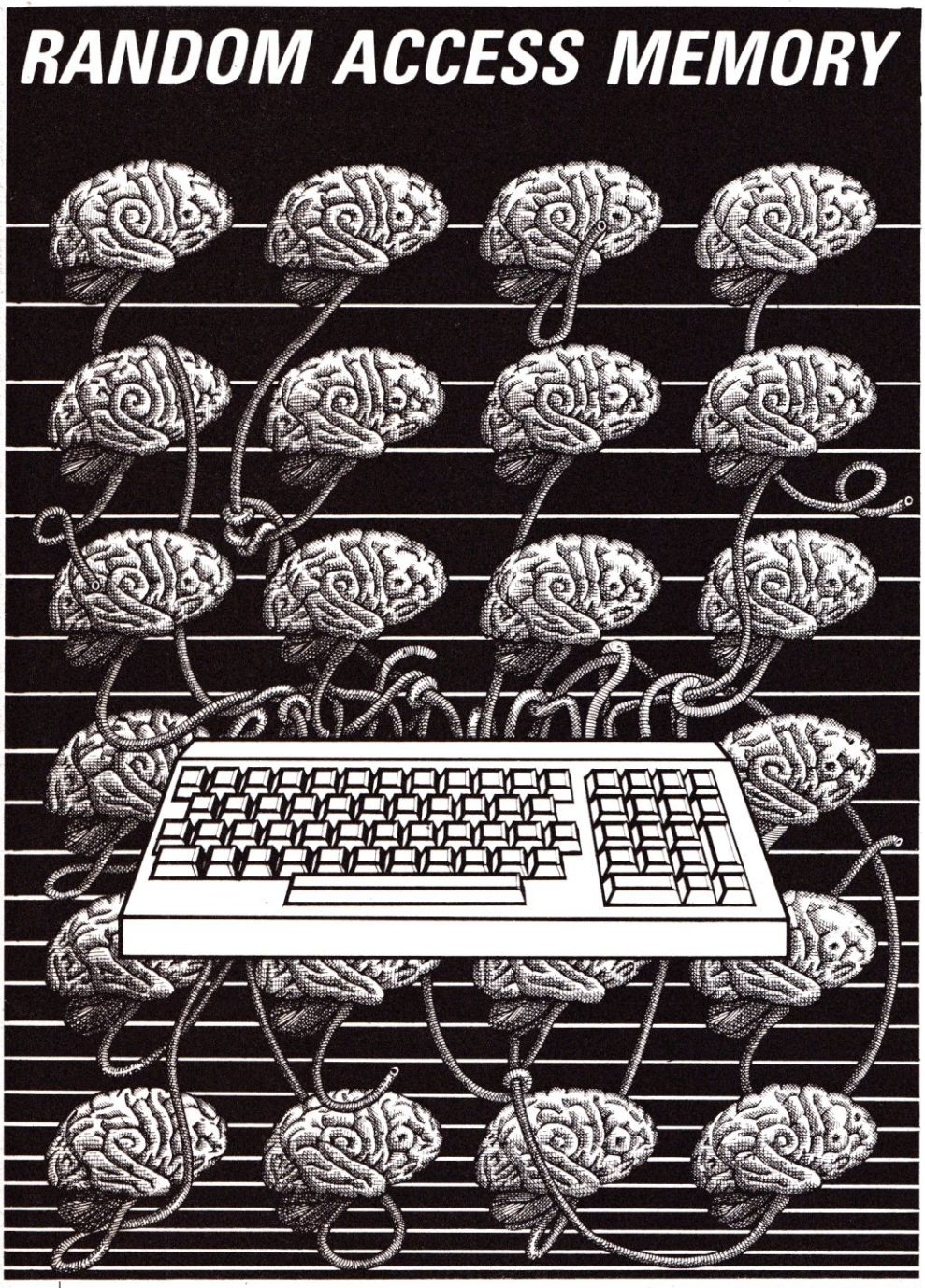
Our databases could be loaded from disc into RAM first thing in the morning, and all updating could take place in RAM, so as to be almost instantaneous, and all the disc activity would be merely to dump RAM contents for safety's sake at convenient time intervals. Battery backup could protect from voltage spikes, and power failures.

It might be that discs of all types would become a thing of the past, with programs and data being loaded and dumped over the telephone by a modem, with suitable passwords and protections, into your friendly local

ILLUSTRATION BY ROBIN MacFARLAN

OPINION

RANDOM ACCESS MEMORY



It might be that discs of all types would become a thing of the past with data being dumped over the phone to your local overnight database

overnight datastore. (There are problems in this in that the use of telephone lines is subject to error, but presumably this will improve and is not an insurmountable obstacle).

In any case, if the function of the disc unit changes from continual random access, to infrequent use of a load and dump kind, at the very least, disc operating systems could be simplified, and the units made available very cheaply.

Perhaps the very small diameter discs which the major companies are now developing will become the norm, and disc units will come down in price to become a really trivial item of expense! It is an intriguing prospect!

All this would require greater addressability than even the current 16-bit machines offer, but the megabyte chip is probably just around the corner. ■

ZX81 BOOKS

To write tighter programs

Near the BBC Television Theatre at the top of Shepherds Bush Road is a block of flats called The Grampians. That's where Bernard Babani's publishing house hangs out. Clive Sinclair passed through on his way to fame and fortune, so it's appropriate that Babani's should pay some small homage in the form of *The Art of Programming the 1K ZX81* by M. James and S. M. Gee — a slim volume of short programs for £1.95, which is considerably less than the cheapest add-on RAM pack, and which will delay for a couple of weeks that inevitable outlay of the extra thirty quid.

Anyone who's tried to write a program longer than about a screenful of BASIC lines, will know that the 1K unexpanded Sinclair starts to juggle your program all over the telly, and snips off lines here and there. Handy program-compression hints in the book show you how to erase lines, but still keep them running within the memory, for example:

```
10 LET A$ = "MY SCORE IS"
20 LET A = 12
30 PRINT A$; A
```

The authors say RUN this brief program, then erase lines 10 and 20. The Sinclair will keep the variables still stored, so that it carries out the instruction in line 30, provided that you don't type NEW or RUN — which both clear all variables.

You've saved 23 bytes by deleting line 10, and another 15 in line 20, so that's space left for writing extra program lines. Just remember to start your complete program only with the instruction GOTO. (You can even SAVE this 'phantom' program, and the re-LOADed program will run quite normally on the command GOTO 1!)

If that's given you a taste for simple gems in here, you'll also discover how to make a moving point travel smoothly, how to write bat-and-ball games and a Lunar Lander, and how to write a 1K Hangman game. It wouldn't be fair to give away the other space-saving hints — there are about ten of them in the last chapter — but the book's certainly worth buying, if only to find out how to print giant letters, using the standard ZX81 character generator.

Most of the tips also apply to the upgraded 8k ROM ZX80, but they have been around long enough for most of those hardy souls to have learned many of these hints long ago.

Why not also buy the Babani book *Beginner's Guide to Microprocessors and Computing*? £1.75 ■

Letters
TO THE EDITOR
Which Micro & Software Review, 57a Hatton Garden, London EC1

Chip Sense

Since looking at the interesting personal computers in *Which Micro?* I find that they all seem to be based on two or three main 'chip' designs — at least, the cheaper ones I have looked at are.

What puzzles me is the large price differences of what seems to be boxing up similar essential units. Will the BBC micro be a sort of standard solution?
Martin Peters, Sandown, I of W.

The answer to the last question is unlikely to be yes, although the project designers probably intended it to work out that way.

But just look at the different notions employed in designing a cheap basic offering. The BBC product is set for expansion to use more powerful chips as they come along. To this end it uses a processor to watch the keyboard and other peripherals and it links this via a fast 'bus' to a main processor which carries out the central series of instructions. Just changing the central processor can give the product a remarkable facelift.

Other products have conerned themselves with providing as an integral feature both a parallel interface to match a printer and one or more serial interfaces of the RS232 kind. With other products you may not always be able to have both such interfaces working together at the same time, or only after paying extra.

On top of all this variety of looking at various kinds of input and output, there are very different views of store, that is main memory, capacity. The Newbrain unit envisages up to two megabytes of main memory, which is exceptional for a cheap starter-price product. Then the games computers add special chips to give graphics features that appeal to the home games addicts and so on.

Certainly there is too much fuss but different chips do different things. — *Ed.*

£200 Micro?

For a £200 limit can you suggest the best buy in micros? I have to take 'A' levels, and hope to go on to a degree course. It must be able to draw geological cross sections and be capable of expansion. Games possibilities are interesting.
Jake Strawberry
Bristol.

Because you are at school I am going to cheat a lot. I believe that you should be able to gain experience of using micros without having to first rush out and buy one. Do you know of any links between local user groups, amateur computing clubs and your school?

I am sure that if you looked around you could find a link or set one up. There is nothing like some swapping of notes between users and potential users for giving you a better idea on refining just what you need most.

Take the graphics options you mention. Graphics need either extra chips to help or store to manage the presentation if complex detail has to be developed. Would the geology applications really involve statistical work to derive the plots? I suspect that the data handling might be more important than the pictures at the end.

Moderately high-resolution graphics might be enough, but you must remember the supporting software has to be somewhere. At the limit you choose (£200 seems to have some magic about it) the Spectrum has to be investigated, but there is some hectic movement in the market, so on all counts I would hold off until you have some experience gained via clubs or special courses for students.

Fast moving games need fast running code, but puzzle type games can be done in Basic — so get a feel for your addictions. — *Ed.*

Spectrum

I notice in the Sept/Oct issue of your magazine that you have published an advertisement/order form for the ZX Spectrum, on behalf of Sinclair Research Ltd. This advertisement quotes a delivery time of 28 days.

I have been waiting a total of 16 weeks (dated from Sinclair's acknowledgement) for a 48K version of the Spectrum, 19 weeks if you count from the date of sending the order. A telephone call to Sinclair elicited the information that the despatch department "have no idea when the next consignment of 48K Spectrums will be available. Even when delivered there will only be a few and there are hundreds of people waiting". What chance have any of your readers, ordering now, of receiving a Spectrum in 28 days?
K. J. Crawley
Kemsing, Kent

On behalf of Mr. Crawley and everyone who has ordered and waited in vain for delivery of their Spectrum, this is the position now according to Sinclair themselves.

Sinclair are already in the process of clearing the massive backlog of orders, those of you who have been waiting weeks and months can expect delivery within 5-10 days. Orders received

MICRO MART

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Enhanced (48 × 30) superboard, Microsoft Basic, 8K ram, 16K expansion board, parallel printer interface. Built into VDU with 12" monitor. Keyboard and numeric pad. 5 volt 40 amp SMPSU. WEMON, full documentation. Cassettes in storage cabinet. £150. Tel: Chesham (0904) 782783.

Microtan rack system with full tanex, 16K RAM, system rack, mother board, MPS2 supply, ASCII keyboard, ASIMOV word processor, all manuals. List £655. Accept £500 o.n.o. Farnborough (0252) 518549.

Vic 20, cassette, joystick, super expander, plus games tapes. Less than 8 months old. Over £285 new. Offers around £240. Tel: Mr D Green, Southend 205636, evgs. only.

Commodore Pet. 2001 Series. 32K. *The Pet Revealed* and a number of other books. Several games cassettes. Complete integrated system for only £365. Call 01-778 9932, any time.

DRAGON 32 microcomputer, PSU, manual, cassette lead. Brand new and unused. £180 o.n.o. Call Peter on Redhill 61612 evgs.

Video Genie EG3003 with sound, v.u. meter, extra keys, all leads and manuals, lots of software (Edtasm, games, lower-case) over 20 programmes, 16K 1ll processor, v. good condition. Sell for £280. Tel. (0632) 876944 evenings.

VIC 20 (8K) plus Datacassette, Superexpander, Programmers Aid, Spiders of Mars, Avenger, Super Lander, Jelly Monsters cartridges. Six issues of VIC computing magazine, Tons of magazines and software. Worth over £520, only £295. Phone Crayford 524840.

VIC 20 + cassette player + 16K Add-on + Database + Super Lander game. 1 month old, 11 months guarantee left, boxed, unwanted gift, mint condition. Worth £350, quick sale £270. Tel. 586 5805 day, 458 6519 evening.

now will be dealt with in 28 days, as Sinclair's advertising states.

Hopefully this is the end of a very frustrating episode (certainly on the part of the public) in Sinclair's history, and one which all manufacturers could take steps to avoid.

Good news for all concerned we hope!

Texas Advice

I very much need your expert advice on which micro to choose, as there are constantly always new micros arriving on the scene. I think my fortune lies with the TI99/4A, the Dragon 32 or the Vic 20. I find the TI99/4A a very attractive machine, the software is truly excellent. The Dragon is about to burst upon the market but I don't think it is a very attractive machine. The Vic 20 has limited memory but is able to expand. I am not a beginner and am looking for a machine that will expand with me.

Michael Bellamy
Barry, South Glamorgan

It sounds to me as though you've already made up your mind that the TI99/4A is the one for you! The basic computer is well made and will stand up to rigorous use, making it more than suitable for your planned expansion. The range of software available provides material interesting to a wide range of skills and tastes, and while software is currently on the expensive side (from £14.95-£39.95 for educational and games software), TI have plans to change this in the future. A fairly standard TI Basic is provided, with the colour graphics and speech capability as well developed and easy to use features. The machine comes complete with a User's Reference Guide which provides examples and suggestions for the programmer to try.

Before you buy I do suggest that you carefully look through our* Home Computing *Supplement (page 51).

Oric Delay

Ever since reading about Tangerine Oric 1 in your news pages, I have been looking forward to its release. Could you give me some sort of idea of its capabilities as a games computer? This would be greatly appreciated and will help me to decide which computer to buy.

A. Irtelli
Sanderstead, Surrey

I contacted Oric on your behalf Mr. Irtelli, and was reliably informed by their Sales Office that the Oric 1 is 'an excellent choice for both games and business use'. Bug-byte Software are apparently at this moment in the process of producing games software in preparation for the release of the Oric 1 early next year (incidentally, all orders received now by Oric will be despatched at this time). An interesting point is that like a number of other home machines the Oric 1 can be connected by means of a communications modem to Prestel via your telephone, which will mean that a wide range of games could be played.

Unfortunately production delays have already occurred with this machine.

Laserbug

WHAT ABOUT US? I found your computer club list very comprehensive except for one case — you missed out LASERBUG.

LASERBUG is an independent national BBC Microcomputer User Group. We were the first user group to be formed for the BBC Micro and our first magazine came out 1 month before anyone else managed to produce anything. Despite this we were not included!

I would be grateful if you could alter this oversight for the next issue of your magazine. I list full details of our group below.
Paul Barbour, Editor.

LASERBUG — The Independent National BBC Microcomputer User Group, 10 Dawley Ride, Colnbrook, Slough, Berks. SL3 0QH.

Comprehensive and professionally printed A4 size magazine every month to members. Edited by Paul Barbour.

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Membership £12.00 for 1 year including 12 issues of the magazine or send £1.00 and a large sae for a sample copy.

LASERBUG membership covers 14 countries worldwide.

Calc Correction

In our July/August issue, we ran a feature on Financial Software and stated that it was not possible to print out the formulae of a VisiCalc sheet. We have subsequently received a letter from Peter Clarkson of Modac Data Systems Ltd of Bradford who writes that it is in fact possible to do this, although the formulae will be printed out in reverse order i.e. it starts at the bottom right hand corner and works along the row to the left hand side of the sheet, then to the next row, right hand side and so on. A formulae printout can be obtained as follows, according to Mr. Clarkson:

a) Start off by saving the Sheet, i.e. by entering /SS.
b) When the prompt line at the top of the screen asks for "STORAGE: FILE FOR SAVING" type in ,S1 (comma S 1), where 1 refers to which slot your printer interface card is located in the Apple.
c) By depressing (cr) RETURN the printer should then proceed to print out the formulae of your sheet.

Apparently there is also a method of saving your formulae on paper by using Applewriter II but this involves using two discs when one is sufficient.

Thanks for pointing out this possibility.

Irish Club

NORTHERN IRELAND COMPUTER CLUB
This, unless we hear otherwise, is the only computer club in N. Ireland:

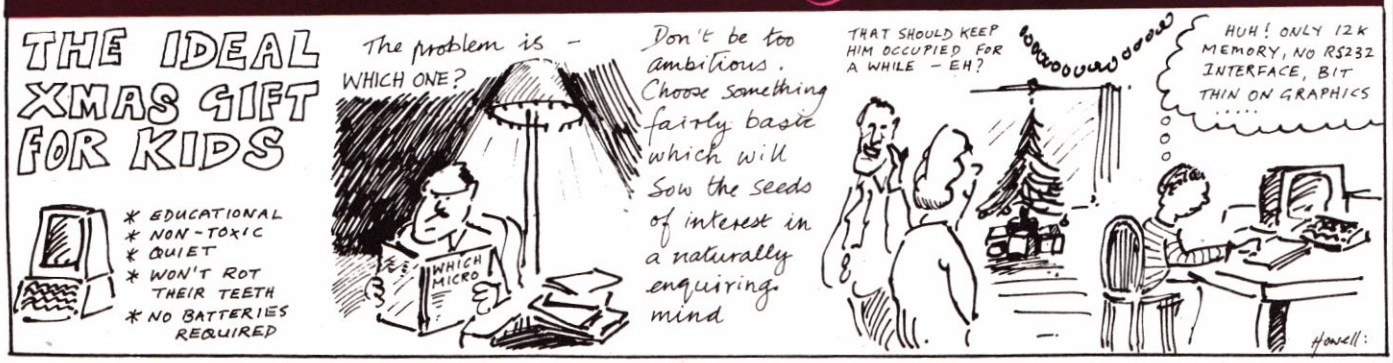
CARRICKFERGUS, Carrickfergus Library — once per month — 3rd Monday in month, at 7pm in the meetings room. Organiser David Bolton, tel. Carrickfergus 63788 (after 6pm).

10 BBC micros, Spectrums and Vics. Monthly competition for best hardware/software. ■

SILICON TIPS

Handy Hints for Micro Users

By Richard Howell



NewBrain

Programs available for the NewBrain:

CARD INDEX £35

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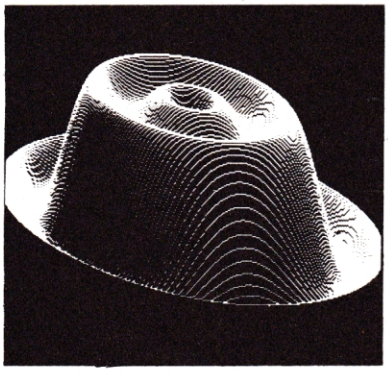
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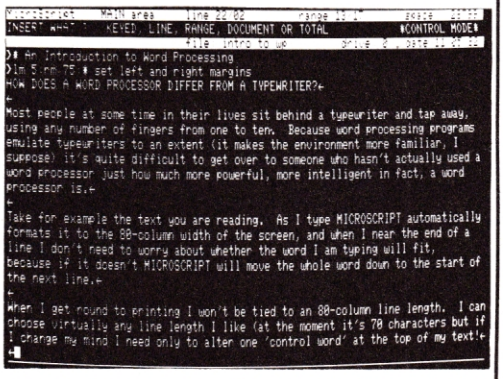
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CIRCLE NO 114

TELESOFTWARE

Prestel's dial-a-program-disc

Shoot a space invader down the line or store a calc program for future use

BBC's *The Computer Programme* is disappointingly unhelpful on the matter of computer programs — Chris Serle and 'Mac'-Davies never seem to have explained properly exactly what a program is, what it does, and why it's necessary.

Most people don't seem to realise that a computer knows nothing, except how to keep itself running.

It's rather like a new-born child, which knows how to keep breathing, how to circulate its own blood, how to maintain its body temperature by shivering or sweating. But an hour-old baby knows nothing of the works of Schopenhauer or Danny Kaye, or how traffic lights work, or the legend of the *Marie Celeste*.

A baby regulates its own internal workings, because the knowledge of how to do so is incorporated into its cells. The baby is a standard-pattern creature — what goes for one baby will do for them all — so the looking-after-itself mechanism can be fitted in from conception.

This is done with each one of every brand of computer. A factory-inserted circuit regulates the rate at which the electric signals race around inside the machine. Another circuit controls how the electronics are fed out to a television picture or a monitor screen.

But nobody knows what the machine is going to be used for — assessing exam results? — controlling an automatic milker down on a farm? — playing a Space Invaders game?

Although writing job-instructions — programs — for your own computer is fun, it can take a l-o-n-g time to give your machine the instructions to do even a simple task, like finding which of a set of numbers can be divided by two with no remainder.

Program queues

You'd think someone would have devised some smoother way of ordering your program without you having to buy it from a shop, laboriously type it from a magazine or order it by mail order.

They have, and it's called 'telesoftware'. 'Tele' as in long-distance (telephone, television) and 'software' as in computer-software; the jargon phrase for loose and floppy pages of print or plastic discs which have programs recorded on them.

So telesoftware means programs to be used at a distance — being LOADed, for instance, from a distant source.

The idea is that you can get in touch directly with whoever is offering the program which you've seen advertised — you just ring them up, and LOAD the program into your computer straight down the phone line.

Try it — ring up a friend, and play a Sinclair program tape on your cassette machine, holding the phone receiver close to the little loudspeaker. Your pal at the other end should be able to record the buzzes and squeaks which come down the wire, and then LOAD that recording into his own machine.

It works — but *don't* clip any crocodile clips from the cassette machine onto the phone line itself — you might electrocute them all down at the phone exchange!

British Telecom are very possessive about their phone lines — you can play sounds down them, but don't dare attach anything.

The principle of telesoftware is fine, and in practice anyone selling programs could simply run a continuous tape loop with a recording of the program on their cassette machine. Then you just dial up and listen to the tape, and copy it onto your recorder.

But how could they get you to pay for the program tape, assuming they wanted some reward for all the hours of programming sweat it cost?

Blips and bloops

When you listen to weather reports, cricket scores and the recipe of the day on the telephone, British Telecom charge you by sending a phone bill every quarter.

Now what if you could get them to levy a charge for the content of the phone call? Specify, for instance, that every call to a particular number was charged at twice the normal rate. That would be the phone number on which you were selling your program. Then after BT had docked their collection surcharge for running the service, they'd simply send you the extra cash from the sales as a credit on your own phone bill!

Mmm, fine if it worked — but d'you reckon they'd balance out the credits and debits reliably?

However, a system like that is already operating on British phones — it's the Prestel service.

Prestel is a set of blips and bloops which come down the phone line and which can be translated into characters to be displayed on tv screens.

TELESOFTWARE . . . INFO PAGE . . .

Prestel is available on a number of provincial and London phone lines; for example 01-618, 01-686 9201, 01-248 6641, 01-248 4242, 01-600 3611 and 01-686 0311. That last number calls 'Enterprise' computer — Prestel is held on a number of computers, each with a separate identifying name. Enterprise offers 'electronic mail' under the title Mailbox. Any Prestel user can send a message to any other Prestel user by keying in his or her own account number, and the account number of the person the message is addressed to. The message takes only a second or two to transmit, and is waiting to be read whenever the recipient turns on their Prestel set.

Telesoftware programs are available on page 700 of Prestel — known as 'Aladdin's Cave' — for BBC, Apple, ZX81, Research Machines, Commodore, TRS-80 and other computers. However until MICRONET 800 launches its low-cost modem adaptors at the end of the year it isn't possible to actually 'download' programs into some of these computers.

Telesoftware is broadcast by the BBC on their 'Ceefax' teletext service. To download it into a BBC Microcomputer you'll need a special adaptor — costing about £200 — which should by now be available from those sources supplying the BBC computer itself.

Rewtel is a database operated by Radio & Electronics World, on Brentwood (0277) 230959 after office hours. You need a 300-baud modem and an RS232 connection to your computer to be able to connect to Rewtel.

There are items of general electronics interest and some software available on the Rewtel number.



ILLUSTRATION BY STUART BRIERS

When you ring Prestel you're charged for the normal phone call. You're also sometimes charged 'computer time' (depending on whether you're a business or a private subscriber) and you can be charged for the cost of the particular 'pages' of information you look at on the screen. That's a cost automatically totted onto your phone bill as a specific file of information is called off the Prestel computer's databank and onto your telephone line.

This 'page price' or 'frame charge' is paid by British Telecom to whoever supplied the facts contained on that page — minus a 5 per cent BT collection and administration charge.

This means that whoever supplies a page of Prestel information — let's say they supply the written listing of a computer program — can ask BT to charge a certain amount for it. That page price is collected from you via your three-monthly phone bill, and BT send-on the money to whoever wrote the program. Easy.

A computer listing — just the written lines of the instruction program — can be very difficult to copy accurately from the screen, though, so the natural progression has been to encode the blips and bloops which come down the phone line as the actual program itself. Fine in theory. But the speed and tone range of the blips and bloops doesn't necessarily match the input of every computer. Some use a slow data-transmission or 'baud' rate, like the Sinclair ZX81; some use a faster rate, like the Spectrum, Apple, BBC, Pet and others.

British Telecom won't alter their transmission rate for every different make of computer, and so a different solution was found so that this program-down-the-phone-line idea could bear fruit.

Mike Brown of the Council for Educational Technology devised a standard format to enable programs for *all* computers to be sent down the phone lines. But other smart Joes have had to devise the circuitry to add onto home computers, so that those computers can make sense of the complex set of data sounds which come down the wire.

Steven Rabagliati, for instance, of the Independent Commodore Products User Group — a kind of super computer-club — has written a program which allows Commodore computers to understand the British Telecom squeaks and squawks, so that the 1200-baud bips and brrs which squirt down the wire can be translated by your Commodore into a ready-to-run program.

Modem hum

There are, in fact, a selection of programs available now on Prestel — but you do need some means of connecting your micro to the Prestel phone signal. And that is, unfortunately, a little more difficult than just recording the phone tone — as in the previous experiment with a friend — and then playing the tape into your computer.

The Prestel phone signal always asks for confirmation down the line that there is actually something at your end — something which can interpret the special Prestel sounds.

You can try humming into your phone receiver at 390Hz (close to Middle C) when you've dialled Prestel (01-618) and you'll hear it answer with a burst of high-pitched garble!

So you need a piece of hardware, a Modem — short for MOdulator/DEModulator — which can recognise signals at 1200-baud, 2100Hz and 1300Hz, and which can respond by acknowledging at 75-baud 450Hz and 390Hz. Got one of those in your saddlebag, John?

These acknowledge-the-signal-and-respond connectors, the Modems — are currently around the £100 to £200 mark, but there is a scheme, known as Micronet 800, which will put low-cost modems in the shops in January '83, and some computers — like the Torch — already have Modems built into them. Many more computers will, too, in the very near future.

Now, then, the scenario is complete.

You buy a computer, and you need programs to instruct it to do a variety of jobs, like counting, sorting, or playing games.

You dial Prestel, and — using your Modem — you display the choice of programs on your computer's video screen. You tap in on your computer keyboard the index number of a program which sounds promising, and you see a simulated showing of what the program does.

You decide to buy the program, so you type-in the signal which says "yes please, I want to buy this".

The 'downloading' program which is running in your computer then reads the ensuing Prestel signal into your micro's memory, and re-interprets it into the kind of data which your computer can handle in the normal way — as if it was the computer's own language which you had typed-in on your own keyboard.

The cost of the program is added to your phone bill. That's all. Virtually instand program Loading. No queuing at Post Office counters; no need for stamps, Postal Orders, cheques, Barclaycard numbers; no waiting for the postman to deliver, only to find the program cassette you've mail-order-bought won't work properly on your cassette recorder.

We've reached the end of Information Technology year, but only the beginning of the telesoftware revolution. ■

MICROWRITING

David Babsky's fingers do the walking over £485-worth of electronic note-pad

ABBOTT and Costello Go To Mars it says on page 1 of *Halliwell's Film Guide,* and it ends with *Zulu Dawn;* 'Confusing historical action adventure, very similar to *Zulu* but failing in its cross-cut attempt to show both sides'.

And there was rather a falling out between Cy Endfield, who wrote it, and the rest of the people who put the film together — unlike *Zulu* ('Standard period heroics, well presented and acted') which he'd written and directed himself.

Perhaps film writing had been getting on his nerves, perhaps he wanted to find a better way of writing altogether. So he turned his attention to improving the cumbersome Qwerty typewriter keyboard.

And he came up with what scientists like to call 'a very elegant solution'.

Why race both hands over about 50 different typewriter keys (26 letters plus numerals, plus Shift and punctuation) when — just think about it — with only five keys (one for each finger) you could achieve 32 different character permutations?

Call your little finger 'a'; then the little and next-to -little fingers together can be 'b'; then press down with your middle, and your next-to-little and little fingers together and you've got 'c', and so on.

Thirty-two alternatives aren't quite enough to conjure up the whole alphabet and all the numerals, but add just one extra button to make a total of six keys, and you're doubling the possibility to 64 different ways of pressing those six few buttons!

That's fine theory, but then so what?

Cy Endfield used simple mnemonics; memory-jogging patterns. 'O', for instance, would be the central One of the five main buttons, 'P' is Press-them-all, 'M' is 'Most' of them — the four rightmost buttons of the main five. 'S' is Single button on the right, and so on.

And out of all that, the Microwriter was born.

It's a slightly larger than hand-sized, creamy-buff and brown, 26 oz (750 grams) extremely solidly built pack of electronics.

It has five brown buttons spaced out to suit the fingertips of an average right hand, with one extra button a little below where your thumb normally rests. Each Button is attached to a microswitch, which gives a little click as each is pressed.

Ahead of the buttons sits a clear 16-character liquid-crystal display panel.

That's all there is to it, except an RS232 output socket, a 3.5mm earphone socket and an on/off press-press switch on the top edge, and also a 37-pin diagnostic 'D' socket and a 9-volts-in power socket on the bottom edge.

It's slightly larger than a pocket-portable compact cassette player. Doesn't sound like much, does it? But it does far, far more than those 64 button combinations suggest, because pressing buttons in a particular order initiates a whole set of procedures.

Pressing (all capitals) MNHL allows you to change the number of lines a printer advances for form-feed between documents; MNYC lets you set the number of characters the Microwriter produces per line; MNYD gives a line-feed disable — yes, it's beginning to sound like a proper formatting word-processor!

Trust the force — trust your fingers

In fact there are 32 print formatting options which the Microwriter provides, that's over and above margin indentation, line centring, tabs, paragraph stepping and right-justification.

It isn't just a toy for tapping out memos, it's a proper portable typewriting tool, which uses only six keys for the total text input and printer program.

How does it behave in practice?

No healthy sceptic would believe you'd learn the novel Microwriter alphabet in an hour, as the publicity blurb promises. But it really is as simple as they say. It takes longer, though, to become fluent and proficient, especially with all those control codes to remember, but you're helped with a pack of reminder cards.

The New User's Guide — handbook number 1 — begins with a picture of a learning curve: it shows you that you'll learn fast in the first hours, then you'll make irregular progress in the following few days, then steady improvement over the following weeks, till you reach the full level of skill several weeks later.

That's also true.

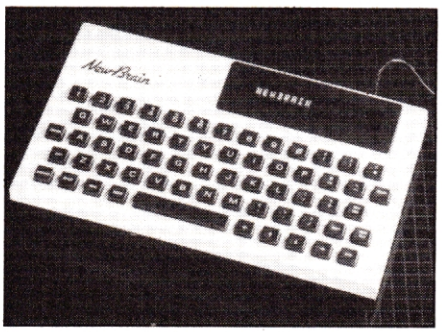
The unnerving thing is that after a day or three your fingers make the right moves themselves, then your brain intervenes to check what you've done — and that's what slows you down. Like Luke Skywalker learning to fence with a light-sabre, you've got to relax your reasoning, and let 'the force' take over — trust your fingers to press the right keys without thinking about it, instead of bothering to make sure that they're right — most of the time they are!

But what's the application for a Microwriter?

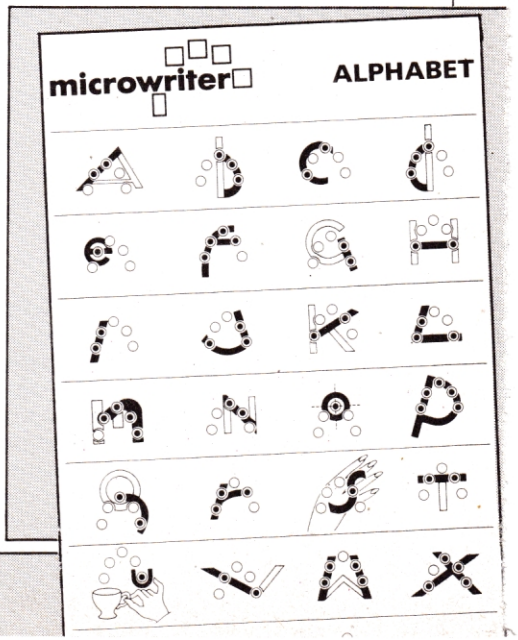
Its whole purpose is to allow you to compose text anywhere, then back at the office you simply plug the Microwriter into a printer. Out comes your document — or documents.

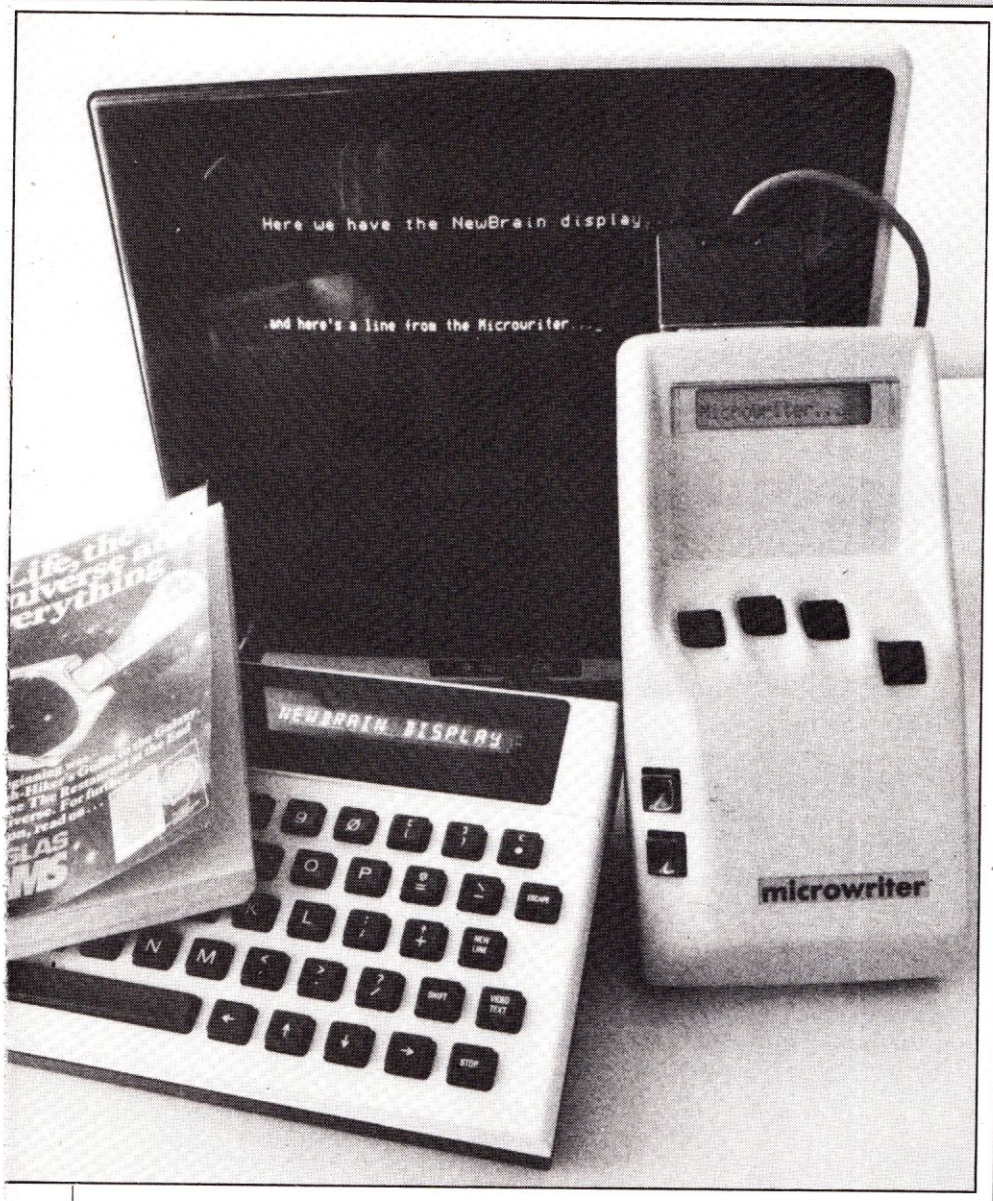
You can certainly dictate a letter anywhere, using a cassette machine, but then someone's got to listen to the tape, and type it all out.

You could write longhand notes and then pass them to a secretary, but then they'd have to be typed onto a keyboard to end up with printed pages.



Newbrain — full review July/Aug issue.





The Microwriter allows you to think your ideas straight onto a portable mini-keyboard — its 8K memory holds about five A4 size pages — and then you plug its RS232 output straight to a dot-printer or a daisywheel. It cuts out the middleman third-person typing routine.

You want to produce more than five pages of text? Use the earphone socket to dump the memory contents of the Microwriter onto a tape recorder — an ordinary cassette machine, or a tiny Pearlcorder. The Microwriter's display shows if your recording level is right, and if there are any errors during transmission. A full memory takes about three minutes to transfer. A thirty minute cassette will hold about fifty A4 pages.

You can retrieve pages from tape by typing MW (Multiple Wipe) to clear out the Microwriter's memory, then COMMAND R, to receive or read from tape.

The COMMAND key is the sixth button — the one below the thumb position. It's used by itself, or in combination with the other keys, to give special instructions to the Microwriter. A single press on the COMMAND key will give a capital letter when you next press any of the other buttons.

A double press of the COMMAND key gives constant capitals until you go back to normal by pressing the COMMAND key and the thumb button together.

Seems straightforward, but we had terrific trouble, struggling for an hour, trying to make sense of COMMAND-K, which is supposed to make the Microwriter step back a character to correct a mistake.

COMMAND-K is the letter K, but made by pressing the fourth finger and the COMMAND button, instead of the fourth finger and the thumb button. No matter how long we looked at the illustration — the handbook has clear pictures of what to press for each letter — we couldn't make any sense out of it.

We went to see Susannah Endfield in Micronet's plush Southampton Row offices to see if she could show us where we were going wrong.

"No, I'm sorry, you've been given an out-of-date instruction book; there's a mis-print — we thought we'd called-in all the faulty printings! Our mistake! Here's a replacement copy. Any other shortcomings?"

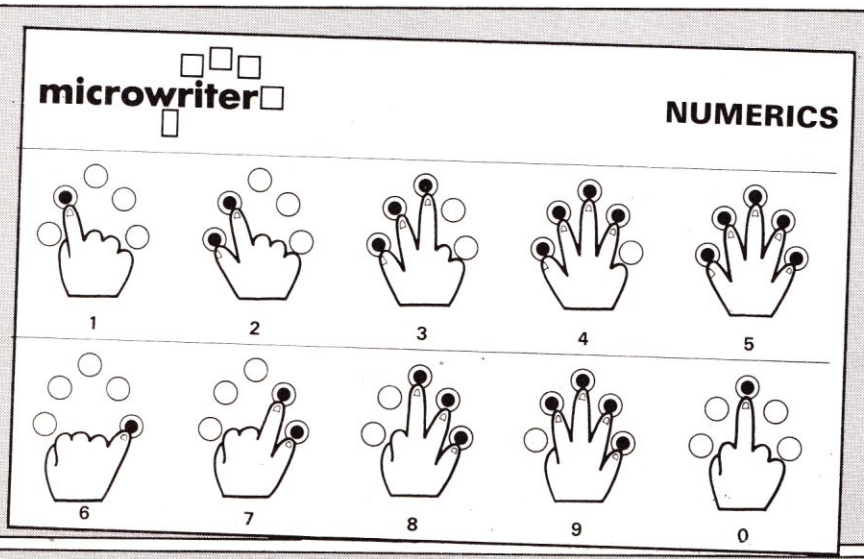
Yes, there's a rather weak index in book 2 — the General Systems Manual. It's difficult to find out how to produce particular printer settings, like re-assigning the baud transmission rate (yes, it does that, too!). And there's an almost cryptically hidden default code, to let you reset all the variables — like line length — to their standard values.

"I agree with you about the index; I think perhaps we ought to improve that — but we've not made a great show of the reset code MNYW because we don't want anyone to key it in 'just to see what happens!'

"If your printer needs a complicated set of codes keying into the Microwriter to make sure you get single-line carriage returns instead of double-line for example, and you press the reset combination just for fun, you'd then have to try and sort out the carriage return code all over again."

Now what about southpaws — left-handers? Why is there only a right-handed Microwriter?

Susannah says "We thought there's a very small proportion of left-handers



Two examples of the easy to learn cards.



Connect 'writer' to a printer.

— oddly enough a far higher than normal ratio of Microwriter users are left-handed! We've found, though, that left-handers can quickly manage the Microwriter with their right."

That's not what we found when our designer Steve gave it to his flat-mate, left-handed Ken. He couldn't master it at all. To be fair, he only slogged away at it for two days.

"We've got left-handers in the office here, and they can use it with no trouble at all." Perhaps Ken isn't the average Microwriter user.■

COMMENT

It really is a lovely instrument, and the more we've used it, the more we've grown to like it. But honestly, the price — £485!

Susannah sat stolidly and self-confidently.

"It's not aimed at the amateur computer meddler — it's directed at the serious businessman; solicitors, engineers, teachers.

"Many of these people haven't learned to type, but they need some way of making notes in the field, and running them straight off onto a printer when they get back at the office.

"There may already be a word-processor and printer in their office, in which case they just plug in the Microwriter and it produces completed documents."

A good printer's £200 to £500 and the Microwriter's £485; that's nearly £1000 just to make notes "in the field".

And isn't Susannah frightened by the Grundy NewBrain (£260) or the Epson HX20 (£500)? They're both portable computers, no less, both with integral display, and they both run very much more than a single word-processing program: they'll do arithmetic, payroll, screen graphics and play games, not just type A4 pages of text. And what of the dedicated Sony Typecorder (£900), with its built-in micro-cassette deck, like the new Epson?

"The Microwriter is faster to use, as it has only six keys, instead of a Qwerty keyboard — and I don't want to run-down the Sony, but it only lets you re-insert a single letter at a time, and its longest battery life is five hours, unlike our Microwriter's 30 hours — which we've achieved through some rather expensive CMOS (Complementary metal-Oxide-Semiconductor) chips which have far less battery drain than normal NMOS circuitry."

We'll have to wait to see how right Susannah is.

I'm certainly finding the Microwriter invaluable — I can write at home on the boat in the dark at night, when the genny's packed up and the lights have gone out. You can do it just by touch-typing — a boon for the blind.

I can write a magazine article on the train, then just poke it into the printer down here at the office.

But I got my Microwriter free, on test. I couldn't afford £485. Maybe my solicitor can. Maybe when Susannah reads this I'll need a solicitor. Maybe that's how he can afford £485!

SPECIFICATIONS

The Microwriter stores 8000 characters, and displays fourteen of them at a time, with two status characters — showing U for upper case lock, for example, and I for insert.

Its built-in batteries give 30 hours use. Charging up from flat takes 24 hours. It automatically switches itself off after 8 minutes if left turned on but unused. Memory remains intact when switched off unless the batteries are flat.
It comes complete with a 240v-to-12v mains adaptor/charger.

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RS232C serial connector couples the Microwriter to any printer (baud rates and handshake RTS delay variable to suit any configuration) or to a tv or monitor to display 16 lines of text 64 characters long, with flashing cursor.

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The Microwriter is distributed only by accredited dealers of Microwriter Ltd, a Hambro Life company, 31 South-ampton Row, London WC1B 5HJ.

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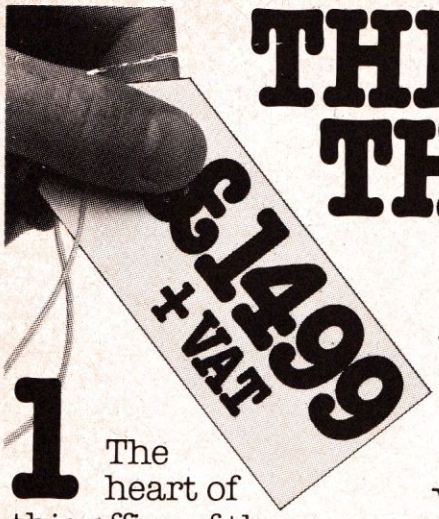
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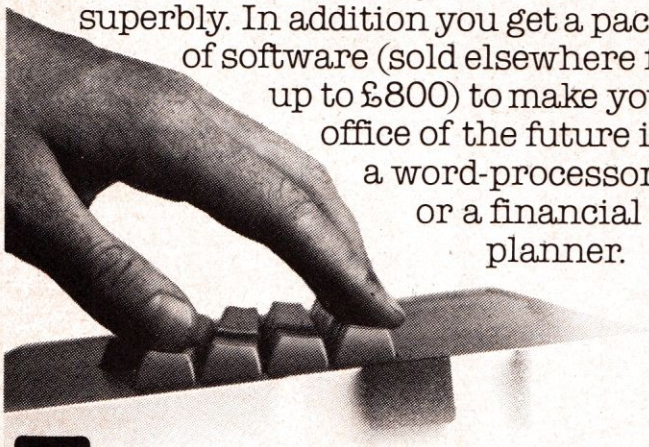
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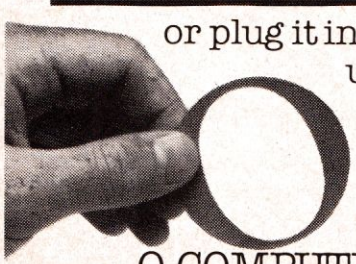


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CIRCLE NO 117

ZX Soft is our regular column concerned with Sinclair's ZX range (ZX 81 and ZX Spectrum). This month Steve Langford looks at some books, flight simulation and a pack of Mazogs



THERE is a lull in the Sinclair software market at the moment. This is probably due to the fact that the underground network of software producers are beavering on new Spectrum programs and for the moment the ZX81 is being left slightly in the shade.

All this leads to this month's ZX SOFT, which has become something of a pot pourri of items that I have wanted to review but not had the space to do justice.

Mike Lord's **The Explorers Guide to the ZX81** is one of the better books to come out of the ZX boom. It is not of the "How to Write Basic" brigade but is more of a sequel to these books.

It deals with a multitude of subjects for saving space in programs to building your own 16K RAM board.

On the way the book deals with converting other computers programs, games programs, business programs and, what I found to be the most interesting section of all — machine language.

Mr Lord's writing style made, what is usually an authors minefield, into a chapter that was very easy to read and understand. For this chapter alone the book is worth buying.

The Explorers Guide to the ZX81 is available from certain shops or direct from the publishers, *Timedata at 57 Swallowdale, Basildon, Essex. It costs £4.95.*

The Electric Pencil have issued one of the best **Asteroid games** that I have seen on the ZX81.

I suppose you would argue that one Asteroid game must be like any other Asteroid game and I will not do the usual and bore you with all the details. But what I will say is that the graphics on this one are very good and it still contains all the usual multi-fire cannon, hunter-killer aliens and four sizes of asteroid.

The game can be played by one or two people and it has a choice of five different speeds. There is a bonus spaceship available if you can get that far and a high score nameboard at the end. *ZX Asteroids is published by the Electric Pencil Company, 1 Mount Vernon, Bilton, Hull, North Humberside.*

Psion's Flight Simulation is an excellent piece of software. It displays all the aspects of flight in real-time.

It begins by asking whether you wish to fly an approach to an airport or fly around and then land. You are also given the choice of risking the effects of turbulence or not.

The program goes on to display a cockpit with at the top of the screen three windows and the horizon seen through them.

Beneath the windows is the main cockpit display. Going from left to right we have a rate of climb display and fuel level bar indicators.

Next to these there is a Radio Direction Finder (RDF). This shows the direction and distance to the radio beacons that are spread about the map.

To the right of the RDF indicator are the power, speed, altitude, flap and undercarriage indicators. All in all, a well equipped cockpit.

By pressing M on the keyboard the screen changes to a map display. Located on the map are the various radio beacons and their identity numbers as well as the location of the airport.

Each beacon is selectable from the keyboard.

When you manage to get the aircraft within range of the airport pressing V displays the runway along with an ILS indicator (Instrument Landing System). This instrument shows whether the aircraft's range from the end of the runway is correct compared to its altitude.

The aircraft responds easily to straight and level flight using the arrow keys. The major problem comes when it is on approach and everything seems to happen at once. It is at this point in the flight that it is all too easy to hit the ground or stall the aircraft.

I have always found it easier to fly the real thing than to fly a computer simulation but this one is better than most.

Aerobatics are possible to some degree but if you stall the aircraft the program assumes that you have crashed and gives you no chance to pull out. The aircraft also shows some funny flying traits.

In a normal aircraft if the power is increased and the aircraft held straight and level the aircraft will climb with the reverse being true of descent. This is not true in the Psion aircraft and does rather detract from an otherwise enjoyable program.

Highly recommended for aeroplane buffs and anyone into the fears of flying.

The program is available from Smith's or direct from Sinclair.

Mazogs from Bug-Byte is an unusual maze game. You take the part of a treasure seeker and you are aided in your itenarency wanderings by the Mazog's prisoners and hindered by the Mazogs themselves.

At the beginning you are offered the choice of three levels of play.

In game one the Mazogs are inactive and will only set about you if you bump into them. They stay in a set place in the maze.

In level two they will attack if you come too close and there is the distinct possibility of personal starvation if you remain too long in the maze.

Level three is just plain suicidal. The Mazogs roam the maze singly or in packs. Meaning that even when you have found the treasure your return to the maze exit can be as dangerous as the inward journey.

When the play level has been chosen a maze is drawn at random by the computer. On entering you will find swords to assist in the killing of Mazogs (beware a sword will only kill one Mazog) and prisoners who will assist you to find the treasure. They will show you the way but after 10 seconds or so the directions disappear from the screen.

Pressing the V key shows part of an overall view of the maze and the direction you have taken so far.

Once you have located the treasure you can pick it up and attempt your retreat to the exit.

There is a minor snag (isn't there always). While carrying the treasure you cannot carry a sword. Not so bad on level one but when you get to level three things become a trifle awkward.

The game is fast and the graphics good. It does make a change from Space Invaders.

If you have anything you would like reviewed or you have something you care to say do write to ZX Soft, *Which Micro?* Petersham House, 57A Hatton Garden, London EC1. 01-242 6552.

In our next issue we will be concentrating a little more on Spectrum software. ■

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CIRCLE NO 118

POWER CHIPS

There is a new chip available for the Commodore Pet range which is a real plus for Basic users — so says Barry Miles

This is a 4K chip, available for 2000, 3000, 4000 & 8000 series machines and goes in the 9000 slot.

The author, Brad Templeton is as they say 'world-famous' because of the technique for merging programs from cassette which he invented and refined, and which Jim Butterfield publicised in many journals.

Jim's fame as a Pet guru is likewise 'too well known' to require comment, and the fact that he wrote the manual is certainly a major advantage.

There may be some unkind criticism of some of the humour in the manual, but only the Users Guides for *Disco-O-Pro* and *Command-O* have anything like the same tutorial content, and the high-quality three-ringed binder in which the product comes is in a different league from products in this price range.

Templeton's technical appendices are unique, in that they show the advanced programmer exactly how to modify *Power* and add features.

This chip's advantage over a number of others available is that it performs in almost precisely the same way on 8032, 4032, and 3032 machines.

I'll give you a quick run down on some of the functions:

Auto provides automatic line numbering, and used on its own works from the current last line used in a program, which is very helpful for convenient addition of code at the end of a program.

FIND AND CHANGE: you can specify the range of lines in which this is to take place and the program differentiates between keywords and other strings. The unique feature is the use of metacharacters.

A full stop matches any character, a splat matches any character on the same line and the closed square bracket matches the end of a Basic line.

The importance of this is that it makes it possible to look for two significant points regardless of what occurs between them: e.g. IF * THEN, and FOR *NEXT will find these constructions if they occur on the same line.

The ability to continue to SEARCH for a particular string, without having to define it again, merely by hitting @ is also very convenient.

INSTANT KEY WORDS: When these are switched on, any shifted character produces keywords in full.

This is attractive for poor typists, and offers two advantages over the more familiar abbreviations supplied within the operating system: You can see the words in full, and you do not exceed the normal line length, which can be useful but also slows up editing.

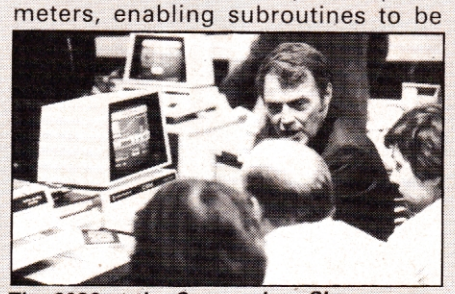
The self adhesive transparent keycap labels provided are different, and as users of *Wordpro* will know, very helpful.

Considerable care has been taken to make the keys selected as near to mnemonics as possible. Particularly convenient are the single key access to SCRATCH DSAVE COPY DLOAD CATALOGUE. Unfortunately these commands are available only on the 4032 version.

SCROLL: This is arguably the single most important facility on the chip. It works in almost exactly the same way as the same utility in Commando.

You may scroll the program up and down the screen in exactly the same way as you can when using a word processor.

RENUMBER: this is by *four* parameters, enabling subroutines to be made to start as significant line numbers, and enabling blocks of code to be moved around the program by selective renumbering.



The 8096 at the Commodore Show

MLM jumps into the Monitor without a break and without modifying the Stack Pointer. This is helpful, and enables you to print Monitor output to the printer, because you are not cancelling the CMD status as you do with SYS4, OR SYS1024.

INSTANT PHRASES: *POWER* offers up to 26 phrase printed on the screen when you press a shifted key. Although for each one used, you lose an Instant Keyword of course.

INSTANT SUBROUTINES: up to 26 shifted characters will invoke that many separate programs to coexist peacefully, and use common variables.

TRACE: This is unique in the range of options provided. You can see a listing of the line, and each variable as it is calculated.

The versatility of the Trace command is enhanced by having special SYS commands with parameters enabling you to switch in and out specific types of Traces. This is particularly good in avoiding waste of paper when loops are running, and also makes it easy to by-pass sections of the program which have already been successfully debugged.

Complex programs can be debugged in stages using a GOSUB to a subroutine for the SYS commands switching the Trace on and off. The manual shows how to avoid the problems of tracing GET commands.

FIX: will occasionally be very useful for resetting certain essential pointers which may have been clobbered by loading machine code programs into an unusual part of memory.

The manual gives a very full explanation of how this command will prevent loss of variables or of the Basic program.

XEC: (execute) this is powerful and 'totally unique'. It is an extension of the technique pioneered by Templeton for merging programs from cassette, there is a danger that it will be seen as merely a rather complicated merging method. This is totally wrong.

The sequential file created is read by the computer and treated in every way as if the strings were being typed in at the machine. This implies that they will be acted upon as direct commands, and their capability is limited only by the fact that the special commands in Power cannot be included.

The manual gives a very tantalizing hint of writing programs which write programs. I would love to see an extended tutorial on this technique added.

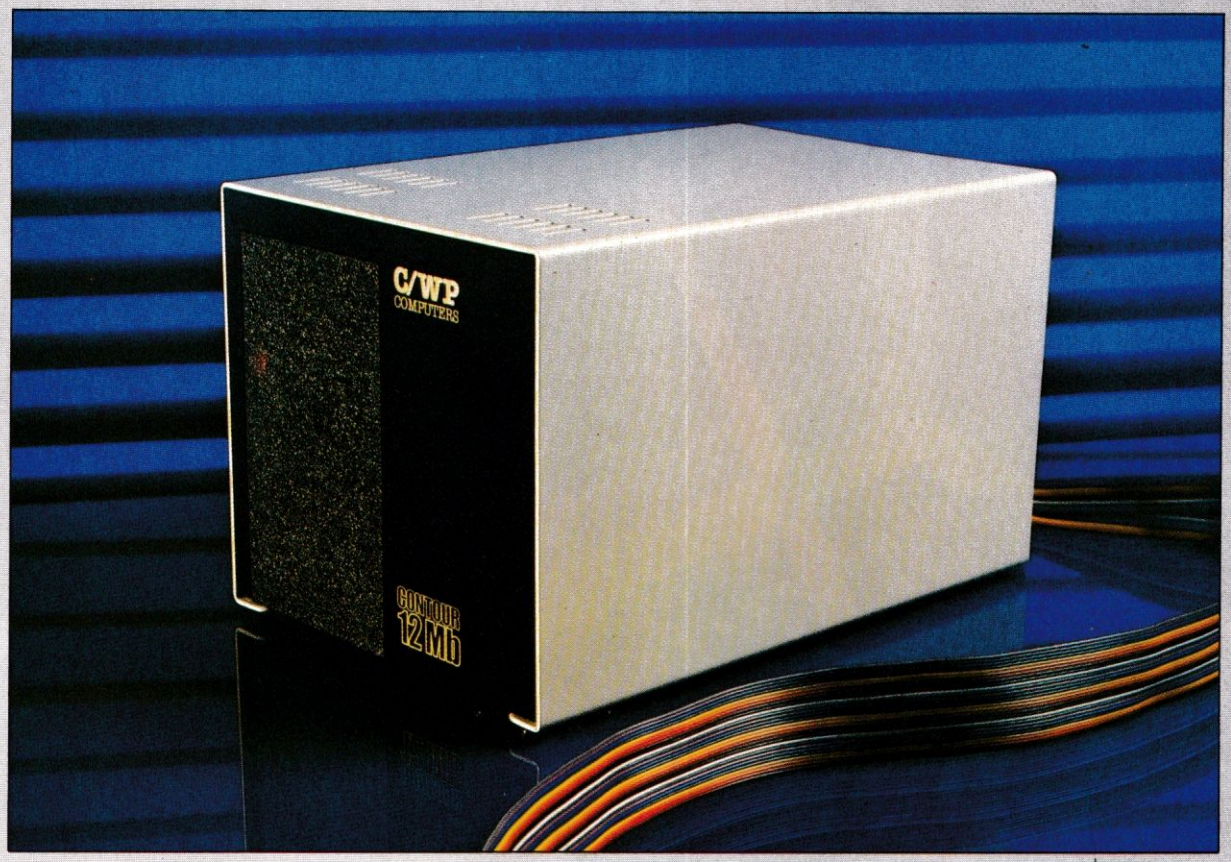
CONCLUSION

POWER offers so many facilities, that the user, whether beginner or expert, can grow in capability by using it.

It is worth emphasising the fact that this is no mere run-time improvement to extend Basic, nor a mixture of such and programmer's aids, but rather a very carefully thought-out set of aids to the serious user of Basic, designed by a truly expert programmer, to cram as much power as possible into a 4K chip, with as much care taken in choosing what to leave out, as what to include.

The fact that it has been rigorously field-tested, and is a mature product is also relevant. ■

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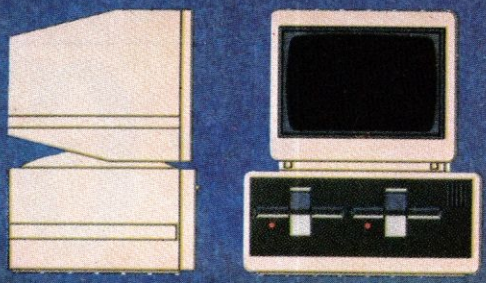
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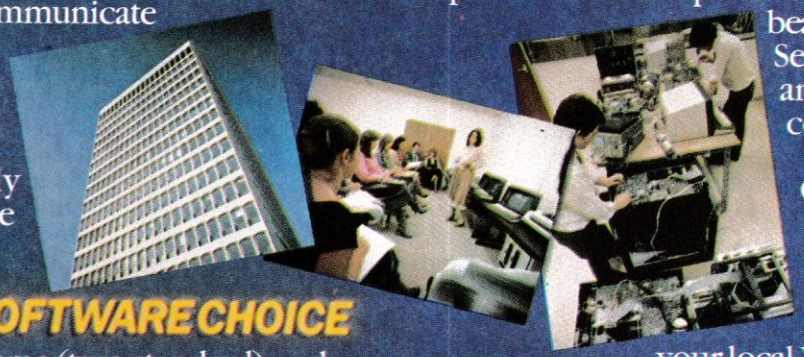


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LYNX v GENIE

Lining up the Cambridge Lynx with one of the latest Far Eastern entrants highlights some inherent weaknesses

THE Lynx from Camputers of Cambridge is a home computer with serious business computer potential. Unfortunately, the only Lynx we were able to see was a model undergoing final development work prior to the official launch at the end of October.

However, we were able to get a good idea of how the Lynx will perform and it is easily one of the most impressive machines in the £200-250 bracket.

For £225 including VAT the user will get a solidly engineered home computer with colour graphics, sound, an easy to learn non-standard Basic and an impressive 48K of user RAM.

But what makes the Lynx stand out from its competitors is its potential as a small business machine as well. Many manufacturers talk of the potential of their home computers as business systems — the Lynx is probably the first in the £200 range that is really a practical proposition as a business system.

Firstly, its internal RAM can be expanded to 192K very easily, and its processor is a Z80A which will take CP/M (virtually the industry standard business operating system for 8-bit computers).

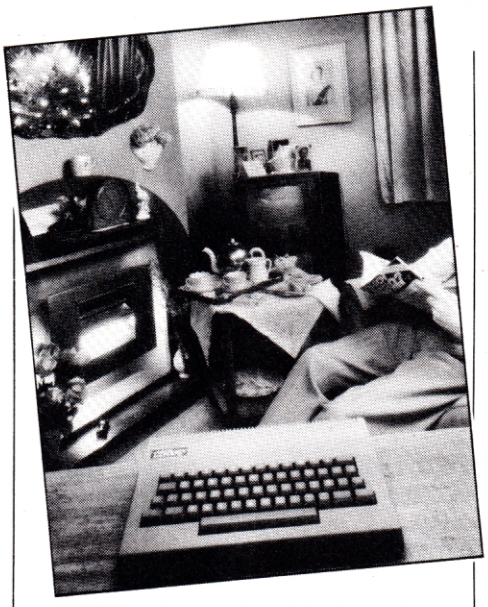
In addition, plans are well in hand for a 5¼inch single-sided floppy disc drive to be available by January complete with its own disc controller. This controller will be able to handle four disc drives and will carry a centronics parallel interface for a printer.

Attracted by the impressive specification for the Lynx we visited the Camputers offices in Cambridge.

Bearing in mind that the company's competitors in this field are giants like Atari, Commodore, Mettoy/Dragon, BBC/Acorn, Texas Instruments and the like, the fact that Camputers is four men and one woman came as something of a shock.

The idea for the Lynx came from Dick Greenwood, founder and boss of a small Cambridge based design company G W Design Services. Last year he and his designer, ex-rock musician and synthesiser buff John Shirreff, put together a CP/M based business system for a new British computer company — IO Technology.

The result was an extremely flash looking, though technically mundane, computer system called the Iona.



Realising that they could design something with much the same capability, but in a smaller box that could sell for a quarter of the price, gave them the idea for the Lynx.

Greenwood set up Camputers to make the Lynx. After considerable market research and a close look at the opposition they came up with the detailed specification.

The machine had to have colour graphics, an easy to learn Basic and a decent keyboard to appeal to the home market. At the same time, if it could handle lots of RAM, run CP/M and use disc drives and printers it could be attractive to the small business market.

The Lynx is built from readily available, reliable components. After the experience of Acorn with the BBC there were to be no ULAs or other fancy chips.

Taking a lesson from what Shirreff viewed as the appalling design of the Dragon and the Spectrum, the Lynx is in a very rugged, grey compact box with smart, typewriter like keyboard. Although it is small the box can still accommodate 192K RAM inside.

An essential of the system was a high quality Basic that would either have to be bought, expensively from a company like Microsoft, or designed within the company.

As luck would have it, just down the road, bored out of his, not inconsiderable, mind working as a salesman in a computer store was Davis Jansons, graduate in maths and undiscovered programming genius.

Genius? Well anyone who can write programs in assembler, machine code and Pascal for a variety of machines, and write his own Basic language and talk both intelligently and intelligibly about it, must be some sort of genius.

Jansons brief, what there was of it, was to write a Basic which would be both easy for the beginner to understand and yet fast enough to handle large business programs.

There is no space here to go into extensive detail but the language looks like this. It has single statement lines for clarity, but automatic line numbering to cope with the slightly

COMMENT

At the price, the Lynx with a good keyboard, soundly engineered components, 48K RAM and colour graphics represents excellent value for money.

Camputers is probably the first company to realise that there is little substantial difference between a powerful home computer and a small business system other than the ability to handle large amounts of memory, disc drives and printers.

Basing the design on the well established Z80A microprocessor the company has come up with a system that will make an excellent home computer, but can also be easily turned into a business system with the minimum of effort.

However, hardware is only half the story. There is no software for the system yet, and Camputers does not have the resources to produce it itself.

This should not be a problem for potential business users since the system will run CP/M and there is a wealth of business software available for that operating system.

This is not true of games software, and Camputers is relying on commercial suppliers to write the software for the Lynx. There is no guarantee that with the wealth of home computers already the commercial suppliers will feel it worthwhile to write enough software to make the Lynx a success.

longer programs this practice will generate.

It has the normal facilities of PLOT, PAINT, LINE DRAW and INK for the graphics, and can handle eight different colours all at the same time. It also has both REPEAT/UNTIL and WHILE/WEND.

To increase the speed of execution of the programs the Basic is automatically translated into reverse Polish notation for the machines purposes, and Jansons has come up with his own system of labelling sub-routines that allows the computer to find them much quicker than if it was looking for a line number. At the same time it tells the programmer what the sub-routine is doing without the need for REMs.

Clarity was very important for Jansons. "I wanted people to be able to read a listing in this Basic and be able to see exactly what the program was doing at every stage."

Other facilities for the would be programmer include single-key statement entries as an option and a machine code monitor for those who really want it.

At the time of the review we were unable to see the graphics as someone had put a burst of surplus volts through the graphics chips but we are assured of a resolution of 256 × 248 and a high resolution of 512 × 248 plus the ability to address each pixel directly and mix colours.

The Lynx also uses the full screen with 40 characters across.

About £70,000 from the Government's small business start-up scheme has enabled Camputers to get this far and they are to get longer term finance from the ICFC.

They've employed advertising and PR agencies and a full-time marketing manager to promote the Lynx and are planning to sell through dealers and high street chains along with some direct selling.

Will they not have trouble getting a look-in on the high street stores when the likes of Boots, Currys, Laskys and Dixons are already being ruthlessly canvassed by companies with considerably more marketing muscle?

According to Camputers this will not be a problem. "They are coming to us and are very interested in selling the Lynx. We are confident that it will be readily available by Christmas."

And after Christmas, apparently, the drive will be on to promote the Lynx as a small business machine which with two disc drives and a colour monitor, plus CP/M will cost less than £1,000.

What about software? Many games software houses already have the specification of the Basic and they will be first to receive machines as they become available.

Camputers is again confident that there will be plenty of games software available for the Christmas period, and Greenwood is already looking at small business software, such as the popular TABS accounting programs with a view to making them available on the system in January.

Frankly, we wish them luck. The Lynx looks an impressive, low cost machine and Camputers seems to have backed a sound market research with a very competitive product.

If this small company can keep it all together we may hear a lot more of the Lynx in 1983.



SPECIFICATIONS

The processor is a Z80A, and standard user RAM is 48K. This is expandable internally to 192K which is more than enough for business applications.

The Lynx can use an ordinary tv set or a monitor. A floppy disc drive will be available towards the end of the year (say Camputers) which will have a controller for up to four disc drives and a Centronics interface.

The screen is 40 column by 14 row, which is unsuitable for word processing. There are no details of whether this will be altered for business use. Resolution is 512 × 248 and 8 colours are available all of which can be addressed at the same time in the maximum resolution.

The keyboard is typewriter style and there is an RS232C interface for the disc drive and controller.

Price is £225 including VAT.

COLOUR GENIE

THE other latest hopeful contender in the battle to grab the biggest share of the Christmas home computer market is the Colour Genie from Eaca of Hong Kong. Like all Eaca's products the Colour Genie is highly derivative. In fact it looks like a Tandy Colour Computer hiding behind a Vic-20 keyboard — but it does have its own virtues.

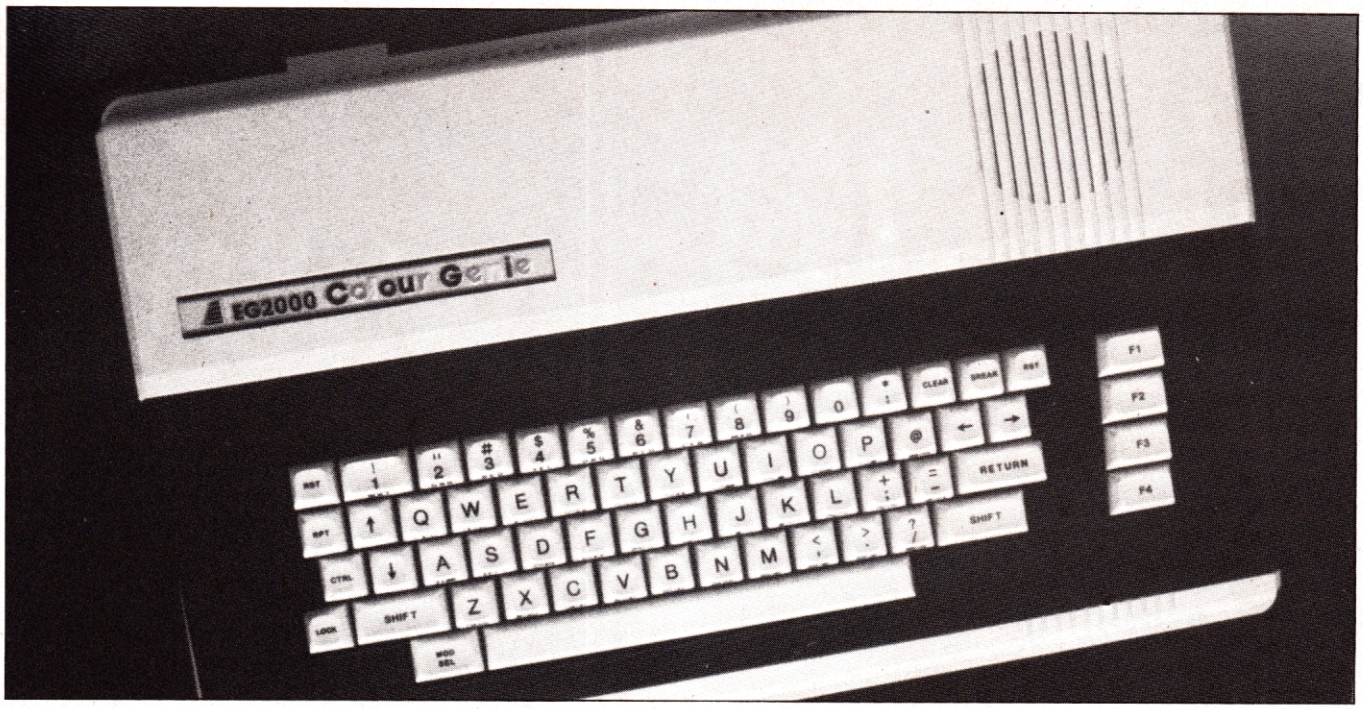
Although Lowe Electronics, UK distributors of the Genie, is closer to getting the Colour Genie onto general sale than Camputers is with the Lynx, when we tested it, there was obviously some way to go.

The manual we were given was apparently a first draft, but hopefully it will be completely rewritten and not just corrected before the computer is on general sale. It mainly consists of tedious technical explanations that are useful as appendices but not very helpful to the person new to computers if that is all the explanation he is going to get.

Also, there was no software for us to test on the machine and no immediate prospect of much being produced. Although Lowe Electronics are no worse in this respect than Camputers, the BBC or indeed many other suppliers, a lot of people new to computers are going to be disappointed if the only way they can play games on the Colour Genie is by writing their own first.

There is no guide to learning Basic in the draft manual we saw and few example programs. Hopefully, that will change before the Genie is sold.

Enough of criticism and onto the machine itself. The Colour Genie is neatly packaged in a box with a carry-



ing handle (a good idea). It is brown and cream and looks substantial. The power supply is housed inside the computer giving a neat appearance and it does not seem to give any heating problems.

The keyboard looks astonishingly like the Commodore Vic's as most of the key's have graphics characters (displayed on the front of the keys) and there are four function keys down the right hand side. The keyboard has a good feel but there is also some 'bounce' which sometimes gives double characters when the key is pressed once.

Around the computer is a power indicator light, an on/off switch, a parallel port (for printer or joy stick, but it cannot use either yet), a light pen socket, a cassette port, a cartridge port (for games cartridges or expansion interface for disc drives), an audio socket for an amplifier, a monitor socket and a socket of indeterminate purpose but it is, we are told, an RS232C. The power supply and tv leads are permanently attached.

Inside, the computer is well laid out. There is the power supply and a heat sink on one side while the rest of the box is taken up with the main circuit board. This has the Z80 microprocessor and 16Kbyte of memory for programs.

There is a video controller chip and a sound generator (of which more later) and the 16K of ROM that houses a fairly powerful Basic language. Two clips, either side of the RAM chips would seem to indicate space for memory expansion in the fullness of time.

Due to the fairly crude directions in the manual it was difficult to get a grasp of the Basic, but what we could get to work seemed quite good.

The display on a tv gives a small window screen (as on the VIC and Dragon) with a different coloured background. The colours can be preset and there are eight to choose from.

Colour quality itself was not very good but certainly no worse than the Dragon and like the Dragon the display is 40 characters across and 24 lines down.

The Colour Genie certainly bears comparison with the Dragon since like it, the Genie uses a version of the Basic language which is reasonably similar to Tandy Color Basic.

Also like the Dragon it has most of the ordinary Basic commands along with PAINT, PLOT, SHAPE (DRAW on the Dragon) and CIRCLE commands for making the most of colour graphics.

In addition, the Colour Genie has a fairly comprehensive set of graphics characters that can be accessed direct from the keys. With these features though it is a pity that the colour quality is not brilliant and the resolution is a maximum of 96 by 160, which is pretty low.

The character set is not very good either with for example, the 0 looking remarkably like an 8 and the * looking like nothing we've ever seen before.

There are however many good points to the Basic. There is a powerful Edit function which is extremely useful when keying in programs and debugging (removing the errors from programs).

The four function keys have been pre-set so that eight of the most common commands can be entered with one or two key strokes. But the most impressive feature is probably the sound.

It has both an easy to use PLAY function which will give adequate sound and musical accompaniment to games and the like and a more powerful SOUND command which allows the user to access a wide variety of notes and general noise that will give, for example, explosion and gunshot type sounds.

Do not expect a Moog synthesiser, but a lot more potential for music than with most other computers in this price bracket.

The sounds that we generated came out of the tv speaker, but there is a hole on the top of the computer that suggests an internal speaker will be added at some point and there is an audio socket for an amplifier.

At £199.53p including VAT the Colour Genie represents fairly good value for money. On the plus side it is soundly engineered and has the colour graphics and sound that make it suitable for the home market. With 16K RAM it has enough memory to hold good games software and there is room for expansion but no news on when this will be available.

The fact that it is based on the Z80 chip gives it a plus on reliability but if the manufacturer had any pretensions to making this a small business as well as a games computer the faster Z80A would have been the choice. A business system this isn't, and probably never will be.

On the software side, previous monochrome Genies were almost direct copies of the Tandy TRS-80 range of computers and were able to run the mass of software written for those computers. The Colour Genie will not run Tandy Color Computer software which could be a serious mistake.

Software houses now have a big choice of home computers to produce games software for and the Colour Genie is unlikely to be high on anyone's list of systems to produce for, which throws the emphasis for producing software, or getting it produced, firmly back at Lowe Electronics.

A point to watch on this system is the loading of software from a cassette. We had extreme difficulty loading a demonstration program from a Lowe Electronics' approved tape-recorder.

It seemed to be caused by a loose connection within the computer, which would probably be a fault particular to our machine, but check out the loading anyway if you are thinking of purchasing the computer. (The fact that when we finally loaded it we found the programs were just garbled data anyway, is neither here nor there!)

This was probably not the most successful review of a machine we have undertaken and many of the faults are more due to the fact that we were dealing with what was undoubtedly a pre-production system than to any inherent weaknesses.

This highlights one of the problems caused by the microcomputer industry's insistence on launching products before they have been fully prepared for the market.

Nonetheless, let us be absolutely plain about this, both the Lynx and the Genie were offered to us as consumer products and on that basis we reviewed them. Both companies say the machines will be ready for Christmas but as you can see, at present (early November) neither really are. ■

COMMENT

At the price the Colour Genie represents fairly good value for money. It is a useful but undistinguished machine.

The Basic is good and fairly powerful but the graphics are disappointing in comparison with even the Dragon, let alone the Atari 400.

The sound generation facilities are excellent and there is still ample scope within the system for good games and educational software to be written for it.

The whole computer appears soundly and, in comparison with the Dragon, robustly engineered which may appear surprising in something that is made in Hong Kong.

An adequate system but, perhaps inevitably in one that is so derivative, it is hardly imaginative in design.

The main problems we experienced were due to the manual and the lack of available software. Both of which together add up to no small criticism.

COMPARISON

The Lynx v The Colour Genie

It is not completely fair to compare the Lynx and the Colour Genie since they represent slightly different aspects of the home/small business design spectrum.

The Lynx is truly innovative while the Colour Genie is essentially imitative.

Both systems are however similarly priced, and both have colour graphics for games and are each based on different versions of the same chip.

The Lynx is the product of a small company with imaginative ideas. Camputers has produced (or to be strictly accurate *intends* to produce) a computer with 48Kbyte of RAM, a fast microprocessor and good, very high resolution graphics which will satisfy the home market.

But with a floppy disc drive to come and the capability of running the standard eight bit business operating system — CP/M-, the Lynx can become the base for a true small business system, and an inexpensive one at that.

The Colour Genie is not nearly as ambitious a design. From a company that has specialised in the past in producing computers that copy others, it is not surprising to find that the Colour Genie is imitative.

It is a solidly engineered, games computer specifically for the home market. While it may have disc drives at a later date and has an interface for a printer, the internal design precludes its use as a real business system.

The Genie can more realistically be compared with the Dragon, Vic, Sinclair Spectrum, Texas Instruments 99/4 and Atari 400, all of which are similarly priced.

Against that sort of competition it has the virtues of a real keyboard, solid construction, powerful Basic and good sound generation. The graphics, however, could be better and the fact that there is no software available at present is a definite drawback.

The conclusion has to be that the Lynx and the Colour Genie should appeal to different types of purchaser. Viewed in isolation the Genie will appeal to the first time user who wants to learn a fairly standard type of Basic and use a computer for games and hobby purposes.

The more ambitious purchaser should go for the Lynx. With a specification that beats all the other computers in this price range, and the promise of an expansion path up to 192Kbytes of RAM and a host of peripherals, the Lynx will be extremely attractive.

However, it has one very major drawback — at the moment the machine is all promise. By the time you read this the Lynx will just be going into full production and hopefully will be for sale fairly soon. There will be very little software and none of the more exciting promised features.

Camputers is a small company, and while it appears to have firm but costly financial backing for the present, if it does not hit the projected sales of 40,000 units in the first year (an ambitious target) it could well be a company in trouble.

We do not want to prejudge a company with exciting ideas and a product with much potential, but any prospective purchasers of the Lynx should at least be aware that the company that produces it is not the most solidly based computer company around.

Eaca on the other hand with the Colour Genie is liable to achieve the same results as it has with previous Genie's. There should be steady sales and the Colour Genie is likely to stay with us for some time to come.

SPECIFICATIONS

The Colour Genie is based around the Z80 microprocessor which runs at a fairly quick 2.2Mhz. It has 16Kbytes of RAM and a fairly standard and powerful Basic in 16Kbytes of ROM.

The screen image is 40 characters by 24 lines and a low 96 by 160 resolution in the highest graphics mode. There is a wide selection of graphics characters and graphics commands. Sound is provided via the tv set.

It uses a standard tape cassette for program loading. There are sockets for a monitor, amplifier, printer/ joystick and light pen. An expansion slot will take games cartridges (none available yet) and later an expansion interface for a disc drive.

The keyboard is very like the Commodore Vic with the addition of cursor control keys. It is a full typewriter like layout with four programmable function keys.

No software is available yet for this machine which is priced at £199.53p including VAT.

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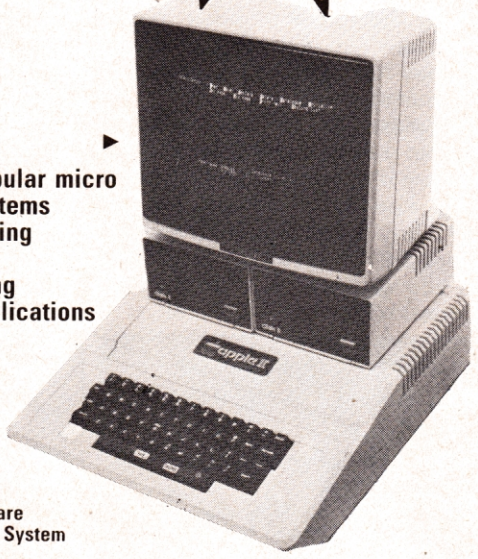
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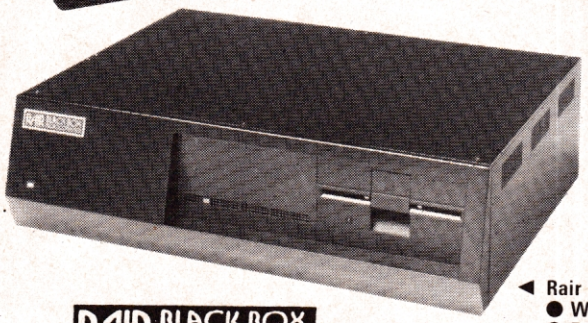
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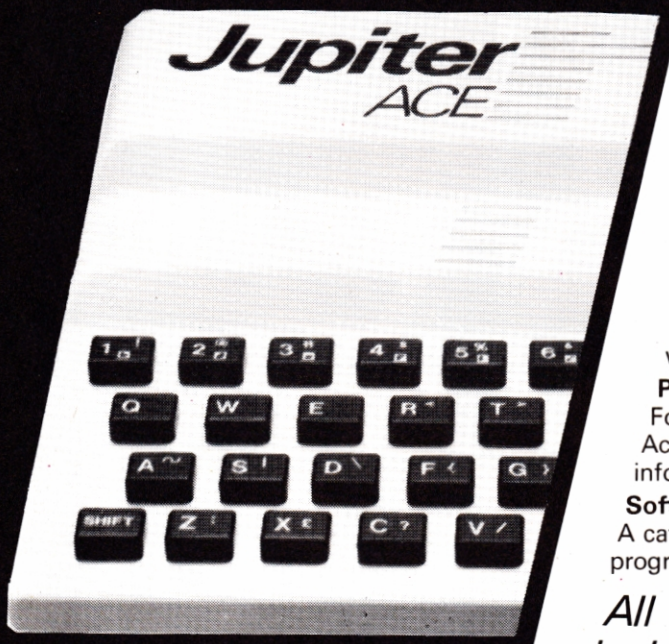
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Technical Information

Hardware
Z80A running at 3.25 MHz.
8K bytes ROM
3K bytes RAM

Keyboard 40 Moving-key keyboard with auto repeat on every key and Caps Lock.

Screen Memory mapped 32 column x 24 line flicker-free display with upper and lower case ascii character set.

Graphics Chunky graphics (64 x 46 pixels) may be plotted, unplotted or over-plotted (XOR operation). Also, the entire character set (128 characters and their video inverses) may be redefined allowing intricate shapes to be drawn with a resolution equivalent to 256 x 192 pixels.

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CIRCLE NO 123



WHICH MICRO? & SOFTWARE REVIEW

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HOME COMPUTING

Already many microcomputer manufacturers are lining up their products in anticipation of a bonanza Christmas shopping spree.

And they could be right. This year has seen the price of several established machines being cut and for the first time the £50 computer is here. Micro-computers though not yet ideal are now relatively cheap and fairly reliable.

This month — in an attempt to help prospective buyers through what will soon be a tinsel covered jungle of computers — *Which Micro?* presents a special supplement giving a detailed rundown on 10 popular machines that any buyer of a home micro should look at first. Prices range from £50 to £400 and where other computers are mentioned further information will be found in the new buyer's guide at the end of the magazine. There is also an "at-a-glance" comparison for home users within the supplement which includes some micros not reviewed.

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The Sinclair ZX81 costs £49.95 — the ZX printer costs £59.95.

SINCLAIR ZX81

1 COMMENT

This is as low cost as you can go and still be buying what you could call a computer. It is the perfect introduction if you know nothing about micros and wish to learn. Probably the main disadvantage of this particulr micro is its lack of a real typewriter style keyboard. But it is an excellent first-time buy.

Probably the main use that ZX81's are put to is to learn Basic programming, play off-the-shelf games and then to write games and your own programs. For instance, if one of the most boring aspects of your life is searching and keeping some kind of record or filing system then you could 'file' them on a ZX81. One of our photo journalists kept a record of his camera knowledge on a ZX81 — so that with a prod or two of the keyboard the relevant information would appear on a TV

There is no doubt that at its new price of £49.95 including VAT this is a remarkable technological achievement.

2 WHAT CAN THIS MICRO BE USED FOR

This is a cheap way of introducing yourself to computers.

The 5 cassettes marketed by Sinclair will allow you to set up your own telephone directory with up to 50 entries. You can also use your ZX81 as a note pad or diary through using another of the programs on cassette. Another provides you with a very basic bank accounting program.

3 KEYBOARD

A touch-sensitive keyboard. Some of the keys have at least 4 functions so it sometimes takes 2 keys to be pressed in tandem before the desired function is achieved.

4 BASIC

The ZX81 has a powerful version of Basic high level language. The Basic is very flexible and expands the options available on some other cheaper systems.

The main strength of the Basic is the syntax-checking that takes place on entering any function. With most Basics a whole line has to be entered, or even the whole program run, before syntax errors are detected. The ZX81 checks every keystroke and determines whether the line is, in fact, possible to interpret. The 1 key word entry means that the ZX81 is a very good system to learn programming with.

5 DISPLAY AND GRAPHICS

Black and white graphics. The display available on a domestic TV is adequate.

6 DATABASE

There is no disc unit for the ZX81 but the machine is very easy to use with ordinary cassette recorders.

7 HARDWARE EXPANSION

The printer for the ZX81 is probably more revolutionary than the computer itself! At only £59.95 the printer must be one quarter the price of anything else on the market. It prints on special metallised paper 4in wide and 65ft long, allowing 250 screensful of data to be printed. But the paper is really quite expensive at £12 for 5 rolls.

The memory capability of the machine can be easily expanded. A standard unit comes with 1K byte of read-write, or user, memory, meaning that a normal Basic program of around 40 lines can be stored. For most applications a memory expansion option is necessary. Sinclair and others sell a 16K byte module which sits on a printed circuit board extension at the rear of the computer and although early problems associated with the memory expansion were related to the wobble in this connection — improvements in design and manufacture seem to have overcome the difficulty.

8 SPEECH AND SOUND

The ZX81 has neither speech nor sound, but hardware add-ons are available from a few firms — Quicksilva, or William Stuart Systems — to provide these as well as speech-recognition.

9 SOFTWARE

Around 80 per cent of all ZX software is aimed at the games player. The machine is not intended for business use and certainly not for word-processing, as the screen re-paints itself after every letter entered, making typing unacceptably slow after four lines.

Only upper-case letters are available, unless an add-on lower-case character set or software program is bought.

The remaining 20 per cent of the software for the machine is aimed at those learning programming, or needing a number-cruncher to process information, as in maths teaching.

10 MANUAL

The manual for the machine is very good. It has 212 pages and is called simply ZX81 BASIC PROGRAMMING.

11 SALES AND AFTERSALES

The machine is readily available from W H Smiths.

After sales service is minimal and usually works by replacement on return.

12 SPECIFICATION

1-16K of RAM
Z80A processor
Cassette interface
TV interface
44 pin expansion port
Software Basic (8K ROM)

The machine is now available through Smith's at £49.95 with 1K RAM.

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ZX SPECTRUM



1 COMMENT

The Spectrum is a home and educational micro, which has recently been accepted on the Department of Industry scheme for a 50 per cent school subsidy. Its main fault is probably its speed of running, it is relatively slow in comparison to the BBC machine for example, which runs about 3 times faster and its 'soft' keyboard. But given the price tag of the Spectrum it is a good first-time buy.

If you are considering a Spectrum, with all the inherent problems of actually first buying one — long delays have developed which Sinclair claim are being solved — it is probably better to get the larger 48K version as a lot of the good cassette software has been produced for the larger machine.

2 WHAT CAN THIS MICRO BE USED FOR?

The ZX Spectrum is essentially a hobbyist, games machine but in about 12 months time there should be on the market a new disc drive (the Microdrive), an RS-232 link to a printer, a Prestel interface and new networking peripherals. There will be much more you can do with the Spectrum when these materialise.

3 KEYBOARD

The keyboard has a rather spongy feel to it, because it is a rubber mat membrane. It is, however, more effective than the keyboard of the ZX81.

The computer is small — about three-quarters the size of this page — and has a standard typewriter layout to the keys but you could not easily touch-type in the same way that you can on say the VIC, Dragon or BBC machines.

Because the Spectrum employs a 'one touch entry' system you can enter a number of important commands like GOTO or PRINT by depressing a single key; however, this makes the keyboard functions look very bewildering with some keys having up to half a dozen functions.

4 BASIC

Sinclair's own Basic. This is considered to be the most widely used version of Basic in the world and easy for the first-timer to use.

5 DISPLAY AND GRAPHICS

Full colour display and complex graphics. In monochrome the Spectrum has excellent high-resolution graph plotting ability but the fine detail is easily spoiled by any attempt to use colour. 8 foreground and 8 background colours are available on a domestic tv display. The resolution for graphics work is 256 × 176 pixels.

6 DATABASE

External storage of programs is in the form of an audio cassette recorder and the machine will also drive a ZX printer. There is also a unit called Microdrive, the most exciting feature of the ZX Spectrum. Few details about this unit are available but it is rumoured that it is a sealed diskette holding tiny floppy discs with 100k capacity. However, this promised addition has not materialised yet.

Going back to the cassette recorder, there are a few complications which could be improved. For example you cannot leave the machine plugged into both MIC and EAR sockets of the recorder otherwise SAVE will not work and you get feedback. Also you cannot stop and start the recorder from the machine.

7 HARDWARE EXPANSION

The 16K Spectrum costs £125, the 48K version £175. There is a 32K memory expansion for £60. Microdrive discs, when they arrive, will cost an estimated £50.

8 SPEECH AND SOUND

There is no speech facility on the Spectrum.

The machine, like the BBC micro, has a transducer to make sounds inside the box. With the Spectrum you can just about hear a faint noise for a certain time on a certain note. Bluntly, the sound facility is very poor. The Atari and Vic 20 have made sure that you can listen to sound as you watch pictures by relaying the sound via the tv's speaker. Unhappily, the Spectrum does not have this quality.

9 SOFTWARE

Software for the ZX Spectrum comes in the form of cassettes. You can buy everything from Space Invaders to tax calculation software.

A company called Quicksilva also make a range of software.

Quicksilva's address is 95 Upper Brownhill Road, Maybush, Southampton, Hants.

10 MANUAL

There is a short introductory manual to get you started plus a long detailed tutorial handbook to teach you Basic.

11 SALES AND AFTER SALES

The ZX Spectrum is only available through mail-order although rumours are that it should follow the ZX81 into the retail outlets such as W H Smith in the near future.

12 SPECIFICATION

There are 2 versions of the ZX Spectrum: 16K version £125; 48K version £175. Both versions have 16K of ROM.

Upgrading of RAM is done with a board of eight 32K RAM chips plus 3 logic chips bridging the gap between the 2 empty sockets shown at the top of the main circuit board.

ATARI 400 & 800

1 COMMENT

These machines are likely to appeal to the games player and also to the amateur programmer. There is an impressive range of software available for both machines, and the 800 can be used easily as a business aid due to the range of programs written for it by independent software suppliers. The graphics are the striking feature of the system; you can select up to 16 colours from up to 128 colour combinations. The ATARI 400 and 800 are two of America's best-selling micros and look set to become equally successful in the UK.

2 WHAT CAN THIS MICRO BE USED FOR?

The ATARI 400 and 800 are aimed quite definitely at the home market in terms of hardware and software. They are both true home computers in that they are fun, educational and yet can also have a business use. ATARI have designed these machines to be as easy as possible to operate, with a plug-in and go philosophy.

The 800 also has a business potential see *Which Micro?* November p114.

3 KEYBOARD

QWERTY layout plus various control and function keys. Each key can be used in various modes — upper or lower case, graphic, reverse video modes. The user has over 340 different characters to play with. All keys repeat and each key depression is acknowledged by a squeak. The cursor is controlled by up, down, left, right and home.

4 BASIC

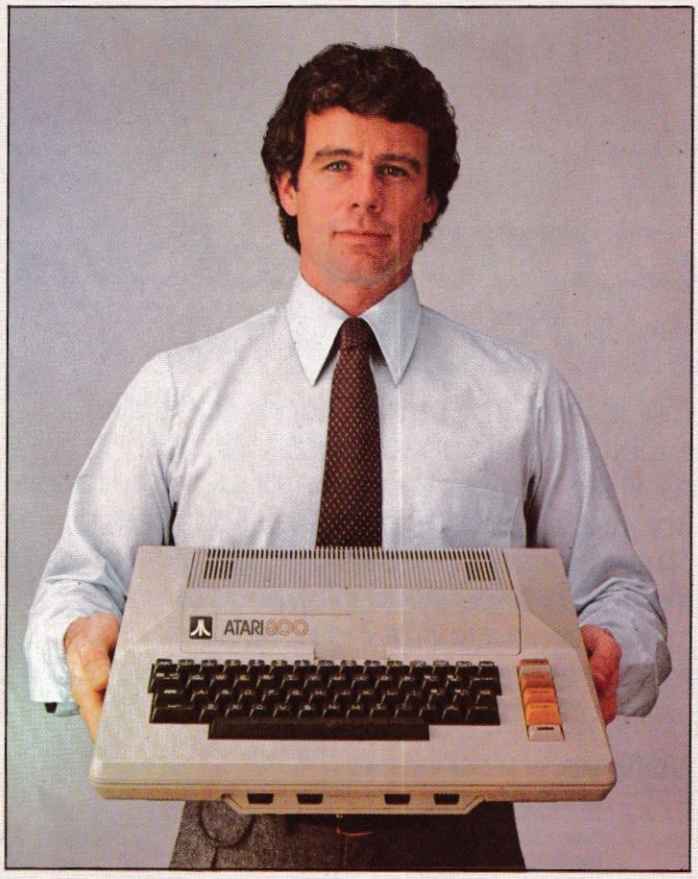
Atari Basic is not a particularly difficult or strange mutation of the genre. It does however have a couple of points worth noting. This Basic checks command syntax as information is being typed and it will detect errors and mark them on the screen as a line fault. This is an excellent feature but unfortunately one which stops when programs are run.

Also, unlike the BBC machine, user defined functions are not provided in the Atari Basic.

But with these few reservations this is an excellent form of Basic which provides for some brilliant graphics commands.

5 DISPLAY AND GRAPHICS

Normal text mode gives a 40x24 display character but the line can be altered to anything between 1 and 40 characters in length. The screen resolution is between 12x20 and 320x192. The graphics are an impressive feature of the ATARI. You can display up to 16 colours from 128 colour combinations and 18 different screen arrangements which include mixed text and graphics.



The Atari 800 is also a business tool.

6 DATABASE

The ATARI cassette recorder has an audio channel and digital channel. The audio channel outputs via the TV loudspeaker. The 800 has an output socket for connection to an external video or hi-fi and a tape counter helps locate stored programs.

There is a $5\frac{1}{4}$ inch 90K single-sided floppy disc drive available and up to 4 drives can be attached to both the ATARI 400 and 800. Even though the 400 was not designed to function with the disc drive the 32K RAM boards and also the available software mean the disc drive is becoming popular.

7 HARDWARE EXPANSION

Various controllers can be attached to the 4 ports at the front of the machine. Both models will accommodate up to 4 paddles or joysticks with 9 positions and a trigger button. A thermal printer is available from ATARI although most Centronics interfaced printers are compatible.



The 400 can have from 16K to 32K RAM.

8 SPEECH AND SOUND

Up to 4 sound channels can be displayed together from a range of about 3 octaves with the addition of distortion and volume levels.

9 SOFTWARE

The ATARI is provided with 2 libraries of programs. One for 8K programs and one for 16K programs. They include games, many quite superior graphics and performance quality and slow teach-yourself™ courses with some business applications.

In addition to an impressive range of games software, ATARI is also intending to tap the educational market, so it seems, and the audio-visual facilities, mixing programs and speech on the same tape are a bonus in this area.

The ATARI 800 is also a business tool with independent software suppliers writing programs for it.

10 MANUAL

There are 2 manuals available for use with the ATARI, and both are of an excellent standard. There is a Basic manual for the absolute beginner and a Basic reference manual for the more experienced programmer.

11 SALES AND AFTER SALES

Atari can be contacted on 01-900 0511 to find out your local retailer. Atari themselves seem to be slow on after sales service.

12 SPECIFICATION

ATARI 400

The 400 can have from 16K to 32K RAM with the addition of a RAM card.

It has 57 touch-sensitive keys.

The machine gives a 40x24 character, or up to 320x192 pixel colour display.

It is based on a 6502 processor at 1MHz.

There is a built-in loudspeaker with 4 programmable sound generators.

Price: £199.99 plus VAT and the cassette recorder costs £50 plus VAT.

ATARI 800

This machine is the same as the 400 except for the keyboard and also the memory capacity. The 800 can have up to 48K RAM. It has 57 typewriter style keys.

The system gives a similar character and pixel display as the 400.

The 800 uses a 6502 processor at 1MHz. The loudspeaker and sound generator are similar to the 400.

Price: £499.99 plus VAT. Two disc drives cost £599.98.

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FREESC

At least £2,000* of software free with each VECTOR 4

Unbelievable. Perhaps, but it's true. The reason it's possible is the Vector 4 from Vector Graphic Inc. This amazing computer is so advanced, it not only has all the features you need for today, but also those necessary for tomorrow. It has both integrated floppy and Winchester disk drives. This tremendous capacity allows us to produce software so wide ranging that individualised software is rarely needed. And the laws of mass production being what they are, this means that software which could cost you £2,000, or even more, will be supplied free with a computer that only costs £3995.

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PLUS

At **ACI** we can provide you with the biggest selection of quality business applications ever developed for micro-computers. This includes a fully interfaced Wholesale/Retail distribution system and a Manufacturing Inventory Control system which includes Production Scheduling and Control. And a lot, lot more.

All of it made possible because of the advanced technology built into the Vector 4 from Vector Graphic Inc.

Nothing can touch this 8/16 bit desk top computer for performance. The 8-bit programs are there for today. The 16-bit processor is waiting to give you the extra speed you'll need tomorrow. It offers 128K of main memory as standard by using the latest 64K RAM chips. And it carries S-100 expansion slots for adding many other different kinds of specialised interfaces.

See it in action soon. Study its world class ergonomics. Look at and play with its extraordinary graphics capability. In short, convince yourself that, whatever other system you compare it with, the Vector 4 will win hands down.

You'll find that **ACI** also offer all the back-up and training you and your staff will need. So, if you want to stay ahead of the game, send in the Reader Enquiry Card or phone the number below.

We'll tell you all about the system and about the free software we're offering.

*ACI normal selling price

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ACI Calapine
12 & 13 Sheep Street, Wellingborough, Northants.
Telephone (0933) 229292 (12 lines)

OFTWARE



Z-80® 8-bit Processor
8088 16-bit Processor
Switching Power supply
128K RAM
Dual mode disk controller

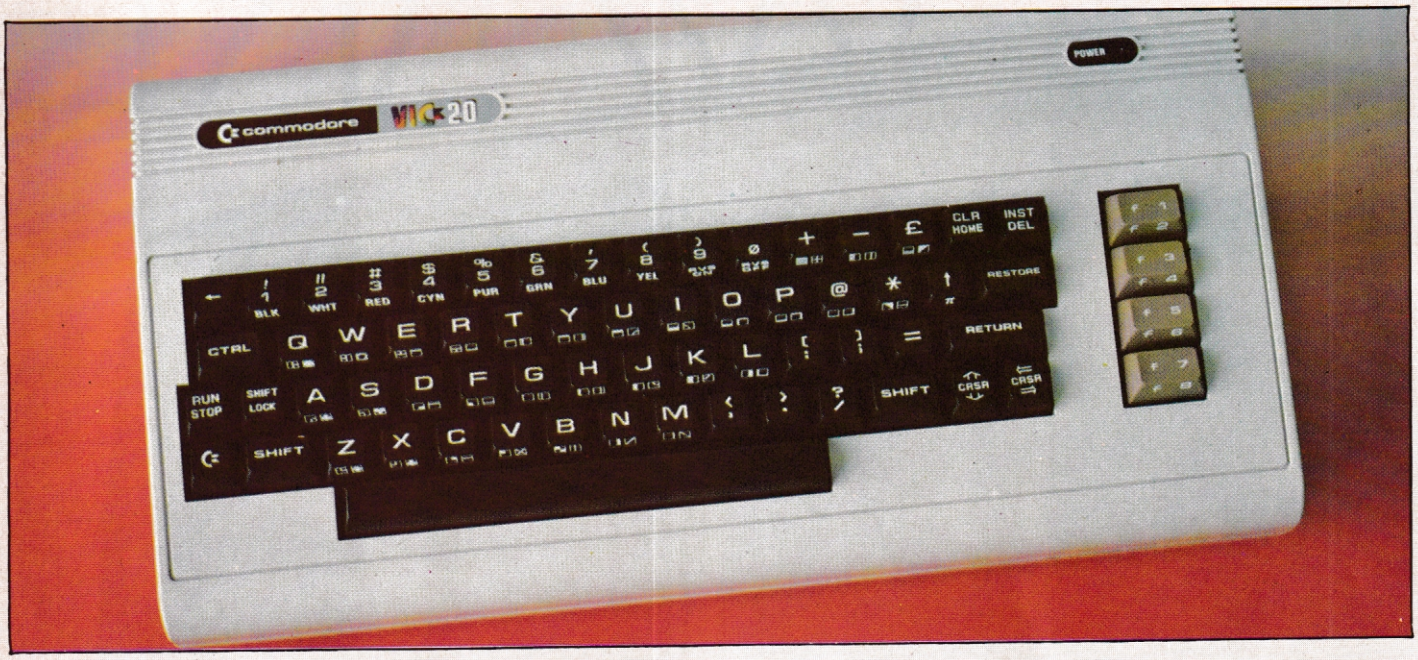
P31 Green phosphor high resolution screen

Integrated floppy & Winchester disk drives

8035 Keyboard processor
Detached ergonomic keyboard

CIRCLE NO 125

VIC 20



1 COMMENT

For the price of the machine, the colour of the graphics is good, the sound quality is also good and the cassette works very efficiently, not presenting any problame in loading or saving.

Personally I think this is the best looking of all the home computers in this supplement. It is made of sturdy cream plastic with chocolate keys and a typewriter keyboard and a total of eight user-programmable functions.

If you are a home computer buyer who would like to see good graphics and a wider range of software then the Vic 20 is probably about right. The Vic is an impressive machine especially at its new lower price of about £160: though I gather you can even buy them for as low as £140.

The problems with this machine are the limited amount of memory on the basic machine. But do not be put off — this is probably still the best buy at the price.

2 WHAT CAN THIS MICRO BE USED FOR

If you are a home user or in education then the Vic 20 will be of interest to you. For £160 plus £44 for the dedicated cassette unit you get a personal computer with colour and sound, which can be connected to a domestic colour television set.

3 KEYBOARD

Full size QWERTY keyboard. The keys have a light touch but no spongy feel to them. Usual layout with numbered keys in the normal place. Long space bar and this can be used with either hand. 4 larger keys, lighter in colour to the rest are the user programmable keys. Return, restore, cursor control keys, clear/home, insert/delete keys, these are all on the right hand side of the keyboard. On the left hand side are control, run/stop and the key marked Commodore. There is a shift key in either side, together with a shift lock on the left hand side.

One thoughtful feature of the keyboard is that some of the keys used a great deal in programming are used unshifted for example +,−,*,/,=,: and :− although $, (,), less and more must be shifted.

4 BASIC

The Basic dialect of the Vic is very similar to Pet's Basic as both machines are made by Commodore. Programs written for the Pet can be used with the Vic providing allowance be made for different screen layouts. Programs written in Microsoft Basic are easily translated, apart from Peek and Poke statements.

5 DISPLAY AND GRAPHICS

On a colour television the display is a central screen surrounded by a border. The screen is white when you first switch it on, the border cyan and the text blue. But 8 border colours and 16 screen colours are available by typing POKE 36789 then any number from 8 to 225.

The screen is 22 characters wide and 23 lines deep. It is a little strange to get used to the display at first. Commodore say they are introducing an adaptor to convert Vic's 22 characters across to 40. But this large screen text will be advantageous in schools and colleges as it will mean that a whole class will be able to read the text even from the back of a room.

6 DATABASE

Programs can be saved to or loaded from tape but only using the dedicated Vic C2N cassette unit, which costs £44. It is a neat machine in matching colours to the Vic 20, that is cream-coloured. With the cassettes unit you can store and recall programs recorded on ordinary tapes. The unit has only one lead coming from it, connecting to the keyboard unit. When you buy the cassette unit you get with it a small operating instruction booklet. The unit works well and has an attractive appearance. There is available a single drive floppy disc unit which uses $5\frac{1}{4}$ discs giving a maximum 170K bytes of storage.

7 HARDWARE EXPANSION

3K to 32K RAM expansion is available.

8 SPEECH AND SOUND

Sound can be produced and played back via the loudspeaker of the television set. 4 voices are available: 3 musical voices, 1 voice for sound effects in games programs such as explosions or aircraft noises.

The musical voices cover a range of 128 notes. POKE statements must be used to obtain sound. The volume required must first be POKED and then the note required. The manual is very instructive as to how to do this for the beginner.

There is nospeech facility.

9 SOFTWARE

If you are in the slightest familiar with the Pet's software then the VIC will suit you. It is a good version of Microsoft Basic. If you want to buy cartridges or cassette based packages there is a wealth of games, small business, some educational and intellectual pieces available.

10 MANUAL

"Personal Computing on the Vic 20". This manual is well produced and set out although perhaps rather simplistic. There are lots of diagrams with good, clear instructions. The manual has a chapter on Getting to Know Your Vic 20; Using the Screen and Keyboard; Colour and Graphics; Animation; Sound and Music and Introduction to Programming. The manual is excellent for the beginner. If you are a little more advanced Commodore produce "An Introduction To Basic", which is again a well produced interesting piece of documentation, and with it you get 2 cassettes of programs. The package cost £14.95.

11 SALES AND AFTERSALES

You can buy Vic 20 from all Commodore dealers, also certain branches of Dixons, Boots, Rumbelows, Currys, and Laskys.

12 SPECIFICATION

The machine is based on a 1MHz 6502 chip.

There is only 5K of memory of which the user gets about 3.6K; however, this can be expanded to 32K of memory.

The VIC requires a mono or colour domestic tv set with 16 colours available.

The keyboard has 65 keys with a Qwerty typewriter style keyboard with good positive pitch.

It has a built in speaker.

ACORN ATOM

1 COMMENT

This is a fast, compact machine with a loyal and dedicated user base. It is made by the same people who won the contract to produce the BBC micro, Acorn Computers of Cambridge.

Some critics consider this machine to be outdated as a home computer: this is probably unfair, but at the price, without standard colour this has substance when you begin to compare the price of an Atom to the newly reduced VIC 20.

Acorn are responding to the market with a new machine called the Electron which will be similar in style to an Atom but have standard colour and a BBC keyboard. This machine as usual has production problems which probably will not be resolved until the first half of 1983.

At its price the Atom is a versatile and powerful microcomputer. Its networking facility will also make it very attractive to schools and colleges. Its main shortcomings are with the use of storing programs on cassette and with the display which begins to flicker after continued use.

The real problem for home use is the lack of 'off-the-shelf' software.

2 WHAT CAN THIS MICRO BE USED FOR?

This is really an educational machine mainly because of its network facility via 'Econet'. Given the difficulty of Atom's Basic this machine is probably not one to choose if you are a beginner. It is more for the enthusiast.

3 KEYBOARD

QWERTY style keyboard with additional keys for screen editing situated to the left and keys for special computer functions to the right.

4 BASIC

The Atom's version of the Basic language is very different from the usual micro Basics, for example Microsoft, and anyone familiar with a Basic of Apple or TRS80 will find this version rather difficult at first. But the language is very powerful and capable of a good deal more than conventional Basics once you are used to it. One ensuing problem to this Basic being different from the crowd is the lack of protability of programs written in the Atom's Basic, you cannot use your programs very easily on other machines and vice versa.

The Atom's Basic does contain some familiar Basic features such as PRINT and FOR-NEXT. But others such as READ, DATA and DEF-FN are not there. However, this Basic makes extensive use of operators which allow you to get at and manipulate the contents of any memory location in the machine. With other Basics the programmer is usually separated from the hardware because the language looks after the hardware's management for him. Not so with the Atom.

Atom Basic is less familiar and rather harder to learn than other Basics, but what is does is to provide a set of software tools with which facilities, often more powerful than those provided by other Basics, can be constructed. Also, most of the commands can be given in abbreviated form by giving only their first one or two letters followed by a full stop.



5 DISPLAY AND GRAPHICS

The high-resolution graphics are very impressive. With a full complement of RAM a resolution of 256 dots horizontally and 192 vertically is obtained, and such a display uses up 6K of the RAM.

Drawing can be made by using the MOVE and DRAW commands. In the high-resolution mode it is possible to make drawings which make visible a considerable amount of detail.

Besides MOVE and DRAW there are 16 drawing commands of the form PLOT, I, X, Y. Depending on the value given to I, these permit lines to be drawn in black or white. They also permit the target position to be specified, either in absolute form or relative to the current position.

There are problems with the display which tends to flicker after 2 hours of continuous use.

6 DATABASE

Data can be stored on cassettes or diskettes. There are problems with recording programs on to cassettes, and with loading them into the Atom from cassette. To be successful the volume control of the cassette recorder must be positioned carefully. If there is difficulty with the permanent storage facility it is hard to enter or to develop programs of any length.

7 HARDWARE EXPANSION

There is considerable potential for hardware expansion on the Atom. Cards can be added for colour graphics, analogue to digital conversion, a printer interface and a disc controller. There is also the Econet communication network with which a number of Atoms can communicate and share resources such as a disc unit and a printer. This will be of great advantage to schools and colleges.

8 SPEECH AND SOUND

Minimal 'Beep' type sound which emanates from the TV speaker.

9 SOFTWARE

Acorn supplies a range of software for the Atom but because of the difference of the Atom's Basic the range is small. Those available are: wordprocessing; database, several games.

Programming languages available for the Atom include Pascal, Lisp and Forth.

The standard system comes with 8K Atom basic — including an assembler and operating system.

10 MANUAL

Excellent. 'ATOMIC THEORY AND PRACTICE' begins with a general introduction to the Atom and features. Programming is introduced from scratch and examples are given. The manual goes on to give instruction on advanced programming. The 'ACORN ATOM MAGIC BOOK' is also useful and with that and the manual you will have all the information you require for the machine.

11 SALES AND AFTER SALES

Acorn's Atom is now available from many stores other than just from Acorn. Up to the present time after-sales support has been less than perfect, but with the Atom now being more widely available the aftersales service should improve.

12 SPECIFICATION

The Atom is based on the 6502 microprocessor. The minimum configuration has 8K ROM and 2K RAM. The Atom is 15" long, 9½" deep and 2½ inches high. A 4K ROM can be added which provides floating point arithmetic and trigonometric routines.

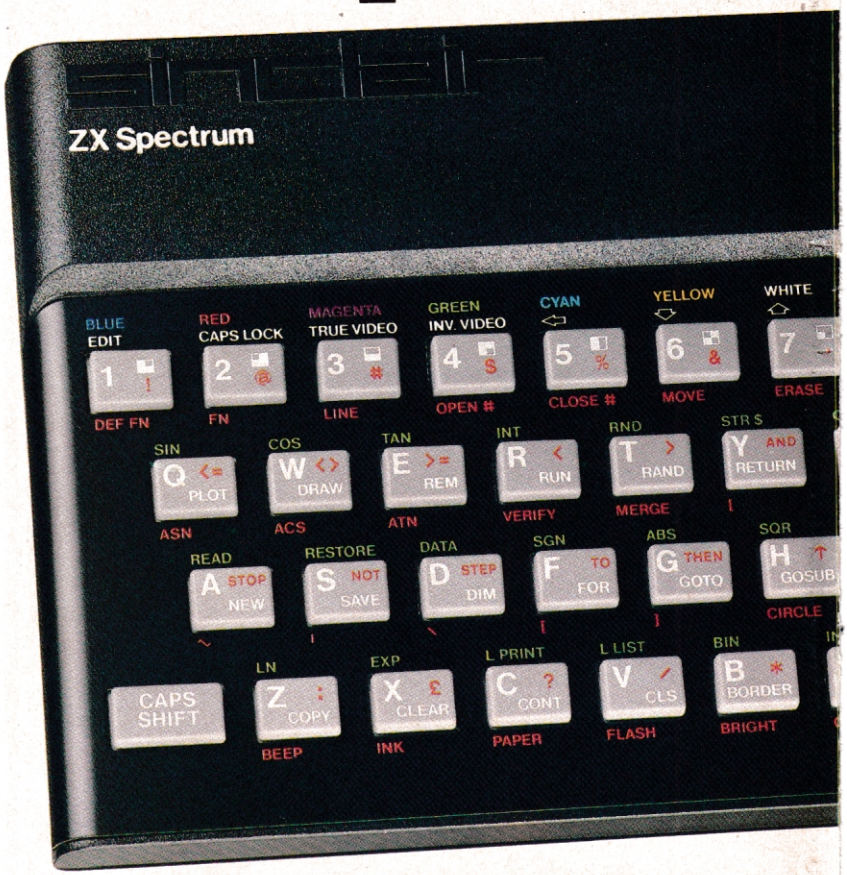
Bought directly from Acorn it costs £120 in kit form and £150 complete.

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Sinclair ZX Spectr

16K or 48K RAM... full-size moving-key keyboard... colour and sound... high-resolution graphics...

From only £125!



First, there was the world-beating Sinclair ZX80. The first personal computer for under £100.

Then, the ZX81. With up to 16K RAM available, and the ZX Printer. Giving more power and more flexibility. Together, they've sold over 500,000 so far, to make Sinclair world leaders in personal computing. And the ZX81 remains the ideal low-cost introduction to computing.

Now there's the ZX Spectrum! With up to 48K of RAM. A full-size moving-key keyboard. Vivid colour and sound. High-resolution graphics. And a low price that's unrivalled.

Professional power– personal computer price!

The ZX Spectrum incorporates all the proven features of the ZX81. But its new 16K BASIC ROM dramatically increases your computing power.

You have access to a range of 8 colours for foreground, background and border, together with a sound generator and high-resolution graphics.

You have the facility to support separate data files.

You have a choice of storage capacities (governed by the amount of RAM): 16K of RAM (which you can uprate later to 48K of RAM) or a massive 48K of RAM.

Yet the price of the Spectrum 16K is an amazing £125! Even the popular 48K version costs only £175!

You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.

Ready to use today, easy to expand tomorrow

Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing.

There's no need to stop there. The ZX Printer – available now – is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232 / network interface board.



Key features of the Sinclair ZX Spectrum

- Full colour – 8 colours each for foreground, background and border, plus flashing and brightness-intensity control.
- Sound – BEEP command with variable pitch and duration.
- Massive RAM – 16K or 48K.
- Full-size moving-key keyboard – all keys at normal typewriter pitch, with repeat facility on each key.
- High-resolution – 256 dots horizontally x 192 vertically, each individually addressable for true high-resolution graphics.
- ASCII character set – with upper- and lower-case characters.
- Teletext-compatible – user software can generate 40 characters per line or other settings.
- High speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY & MERGE for programs and separate data files.
- Sinclair 16K extended BASIC – incorporating unique 'one-touch' keyword entry, syntax check, and report codes.

um



ZX Spectrum software on cassettes – available now

The first 21 software cassettes are now available directly from Sinclair. Produced by ICL and Psion, subjects include games, education, and business/household management. Galactic Invasion... Flight Simulation... Chess... History... Inventions... VU-CALC... VU-3D ...47 programs in all. There's something for everyone, and they all make full use of the Spectrum's colour, sound and graphics capabilities. You'll receive a detailed catalogue with your Spectrum.

RS232 / network interface board

This interface, available later this year, will enable you to connect your ZX Spectrum to a whole host of printers, terminals and other computers.

The potential is enormous. And the astonishingly low price of only £20 is possible only because the operating systems are already designed into the ROM.

CIRCLE NO 127

sinclair

Sinclair Research Ltd, Stanhope Road, Camberley, Surrey GU15 3PS.
Tel: Camberley (0276) 685311.

The ZX Printer – available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your ZX Spectrum. A roll of paper (65ft long and 4in wide) is supplied, along with full instructions. Further supplies of paper are available in packs of five rolls.

The ZX Microdrive – coming soon

The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing.

Each Microdrive is capable of holding up to 100K bytes using a single interchangeable microfloppy.

The transfer rate is 16K bytes per second, with average access time of 3.5 seconds. And you'll be able to connect up to 8 ZX Microdrives to your ZX Spectrum.

All the BASIC commands required for the Microdrives are included on the Spectrum.

A remarkable breakthrough at a remarkable price. The Microdrives are available later this year, for around £50.





How to order your ZX Spectrum

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day. BY FREEPOST – use the no-stamp needed coupon below. You can pay by cheque, postal order, Barclaycard, Access or Trustcard.

EITHER WAY – please allow up to 28 days for delivery. And there's a 14-day money-back option, of course. We want you to be satisfied beyond doubt – and we have no doubt that you will be.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR. **Order**

Qty	Item	Code	Item Price £	Total £
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	Printer paper (pack of 5 rolls)	16	11.95	
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DRAGON 32

1 COMMENT

This is the newest of all the computers in this Home Supplement and probably one of the most interesting features about the Dragon is its manfacturer, Mettoy. The toy industry has been facing difficulties lately, and at times it has looked as though Mettoy might not survive as many companies have not. But Mettoy must be intending the Dragon to fill the demand of a changing toy market especially among the 11 to 15 age group. The product is already showing signs of being powerfully marketed and should sell well, but may be in difficulties if other companies start to slash their prices.

Its least impressive features are the poor colour and the so far very average software produced by Mettoy.

Its most impressive feature is the very comprehensive Basic and the size of the memory which comes with the standard machine.

2 WHAT CAN THIS MICRO BE USED FOR?

Learning Basic and playing games. The Dragon is aimed at the home computer market and is an unfussy home computer that will appeal to many. It has a powerful Basic, sufficient memory, good graphics and at the moment, it is also cheaper than the ATARI 400, the TANDY COLOUR COMPUTER and the BBC MICRO. Added to this, in some areas it also performs better than the ZX81, Spectrum, and the VIC.

3 KEYBOARD

The Dragon 32 has a strong typewriter-like keyboard with a minimum of extra keys. It has just cursor controls and Break and also no multiple function legends on the keys.

4 BASIC

A sophisticated Basic language — Microsoft Extended Colour Basic — it is in fact similar to the Basics on the Tandy range. There would be no problems rewriting software for the Tandy Colour Computer to run on the Dragon.

5 DISPLAY AND GRAPHICS

The graphics are an impressive feature of the Dragon 32. The graphics have 5 resolutions from 128 × 96 to 256 × 192. Only 2 colours can be used in the highest resolution but on graphics mode 3 (192 × 128) either green, yellow, blue and red or buff, cyan, magenta and orange can be used. These colours can be used to produce some very exciting effects.

PLOT and DRAW commands are used for drawing shapes on the screen. LINE for simple squares and rectangles, PAINT so the shapes can be filled in with colour easily.

The handbook shows you how to draw a coloured rocket and then how with one line of Basic blow the picture up to 4 times its size. With the insertion of another 2 lines of Basic, the rocket can be seen to turn through 90, 180, 270 or 360 degrees.



6 DATABASE

You have to buy a special connection for a cassette player, but any cassette recorder with remote control sockets, earphone and auxiliary input will work with the Dragon. You can start and stop your recorder from the keyboard, eliminating the need to press play every time you want to LOAD or SAVE a program, which is a very useful feature.

7 HARDWARE EXPANSION

Now that Mettoy has sold off part of its Dragon Data holding (to raise some desperately needed finance) it says it will be producing disc drives and extra add-ons early in 1983.

8 SPEECH AND SOUND

There is no speech facility on the Dragon, but good quality sound is produced via the television's speaker. By using PLAY command you can hear all piano notes, and there are even tempo changes which occur and changes in octave can be produced along with an attempt at achieving rhythm. With practice you can produce a wide range of sounds.

9 SOFTWARE

On the right hand side of the computer is a space to plug in cartridges for games and memory expansion. The range of software is, however, limited. On cartridge there is GOBBLER, a colourful but fairly standard version of Pacman for £24.95. There is also BESERK, which is a black and white ROBOT SHOOTING for £19.95 and a version of Space Invaders called COSMIC INVADERS for £19.95. There are also other games available but we have been unable to test these as Mettoy, the manufacturer, has so far been unable to supply us with them. The 2 games compendiums are very good value for money (they cost £7.95 each). All the games and examples can be listed out as they are not protected, and they have lots of REMARK statements so that if you are learning Basic you can see how these games are put together and thus learn from them.

10 MANUAL

When you buy the Dragon you get "An introduction to BASIC programming". The manual is written in a friendly way with sometimes annoying attempts at humour. For the newcomer to Basic and indeed microcomputers it is not a very satisfactory piece of documentation. The chapter headings, such as GETTING STARTED and A PROGRAM AT LAST, look very promising but do not live up to expectations. The explanations and instructions are not detailed enough, and tend to leave you more confused than anything. It is probably better to buy a general manual of Basic instruction and refer back to your Dragon manual when you are more experienced.

11 SALES AND AFTER SALES

Dragon Data, Queensway, Swansea Industrial Estate, Swansea.

12 SPECIFICATION

The Dragon 32 has 32K of RAM and a typewriter style keyboard. The machine has a cartridge slot for memory expansion — this is not yet available however. The cartridge slot can also be used for games cartridges. There is also a Centronics-type parallel interface socket on the machine.

Joysticks will soon be available from Dragon Data but the price has not yet been fixed. There are also plans to introduce a disc drive but the pre-production model tested by us had no interface for a disc drive. Screen resolution is from 128 × 96 to 256 × 192. There are 9 colours and a sound generator which works through the tv.

Games cartridges and cassettes will be available from Dragon Data priced at £19.95 and £7.95 respectively. The Dragon costs £199.50 including VAT.

TI99/4A

1 COMMENT

This machine is the only one in this supplement to have a silver 'high-tech' finish. It has been designed as an education machine for the 'high-tech' family.

A number of users have been a little disappointed because without buying the Extended Basic cartridges they have become frustrated with the capabilities of the machine.

This is a reasonable buy if you are more interested in off-the-shelf software than writing your own but the range of software is not as wide as say the VIC 20.

2 WHAT CAN THIS MICRO BE USED FOR?

As we have already pointed out, this micro is called a home computer not a personal computer and it does live up to the name given to it. There is a range of software to suit most ages and tastes. For a family computer it is important that the machine be capable of expansion to meet changing requirements and this micro can easily be expanded by means of the new peripheral box we have talked about. Also, because you have access to UCSD Pascal you will be able to use a much wider range of software than the modules outlined above.

3 KEYBOARD

QWERTY in positioning, although some of the punctuation keys are in non-standard positions which could be off-putting for the touch typist. The function key must be pressed together with the key of the character required to get some punctuation and also use of up, down, left and right arrows. With the Function key you can also gain access to a number of program facilities with the top row of keys.

The Enter key is equivalent to the Return key on other machines and is used a lot, so its small size on this machine may become annoying after a while. Every key has automatic repeat if held down for over a second.

The keyboard is well-laid out, but does have a rather spongy feel to it. Texas Instruments call the 99/4A a home computer not a personal computer and the keyboard should live up to pounding by children.

4 BASIC

The TI Basic is fairly similar to the other computers' Basic; it behaves in a standard fashion. The Basic does include a series of CALL instructions to produce colour graphics and sounds. It is a floating point Basic and is very accurate. 13 sig.figs. are used in calculation and rounded to 10 for display. However, multiple statements cannot be input in one line of program. Most Basics now have this function but TI Basic does not. But this function is available in TI's Extended Basic Package.



5 DISPLAY AND GRAPHICS

When you first turn on your machine the 'Master Title Screen' appears. This shows blocks of 16 colours and some of these need to be retuned on your television screen. The range of colours is good, clear and varied. The 16 available colours include transparent. By using this 'colour' you can produce the effect of one object moving behind the other, and in front of a third. Exciting stuff.

The graphics are organised in a matrix grid 32 grid spaces across and 24 down. 64 smaller squares make up each grid space and these can be programed to make detailed shapes which then can be fitted into the whole picture on your screen. This feature means that some of the software packages for the TI 99/4A contain complex illustrations.

6 DATABASE

The machine uses an ordinary cassette recorder or disc drive.

7 HARDWARE EXPANSION

The TI 99/4A now has a new peripheral box into which 8 cards can be fitted. The box is 14 × 15 × 20 ins and the following cards can be plugged into it:

1. an interface card relating to all the peripherals added to the console.
2. a memory expansion card, expanding the memory to 48K RAM.
3. an internally mounted disc drive.
4. 2 further disc drives.
5. 2 RS232 interface cards to allow the machine to interface with other computers.
6. a P-code card containing UCSD Pascal and the P-code interpreter.

The box costs around £189 and allows for all the expansion you are likely to require.

8 SPEECH AND SOUND

A speech synthesiser plugs in on the side of the computer. It offers a range of 373 words, phrases and letter names, which are loosely related to computers — included are such words as enter, read, control and so on as well as a more general vocabulary.

Many of the software packages have jingles at the beginning and throughout them, and using CALL SOUND you can get your machine to play tones of different volume, frequency and duration. You can produce up to 3 notes at a time.

9 SOFTWARE

3 categories of software modules are available.

1. Entertainment . . . space invaders . . . chess . . . munchmen . . .
2. Educational — aimed at primary school children eg reading and maths programs.
3. A range including programs for structural engineering, word processing, UCSD Pascal and Extended Basic.

The software is fairly expensive: £14.95-£39.95 for the entertainment modules, £14.95-£29.95 for the educational modules, and up to £159 for the other range of software.

10 MANUAL

A 'Beginner's Basic' book is provided and also a 'User's Reference Guide'. Both manuals are well laid out and informative; they contain many examples and program suggestions.

11 SALES AND AFTER SALES

TI stockists are Dixons, Boots, Rumbelows etc.

12 SPECIFICATION

Based on the 9900, 16 bit Microprocessor the TI costs £200. It has 26K ROM, 16K RAM, expandable to 48K. The size of the console is 15 × 10.5 × 2.5 ins. Five octave sound, three available at once. 15 colour graphics plus transparent. A peripheral box provides the interface to peripherals. The machine will take up to 3 disc drives, or 2 recorders (cassette).


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ORIC-1
The Real Computer System

ORIC PRODUCTS INTERNATIONAL LTD Coworth Park Mansion, Coworth Park, London Road, Sunninghill, Ascot, Berks SL5 7SE.

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ORIC-1 48K RAM		£169.95	
ORIC Communications Modem		£ 79.00	
Postage and Packing		£ 5.95	
		TOTAL £	

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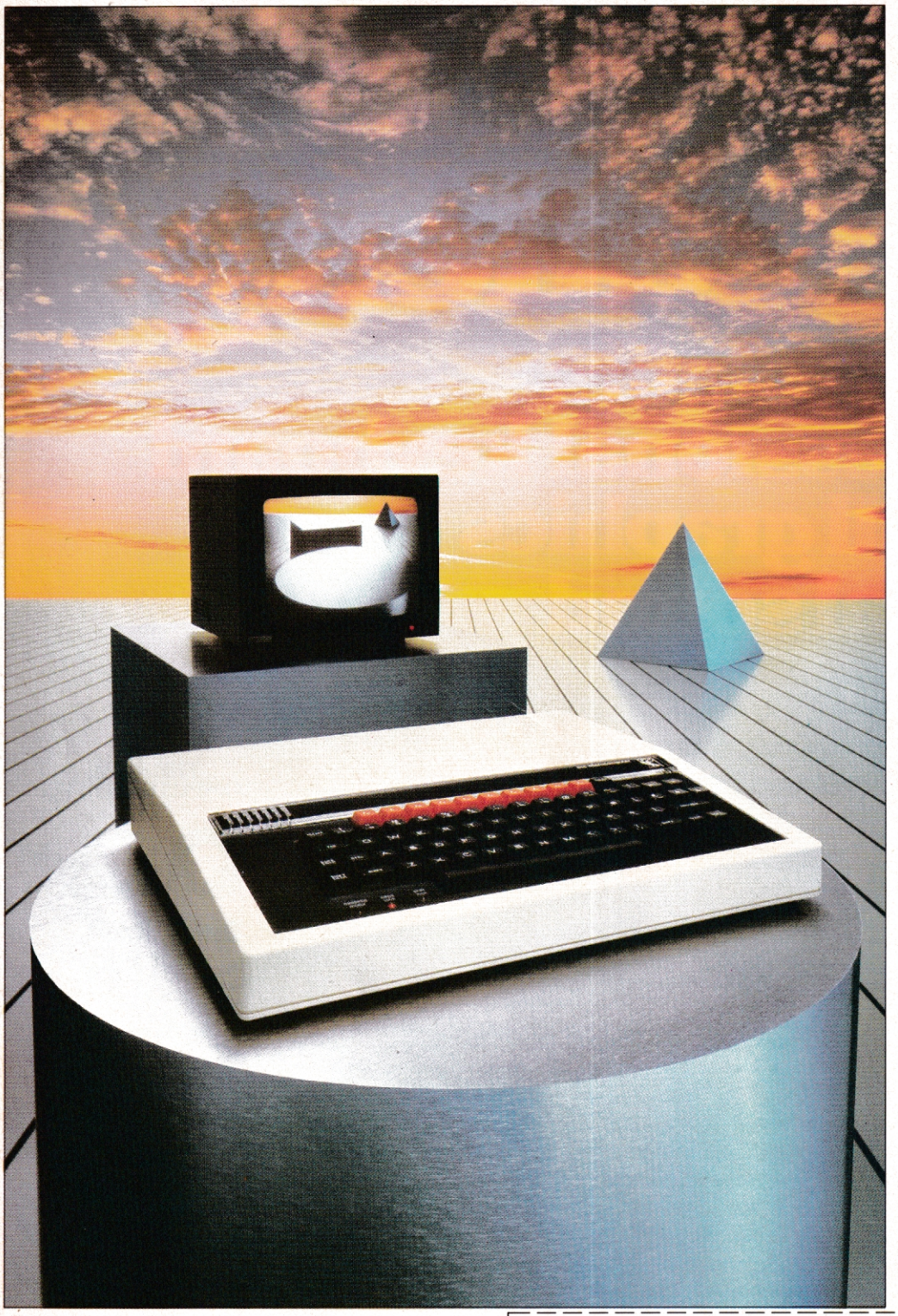
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CIRCLE NO 128



'Whether your interests lie in business, educational, scientific, control or games applications, this system provides a possibility for expansion which is unparalleled in any other machine available at present,' comments Paul Beverley in the July 1982 edition of *Personal Computer World*.

The BBC Microcomputer can genuinely claim to satisfy the needs of novice and expert alike. It is a fast, powerful system generating high resolution colour graphics and which can synthesise music and speech. The keyboard uses a conventional layout and electric typewriter 'feel.'

You can connect directly* to cassette recorder, domestic television, video monitor. disc drives, printers (dot matrix and daisy wheel) and paddles. Interfaces include RS423, inter-operable with RS232C equipment, and Centronics. There is an 8-bit user port and 1MHz buffered extension bus for a direct link to Prestel and Teletext adaptors and many other expansion units. The Econet system allows numerous machines to share the use of expensive disc drives and printers.

BASIC is used, but plug-in ROM options will allow instant access to other high level languages (including Pascal, FORTH and LISP) and to word processing software.

A feature of the BBC Microcomputer which has attracted widespread interest is the Tube, a design registered by Acorn Computers. The Tube is unique to the BBC Microcomputer and greatly enhances the expandability of the system by providing, via a high speed data channel for the addition of a second processor. A 3MHz 6502 with 64K of RAM will double processing speed; a Z80 extension will make it fully CP/M** compatible.

The BBC Microcomputer is also at the heart of a massive computer education programme. The government has recommended it for use in both primary and secondary schools. The BBC Computer Literacy Project includes two series of television programmes on the use and applications of computers.

There are two versions of the computer. Model A, at £299, offers 16K of RAM and Model B at £399 has 32K of RAM.

For technical specification and order form, send stamped addressed envelope to P.O. Box 7, London W3 6XJ and for details of your nearest stockist ring 01-200 0200.

Broader horizons

BBC Model B Microcomputers are available for immediate despatch by courier to your door.

If you would like to take advantage of our special delivery offer just fill in this coupon, but remember this only applies to the Model B, and only in the UK. Any other items have to be ordered on the standard order form or from a BBC Computer Stockist.

BBC Microcomputer System Offer
c/o Vector Marketing
Dennington Estate
Wellingborough
Northamptonshire NN8 2RL

Please send me by courier_____BBC Model B Microcomputer(s) at £399 including VAT and delivery.

Cheque enclosed for £_____ payable to BBC Microcomputer System readers a/c or charge
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Co Reg No 1403810 VAT No. 215400220

*Model A has a limited range of interfaces but can be upgraded to meet Model B specification.
**CP/M is a registered trade mark of Digital Research.

The BBC Microcomputer is designed, produced and distributed in the UK by Acorn Computers Limited.

The BBC Microcomputer System

CIRCLE NO 129

BBC A & B

1 COMMENT

The BBC micro is without doubt an impressive and powerful micro, surpassing many American and Japanese near-equivalent machines. Excellent value for money — if you can stand the delivery delays!

Until recently one of the major problems with the BBC micro has been supply. Many hundreds of people after waiting weeks and months went elsewhere to buy. But recently we have had assurances from Acorn the manufacturer that the problems are at an end and production is now running faster than demand. Well we shall see . . .

But if you can buy one, and it is not imperative that you purchase through Acorn as others are selling the machine, then you will have made an excellent choice.

This is probably still the most advanced machine in this price range. For the beginner there is an easy explanation of the system with the supplied cassette entitled *Welcome* which takes you step by step through the early stages of learning about the machine's capabilities.

2 WHAT CAN THIS MICRO BE USED FOR?

The things you can use the machine to do are for example: playing video games, learning simple programming, word processing, accounts and tax calculations. There are a number of other applications, but check if you need extra equipment.

3 KEYBOARD

The keyboard is a 72-key QWERTY style keyboard, in the form of a typewriter. It has a good feel to it. 10 red keys above the keyboard are the user-definable keys and have auto-repeat. They can be used to represent special character and time can be saved in typing frequently-used words and phrases.

4 BASIC

The BBC Basic is close to Microsoft Basic as used by Pet, Sinclair, Nascom, etc., The Basic on the BBC Micro does have some extensions to cover the new features on the machine. It has a sophistication only found on larger and more expensive computers normally. For example it has 43 different error messages. Any program written in Microsoft Basic should run on the BBC Micro. This is a great advantage because it means you have access to a large amount of software already on the market. There is also built into the system a greatly improved type of the Atom assembler, allowing Basic and assembler statements to be mixed together at any time in the programs.



5 DISPLAY AND GRAPHICS

The BBC Micro has excellent graphic facilities. There are 8 different graphic modes enabling the mixing of text and high-resolution graphics anywhere on the screen. The different modes are all memory-mapped. Model B can operate in the eight different graphic modes but some of the graphic modes need up to 20K, a significant part of the 32K. The 16K memory of Model A allows 4 graphic modes to be used, a considerable improvement on existing micro models of a similar type.

6 DATABASE

Programs can be loaded from or saved to tape using a cassette; it is not necessary to buy a special cassette recorder for the purpose but you do have to buy the appropriate cable to link to the keyboard unit as the BBC do not supply one. They say this is because of the variety of connectors used on cassette recorders.

7 HARDWARE EXPANSION

The BBC has enormous potential for expansion in terms of add-on connections which will allow a highly expansive system to be built up. There is a TUBE interface which is unique to the BBC machine. Through this you can add a second micro. The second micro is controlled by the BBC Micro and all programs or data are sent to and from it through the TUBE. This means that the system has unlimited expansion potential.

Both A and B models are designed to accept plug-in chips (ROMs) and there is space for 100 of these. No extra ROMs are needed for drawing, sound or colour.

Both models have an Econet networking interface. For £363 and £466 Models A & B will be able to share other equipment such as printers and disc drives, and also be able to communicate with other micros by linking into a network.

8 SPEECH AND SOUND

A special sound chip allows up to 3-note chords. Four different effects can be produced from the noise channel. Built into the machine are a music synthesiser and loudspeaker, which will be used for games. The synthesiser option is available by plugging chips into the main board. They both only enable the computer to speak but control special cartridge ROM packs that are available. The chip provides a vocabularly, in the voice pattern of Richard Baker, of approximately 150 words.

9 SOFTWARE

Software packages include a home database, music and games. Packages such as enhanced graphics, engineering and VAT are all under consideration and will be either written from existing programs or written from scratch.

The BBC say they want to continually expand the software range for use in the home and small business. A professional word processing package, a financial modelling program and a whole range of telesoftware programs have been commissioned by the BBC.

10 MANUAL

An excellent guide is supplied with the machine explaining its functioning and software. Each Basic keyword is fully explained and a page is devoted to each keyword in Basic instructions. It is a useful book of over 200 pages aimed at the beginner but as the text moves on it becomes more of a refresher course for those with some knowledge of Basic already.

11 SALES AND AFTER SALES

Order forms and details on the BBC microcomputer are available from:

Vector Marketing Ltd.
Dennington Estate
Wellingborough
Northants
0933 228853

You will almost certainly experience delay in receiving your machine, although the BBC now assure us that the backlog of Model A orders has been cleared and the backlog of B's will now be cleared. Once you have received your machine you'll be pleased to know that the BBC have some good back-up material in the form of books, a part-time course on programming and a problem referral service for things that go wrong.

After-sales servicing will be provided by a network of over 50 retailers. Most of them are Acorn dealers, many are now selling BBC micros over the counter.

12 SPECIFICATION

The BBC Micro comes in 2 models: Model A £299; Model B £399. Both prices include VAT. 32K ROM, 16K RAM (Model B has 32K RAM).

The machine is based on the 6502A microprocessor.

Colour graphics (high resolution colour or mono).

Expansion to: network, Prestel, teletext, disc drives, cassette, printer. Analogue input and output devices, TV.

68

EIGHT HELPFUL HINTS

A Don't believe anything you're told about a computer — always try it for yourself in the shop.

B If you get keen on a particular computer, ask to see its instruction book. Read a few pages. If you can't make sense of the first five, you're going to have a long, hard struggle. Find an instruction book — and computer — which are easier to get along with.

C There are business computers like the Commodore CBM which just put plain no-nonsense figures and letters on a screen, and there are hobby, home or entertainment computers, like Sinclair, Sharp, Atari, Vic and Dragon, which manipulate colours, designs and even sound via your tv set. The business computers are very boring to use at home.

The all -singing/all-dancing home entertainment computers don't usually have enough memory to do proper industrial calculating jobs. Try and decide coldly and calmly what you really want a computer for, and don't be ashamed if it's just for fun, and 'getting to understand computers'. Indulge yourself, don't try and kid yourself.

D You definitely need a cassette machine to go with a computer. Most computers are happy with any cassette player, though some — like the Vic-20 — insist on having their own 'dedicated' special cassette player for recording and playing-back instruction programs. The cassette machine acts like a permanent memory when the computer's switched off.

E Computer discs do the same job as cassettes, but faster and very much more expensively. Business computers need discs. Home computers can get by with cassettes.

F You don't need to be good at maths to find pleasure in a computer — but enthusiasm, logic and patience are handy!

G Unless you buy extra circuits called 'ports' — which clip into the internal 'expansion port' circuitry of most home computers — your machine won't be able to do mechanical or household jobs like turning lights on and off, controlling a lathe or a model railway.

Computers normally only provide pretty pictures on a tv screen, or sometimes print information onto pieces of paper.

H You won't be really happy till you've bought approximately £60 worth of extra pre-recorded-instruction program cassettes, discs or plug-in modules.

So if you're buying a computer for your son or daughter be prepared for the extra cost, and don't begrudge it. It's like a record-player — you build up a collection of computer programs just like a record collection, and the 'hardware' (the mechanical, electrical computer or record-player) is no use without the 'software' (the disc, cassette or program).

COMPARISON TABLE

FEATURES	ZX81	SPECTRUM	BBC A	VIC 20	VIDEO GENIE	APPLE//	ATOM	TEXAS INSTRUMENTS 99/4A	DRAGON 32	ATARI 400	ATARI 800
Price	£50	£125	£300	£160	£345	£612	£184.70	£190	£199.50	£200	£500
RAM min	1K	16K	16K	16K	16K	16K	2K	16K	32K	16K	16K
ROM	N/A	9K	3K	N/A	N/A	N/A	8K	26K		10K	10K
RAM max	16K	48K	32K	5K	16K	48K	12K	48K	64K	32K	48K
colours	B/W	8	8	16	Yes	Extra	Yes	16	9	16	16
sound	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Highest Resolution	64×44	256×192	320×256	N/A	128×47	280×192	256×192	256×192	256×192	320×192	320×192
Power supply	external	external	internal	external	internal	internal	external	external	external	external	external
Keyboard	touchpad	Qwerty touchpad	t'writer	t'writer	t'writer	t'writer	t'writer	t'writer	t'writer	touchpad	t'writer
user definable keys	none	none	10	8	none	none	none	none	none	none	none
printer interface	Sinclair only	Sinclair only	RS423	Commodore Serial	separate	RS232	separate	RS232	Centron-ics	RS232	RS232
Other interfaces	none	none	teletext	RS232	RS232	RS232	Yes	RS232	Yes	Yes	Yes
mass storage	cass	cass (or microdrive when avail.)	cass	cass	cass/ floppy	cass/ floppy	cass	cass/ floppy	cass	cass/ floppy	cass/ floppy
paddles	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
network	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
2nd CPU option	No	No	Poss	No	No	Poss					
Languages	Basic	Basic	Basic +option	Basic	Basic Cobol Fortran Assembler	Basic(2) Cobol Fortran Pascal	Basic Pascal Lisp Fortran	Basic others available	Basic	Basic	Basic

TAKE THE DRAG OUT OF BUYING A DRAGON!

We give the best service
Why drag yourself from shop to shop or spend hours trying to find the best deal on a DRAGON 32?
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COMPUTERS FOR ALL are DRAGON specialists
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We know the computer inside out
Our knowledge of DRAGON 32 is probably the most complete in the country. We don't just sell them. We use them, play with them, analyse them, program them . . . enthuse about them!

We can show you how to use it professionally
Unlike some computers, DRAGON 32 is not just a toy!
It's fun, but it's also very professional. Whatever you want to do with it, COMPUTERS FOR ALL can advise you at every stage, and as your knowledge of programming grows, you can always turn to us for the latest peripherals.

We have a wide range of hardware / software
It doesn't do to stand still in the computer market.
That's why COMPUTERS FOR ALL are always looking for and stocking the newest hardware and software for the DRAGON 32. Printers, Joysticks, ROM Cartridges, Cassette Software, Monitors . . . practically everything you will need now or in the future is available under one roof . . . our roof!

We look after our customers
Some dealers are content to take your money and forget all about you. We're different. We want you to have the very best service.
You needn't worry about contacting us if you need information or advice. That's what we're here for . . . and we'll help whenever we can.

We don't quibble
Needless to say, if you buy a DRAGON 32 from COMPUTERS FOR ALL it comes complete with a year's warranty.
But we go further than that: our service is completely "quibble-free" if, in the unlikely event of a complaint, you contact us, we will settle the matter immediately.
In short, COMPUTERS FOR ALL can take the DRAG out of buying a DRAGON.
You can call us with confidence . . . anytime.

HOW TO GET YOUR DRAGON IN TIME FOR CHRISTMAS



You don't have to go to the North Pole.
All you have to do is visit North Street ROMFORD or post the coupon!
As soon as we receive your order, it will be straight back in the post to you . . . but a word of warning – please allow enough time for the rush!
Do it now. WE'LL DELIVER THE GOODS!



STOP PRESS
New wide range of software now available. Send S.A.E for details.

SEND TODAY OR CALL AT OUR SHOP
For fast, efficient mail order post to COMPUTERS FOR ALL, 72 North Street, ROMFORD, Essex, or phone: (0708) 752862

NAME .....

ADDRESS .....

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Please send me the following items: Total:

..... DRAGON 32 Microcomputers @ £199.50 + £3.00 Cartridge .....

..... DRAGON Joysticks @ £19.95 pr .....

DRAGON CARTRIDGES			DRAGON CASSETTES		
Ghost Attack	@ £24.95 ea	.....	Compendium of Games	@ £7.95 ea	.....
Berserk	@ £19.95 ea	.....	Comp of applications	@ £7.95 ea	.....
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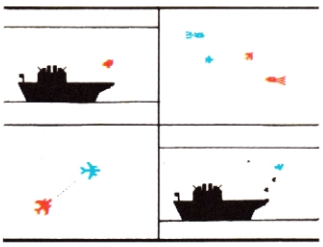


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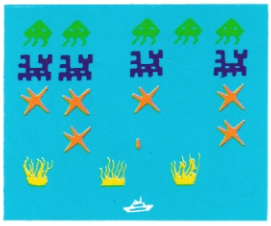


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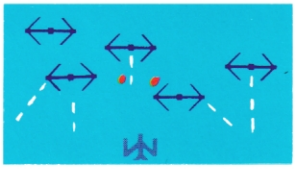
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Points: Ace = 1 or 11. Jack, Queen, King = 10.
Scoring 21 points with 2 cards — you automatically win.
Scoring 21 points or less with 5 cards — you automatically win.
Draw — the computer wins.
Your kitty is automatically adjusted win or lose. If you lose all your kitty — game over.

DECIPHER:-
You have to guess what combination of colours the computer has selected — to enter a colour just hit the colour button on the computer, when you have entered your 5 choices of colour, the computer will display (A) Nothing at all = None right, (B) Black or White Squares or Both — For every black square you will have a correct colour in the correct position, for every white square you will have a correct colour in the wrong position. If you cannot find the complete combination, it will be displayed when you have had twelve attempts.

FOUR THOUGHT:-
You have to make a line of four squares — horizontally, vertically or diagonally BEFORE the computer does, taking turns to take a square (squares can only be placed at the bottom of the grid, or on top of another square). **Keys:** Hit the number key of the column you want your square dropped in then hit the return key.

TEASER:-
The aim of the game is to score "15" BEFORE the computer does, using any combination of 3 boxes. If you cannot score "15" then you must try and stop the computer from doing so and force a draw. **Keys:** Hit the number key of the box that you want (you can only select an empty box).

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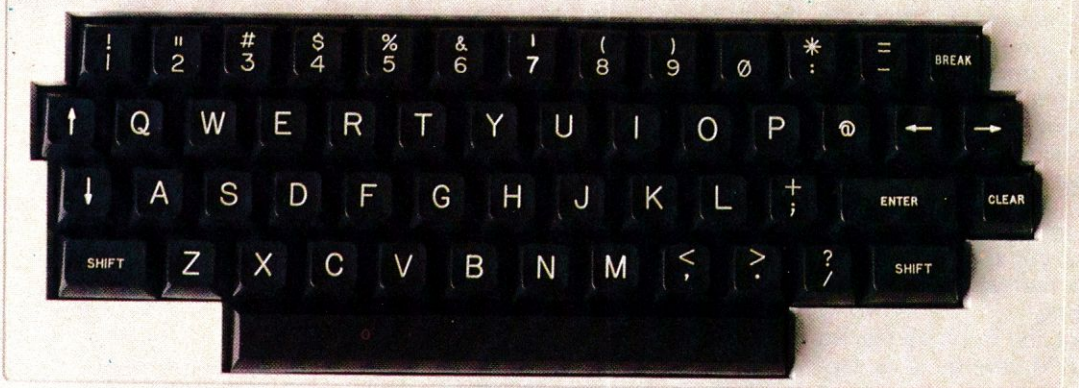
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XEROX 820

Having one of the biggest names in office equipment is not enough to make the 820 an instant success claims Martin Banks

OVER the last three or four years, in a variety of magazine and trade paper articles, the general definition of what a 'professional' microcomputer ought to consist of has been developed and honed.

Unless there has been some strong reason to follow the routes already set out by either and/or Commodore and Apple, and make lookalike systems to these two successful brands, the general outline of a professional machine has become something not totally removed from the following: Z80 processor, 64K bytes of read/write memory, Microsoft Basic, CP/M operating system, screen, keyboard, dual disc drives, and ports for a printer.

Put that lot into a package of some description, get the pricing competitive, and a manufacturer will not go too far wrong.

The amount of software that is available for CP/M is large. It is arguably also generally pretty poor, but it is available to give the first time user a leg up into the computing fraternity.

But some of it is quite reasonable once its quirks and idiosyncracies have been mastered, and will give the owner of one of the many boxes available with a reasonable start into the basic functions like word processing and general accounting functions.

With such well-understood criteria therefore, the market for hardware in the CP/M-oriented business is something akin to a commodity business. The users are spoilt for choice over what subsidiary facilities are offered with any particular manufacturer's products, or conversely, what price he is prepared to pay.

For a manufacturer to enter this incredibly competitive marketplace therefore demands either courage, or a new product that offers something different.

A classic example of both has been Osborne, which produced a new, packaged approach to hardware/software integration and design at a cost that took courage to produce. (Review *Which Micro?* May/June).

While it is not suggested that other manufacturers should follow Osborne's lead any addition must have a similar 'unique selling point'.

Unfortunately, having one of the biggest names in the office equipment business is not enough to make a new product an instant success, especially if that product offers little else but the name over any other piece of kit that can be purchased.

The name is Xerox, famous the world over for its photocopiers.

Indeed, the name is synonymous with photocopying, in the same way as Hoover is with vacuum cleaners. But in the same way that no one talks about 'hoovering' the clothes, even though that company produces washing machines, it seems unlikely that users will ever refer to 'doing a Xerox' when talking about word processing or financial modelling.

The reason, if reason it be, is the Xerox 820/II, a CP/M microcomputer system that leaves nothing to chance by chancing nothing.

The 820/II is the Xerox machine that has been designed to take the company into the mainstream of professional microcomputing. It fits the criteria of the standard CP/M 'professional machine' to a tee.

Sadly, it steps not one inch outside those criteria to offer anything that marks it out from the crowd.

Indeed, the only factors that could be considered as making it different from many of its competitors reside on the negative side of the balance sheet.

The 820/II bucks the general trend amongst recent additions to the CP/M systems marketplace by coming as three separate boxes, rather than an integral desktop unit.

The three consist of a display/processor console, a keyboard, and a dual disc drive. There is arguably some sense to the latter being a separate unit, as Xerox offers either 8 inch or 5.25 inch drives as options.

There seems to be little ergonomic sense to the layout however, especially as other established equipment has shown that an integral design is normally the most popular.

Though each box is well designed in itself, they fit together rather poorly.

For example, with the keyboard tucked up in front of the display console, and with the disc drive tucked into the side, it is impossible to load discs into the drive units. This is because the keyboard is some six inches longer than the display is wide, so it overlaps, covering the disc drives.

In operation, therefore, the 'footprint' of the system on a desk is quite large, something over 5sq. ft, and that is without including any printer mechanism.

There is a strong body of opinion that suggests a separate keyboard is a good idea (ie IBM's PC, DEC's Rainbow or ACT's Sirius), which explains why the 820/II has one. It allows the user to pull the keyboard around a desk into a comfortable location.

But this is actually quite difficult with the Xerox keyboard, for the cable connecting it to the console is getting on for half an inch in diameter.

As I found to my cost, incautious movement of the keyboard is liable to knock a variety of objects from the desk or table, and that can include the disc drives. Why the cable has to be that thick when other manufacturers don't seem to need the same for their remote keyboards is unclear.

The cable for the drive unit is even thicker, and more inflexible.

The keyboard itself is housed in a largish box which contains no surprises whatsoever. There is a standard QWERTY keyboard that is coupled with a numeric/cursor control/function controls keypad. These latter comprise ESCAPE, DELETE and LINE FEED.

As might be expected, it is well-engineered, though as already mentioned it seems to suffer from the old British disease of being well engineered with the wrong objectives in mind.

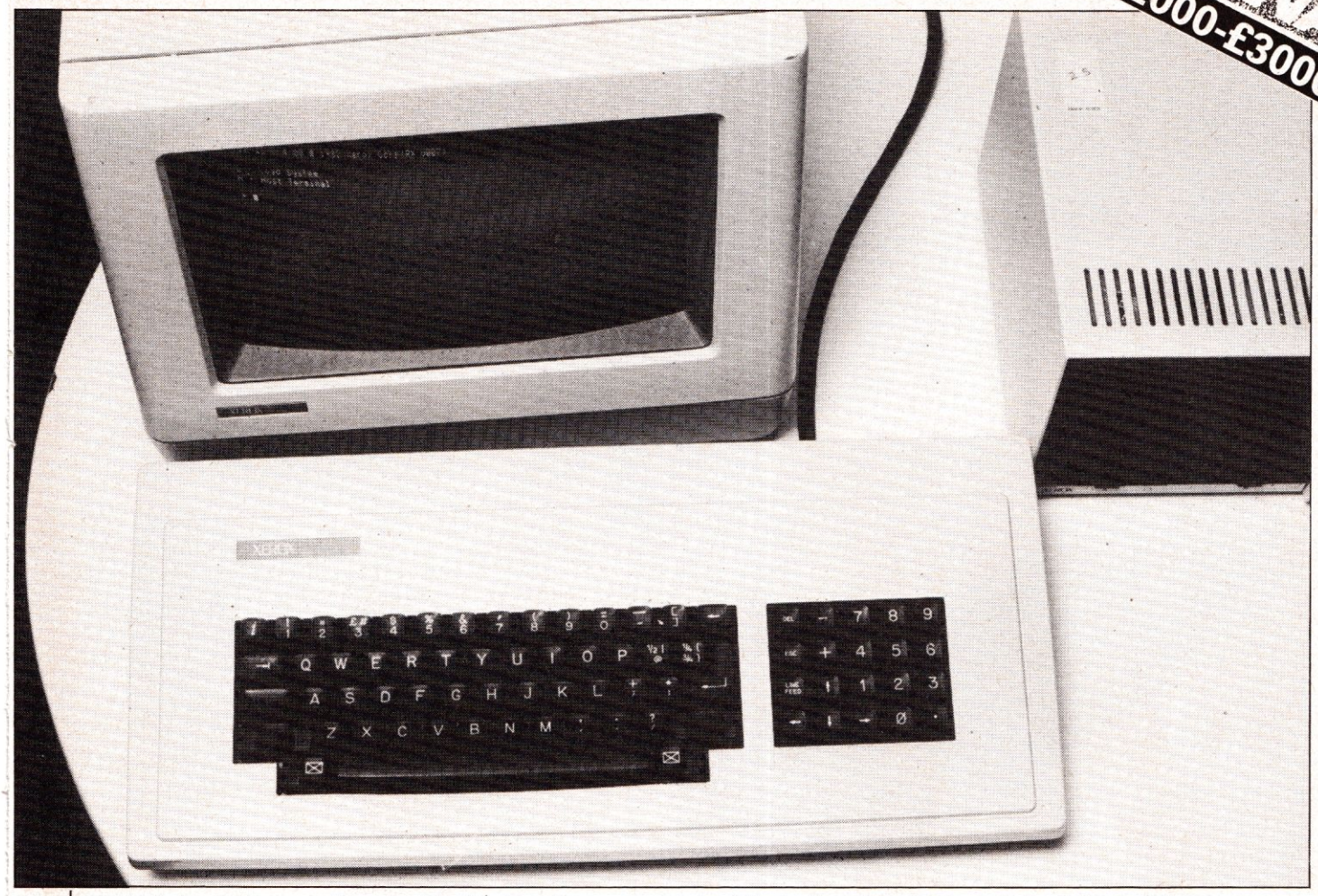
It is a well engineered but overpriced business system

One good idea on the keyboard is the incorporation of two CONTROL keys, located either end of the space bar. This good piece of thinking is spoilt however, by the fact that neither is marked 'CTRL' or 'CONTROL'.

Instead, each is marked with a square inside of which resides a cross. As this key can be of considerable importance to a CP/M machine, this designation (or lack of it) seems odd.

The system documentation was no help — well not at first anyway.

The description in the hardware introduction reads: 'The keyboard is



Incautious movements of the keyboard can send a variety of objects flying

very similar to a regular electrical typewriter keyboard, with additional keys on the right of the typewriter keys.'

That's it. No mention of the fact that at the back of the manual, buried in the appendices, is a diagram of the keyboard layout that actually says that these are control keys.

As already stated, the keyboard contains no surprises. Well, in terms of personal opinion it does contain one, and that is the lack of any software-programmable function keys.

For a system of this price, and from a company with a 'name' like Xerox, fitting software-programmable function keys would seem to be an obvious move, but it has not been taken by the company. It is a sad loss to a machine advertised as the businessman's system especially as cheaper hardware can be purchased that does incorporate them.

There is a surprising lack of programmable function keys

The lack of such keys is noticeable on some of the software for the machine, where some of the function keys are 'buried' as re-programmed keys on the main keyboard, and are subsequently difficult to find. A 'lets try this one' process of elimination is often required.

The main console into which the drives and keyboard are connected contains the processor, power supply and display. It contains all the usual features, while again incorporating nothing to make the blood rush to the head.

There is a 12 inch display using white on black characters, a brightness control hidden under the left-hand side of the console, and an ON/OFF switch hidden under the right-hand side.

The keyboard and screen connectors fit into the rear of the console, using large, high-quality multi-pin connectors with screw fixtures.

The display itself is of excellent quality, with an easy to read character set that incorporates full descenders. It does have one quirk that takes some getting used to however, and that is the cursor.

When it is located in blank space on the screen it is like any other: appearing as a white, non-flashing square. When it appears over a character, however, there is no cursor at all. Instead, the character appears in reduced illumination.

This takes some getting used to as it is easily possible to 'lose' the cursor on the screen. Sometimes, the only way to find it in a screen-full of text is to move it around. Then, it shows up very well.

The Xerox 820/II comes with CP/M, and there is also *Supercalc* and the company's own word processing (WP) package available. The company also sells the popular *Wordstar* package as an option.

In the case of *Supercalc* and the WP package, they come installed for the machine, while Wordstar has to be installed specifically, which can be 'fun' for a first time user.

The Xerox word processing package would appear to be, to all intents and purposes, Micropro's *Wordstar*, with all the control keys changed around.

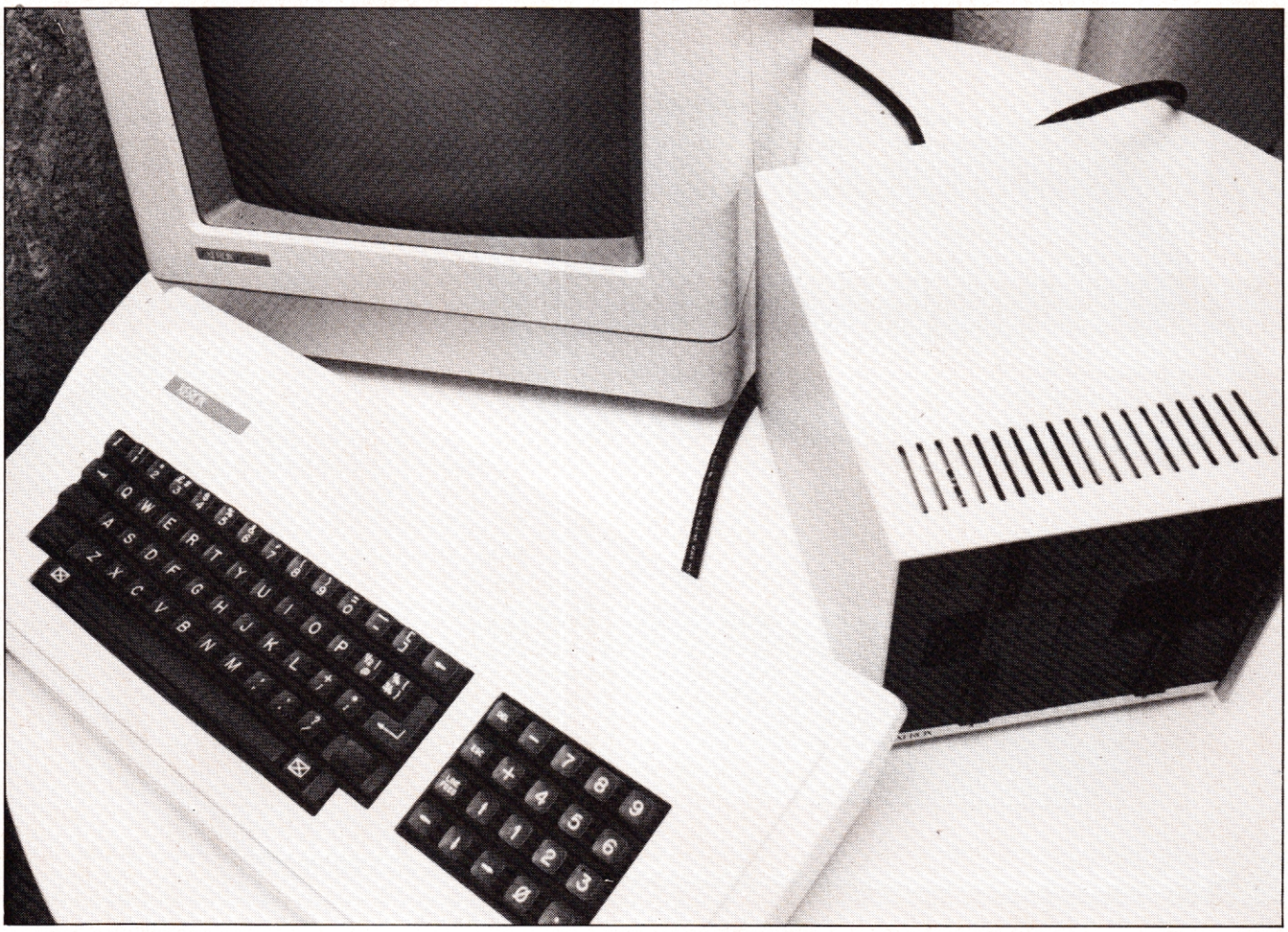
The original clue that this might be the case comes from the manual, which states that large portions of it come from Micropro, and that the package is based on their software.

The second clue comes from the fact that the Xerox package can access and run text files previously created on *Wordstar.*

The file has to be on a second disc of course, but it is possible to create a file under one package, edit it under the other, and then view the handiwork under the first.

As the package is basically *Wordstar*, it seems a rather strange exercise to go to the trouble of producing this

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There is a 12 inch display using white on black characters

variant, especially as *Wordstar* is so popular.

It is a quirky package in its own right, but there is now a fair body of people out there who are capable of working it, so why Xerox should want to deprive themselves of some market potential by having a *Wordstar* that isn't *Wordstar* even though it is, is difficult to understand.

Another quirk of this package is in the documentation, wherein lies no apparent word as to how to SAVE a file once it has been created.

I would have thought this was a fairly fundamental operation in most WP applications but the only reference I found in the manual was in the section on editing multiple-page documents. This had a sub-section 'reference to regular saving, and cross referred the user to a screen menu.

The *Supercalc* spread sheet package is not without its quirks, either, though in itself a good example of the 'calc' package breed, the Xerox implementation has some oddities attached to it.

In particular, some of the keys on the keyboard do not correspond with what appears on the screen.

This can be rather galling when the manual makes no easily locatable reference to the differences, and when the differences are mainly concerned with the keys that are important to entering formulae.

For example, the key '[' is actually this: '+', while '*' (the multiplication sign) enters quotation marks; "". The Quotation mark key enters '@', and so it seemed to go on round the subsidiary keys of the keyboard.

Xerox has obviously heard the story about how difficult it is to hit a moving market. ■

COMMENT

Apart from higher capacity disc drives and a much bigger screen there is, in all honesty, little in the Xerox 820/II that cannot be found in a machine like the Osborne 1 at nearly half the price.

Certainly it is an extremely well manufactured system and it has the backing of the nationwide service network that Xerox already has for its copier business which is certainly no small point.

There is however, nothing to mark it out from a crowded marketplace, except perhaps for its price. For what the user is being asked to pay, the 820/II has to be placed into the lower quartile of the value-for-money charts.

It is of course early days for companies like Xerox, which have seen a whole new area of their traditional marketplace, the office equipment business, develop under their very noses.

The 820/II could be significant not for what it is — a 'five-out-of-ten-for-effort' machine — but for what it represents, an appreciation by Xerox that the market won't be allowed to pass it by completely. With its next machine Xerox could get it right.

SPECIFICATIONS

The system, as delivered for evaluation, costs £2,330. For this the purchaser acquires the console/Processor, keyboard, 5.25 inch double-sided dual disc drive unit, and the CP/M operating system.

A range of printers are available, as are a whole panoply of CP/M business oriented software packages but these cost extra.

The Xerox 820-II microcomputer comes with a very helpful piece of software...

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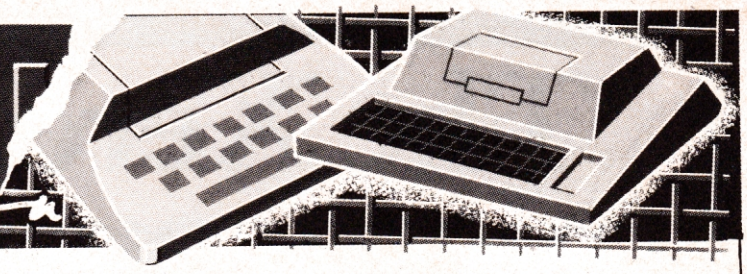
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CIRCLE NO 132

The Atari Column



Ron looks at Microsoft's Basic differences and two softbacks

Microsoft Basic has finally arrived for the Atari and, before you ask, Atari have "no plans to put it in ROM in the near future".

I have been using it for a couple of months now and have found it easier to use than the Atari Basic and its superior function's a boon. Just what makes it different?

I'll start off by describing the extra commands that Microsoft has over the Atari Basic.

AUTO — Automatically numbers your program lines at intervals set by you.

DEL — Deletes program lines in batches or singly.

VERIFY — This compares the program in memory with the program named specified. If the programs are not identical an error message is printed.

MERGE — Merges two programs together to make a whole.

RENUM — Renumbers all the lines in a program. The renumbering parameters are set by the user. The command will not, however, renumber GOTO's, GOSUB's etc.

LOCK, UNLOCK, KILL, NAME . . TO — All of these are the same commands that are available from DOS and can now be actioned straight from Basic.

TRON, TROFF — When a program is run all of the line numbers are displayed on the screen before execution.

The statements available on Microsoft are virtually similar to Atari Basic with one or two extras. Namely:

WAIT — This statement stops the program until certain conditions are met. It is used for animation and scrolling.

RANDOMIZE — This ensures that a different sequence of numbers will occur whenever a RAND statement is used.

Microsoft also has superior error handling facilities with statements that print the line on which the error occurs or diverts the program to a specified line if an error is encountered.

Outputs are enhanced by the inclusion of TAB and PRINT USING statements, which give easier control over the positioning of displays on the screen.

MID$, LEFT$ and **RIGHT$** are included for better string handling. Also included in this section is a rather novel command named **TIME$**. The manual gives a short five line program for displaying a digital clock. What other function this might have I have yet to find out.

Graphics handling remains the same as Atari Basic except for the extra command **FILL** which fills a specified area with colour.

Microsoft supports the player/missile graphics and sound system as you might expect.

The manual really is superb and is a great improvement over the manual supplied with Atari Basic.

Rather cheeky I thought was a section in the manual devoted to converting microsoft programs from Apple, TRS-80 and the Pet. My only reservation about the whole thing is the memory that Microsoft uses up.

I found that I only had about 21K of RAM left after loading it into my 48K 800.

POKE OF THE MONTH

POKE 54018,52 Turns on the cassette motor.

POKE 54018,60 Turns off the cassette motor.

This poke is useful if you want to listen to music from the cassette while programming.

Most programs will, of course, be well inside this amount but there will always be that odd one where, after sitting down for hours typing it in, you find that although the program has all gone in there is not enough left to run it if player/missiles have been used.

Microsoft also appears to be faster in execution and for that reason alone I shall probably be using it more and more as the months go by and I get used to its extra facilities.

I recently bought two books about the Atari at my local bookshop. One is concerned with the Atari sound and graphics and is in the style of the Atari Basic book that comes with the computer.

The other has become my bible and sits right alongside my 800 on my desk. In the short time I have had it in my possession it has become an invaluable work of reference. Indeed so often has it been looked at that it is becoming slightly dog-eared. The name of this book? *Your Atari Computer.*

It is a 460 page softback packed with information and advice. Its coverage is wide and is suitable for all levels of users. There are 11 chapters dealing with programming etc.

The first two chapters cover how to connect up the computer, using cassettes and discs, some of the key functions and other minor details.

The next two chapters deal with basic and advanced programming and, like the rest of the book teach the subject in a concise but relaxed style with lots of examples to try out, manipulate and play on the computer.

Chapters five, six and seven deal with the use of the cassette recorder, disc drive and printers. Subject matter includes creating files, printer character sets and detailed discussions of the disc operating system.

If, like me, the disc manual gave you a headache then perhaps you ought to read this book.

Chapters eight and nine deal with graphics from the very basics up to using player/missile graphics and collision registers. Tucked away in this section is a nice little program for creating player/missiles using the joystick.

Sound is the subject of chapter ten and, like the rest of the book, deals with the topic with the minimum of fuss.

The main part of the book is rounded off with one of its most useful features, a compendium of all the commands and statements used in Atari Basic. All are listed alphabetically and as well as the abbreviation for that command the book also gives a summary of the way in which each command is used with examples where necessary.

If you were thinking of buying De Re Atari can I suggest that you hold off until you have had a chance to inspect this excellent book. It is, in my opinion, far superior to De Re for the general programmer.

Your Atari Computer was written by Lon Poole and is published by Osborne/McGraw-Hill. ISBN number 0-931988-65-9. I paid about £11 for my copy.

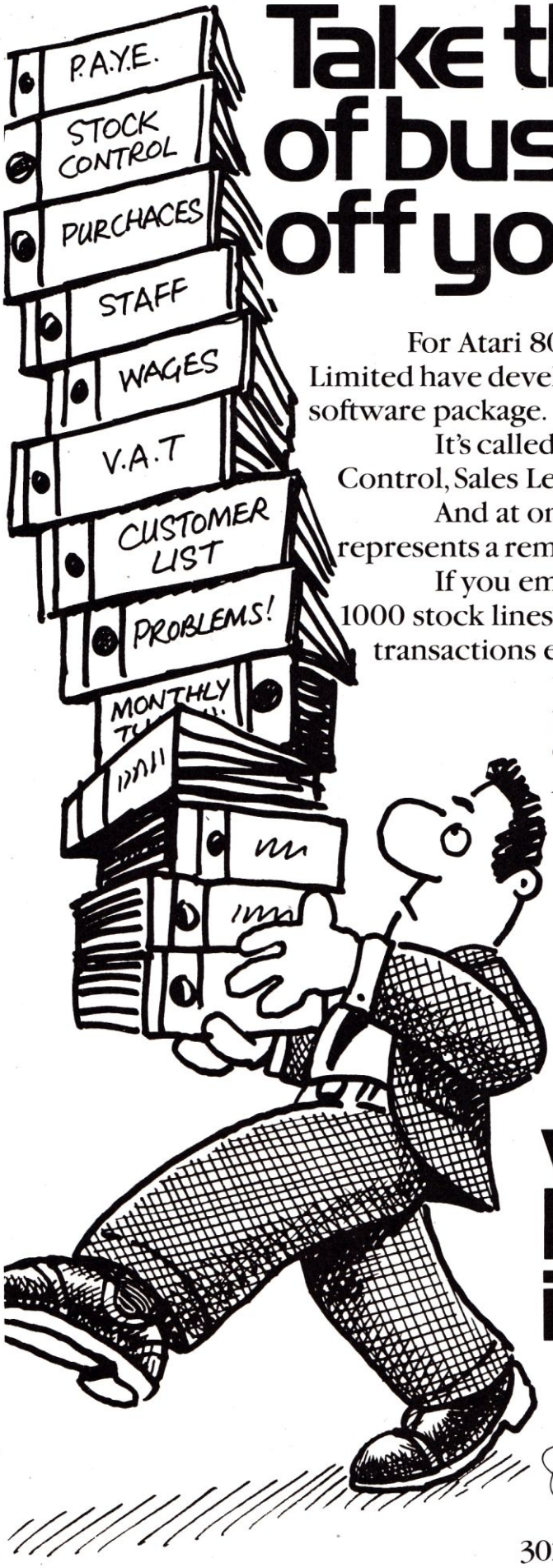
The second book is called *Atari Sound and Graphics*. It is a self teaching guide in much the same mould as the book that accompanies the Atari.

This assumes no prior knowledge of the Atari. Indeed it starts off showing you what a cursor is. After each chapter is a self-test for those who can be relied upon not to cheat. The book begins with sound and graphics and then goes on to mix the two with advanced routines and string handling.

If you are in any way interested in sound or graphics (and with an Atari who is not) then I can heartily recommend this book as well.

Atari Sound and Graphics was written by Herb Moore and is published by John Wiley and Sons, Inc. I paid £6.70 for my copy.

Write to me: **Ron Stewart, *Which Micro?* Petersham House, 57a Hatton Garden, London EC1.** ■



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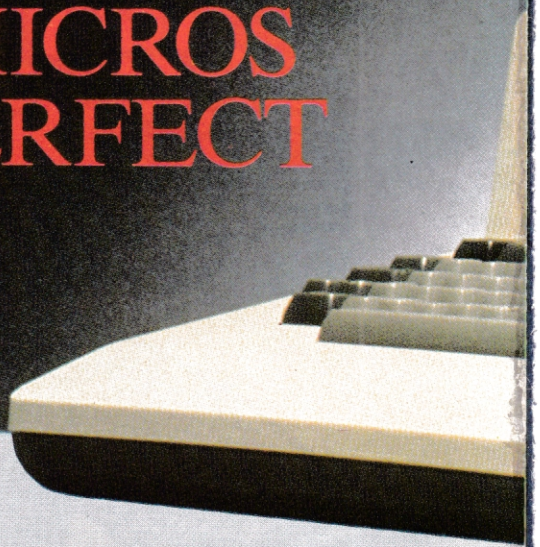
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SOFT RELEASE

ACORNSOFT GAMES

Philosopher's Quest for the BBC Microcomputer Model B. Price £9.95 incl. VAT.
An advanced Adventure and as with other similar games you tell the computer what you want to do, and it describes in plain English your progress through a world full of fiendish puzzles to be solved.

Considered to be a reasonable clone of the fascinating original from Microsoft. Good value.

Defender for the BBC Microcomputer Model B. Price £9.95 incl. VAT.
A similar fast-action graphics game as the arcade original.

Save the humanoids from the Landers, using the ship's laser missiles, smart bombs, and hyperspace jump. Complete with mutants, baiters, bombers, pods and swarmers to attack you.

Certainly a good representation of its forefather but somehow these games don't quite make the transition into the home.

Monsters for the BBC Microcomputer Model B. Price £9.95 incl. VAT.
Pursued by monsters your man is chased up and down ladders and along walls; the only hope of survival is to dig holes in the walls and trap the monsters by filling them in.

Score more by dropping the monsters through several levels, but watch your oxygen level.

Imaginative and witty, combined with a Gothic sense of the macabre.

Snapper for the BBC Microcomputer Model B. Price £9.95 incl. VAT.
Guide the Snapper through the maze eating dots and fruit and avoiding the creatures that chase you.

The game gets progressively faster, and with higher scores as the fruit increase in value.

Sound effects, score, and a ladder of high scores.

A trifle dull after the first few rounds.

Arcade Action for the BBC Microcomputer Models A and B. Price £11.90 incl. VAT.
Four games in one pack; (*A good first-time buy with reasonable variations although nothing startling):*
INVADERS — fight off the waves of advancing aliens while dodging behind four shelters to avoid being hit by their missiles. The closer they get the faster they move and the thicker the hail of missile fire.

A direct imitation of 'Pub Invaders'. We have seen it all before but it is still quite amusing.

BREAKOUT — You knock bricks out of a multicoloured wall. There are seven variations on the standard game, including progressive walls and captive balls.
DODGEMS — your racing car has to outwit the computerised car which is programmed to crash into you. You have the advantage of acceleration, but must keep switching lanes to avoid a head-on collision. A pre-*TRON* lookalike.
SNAKE — guide the hungry snake towards its prey and watch it grow as it consumes different kinds of food — Whow.

The idea of the game is to score as many points as possible while preventing the snake from bumping into itself or the walls as it gets longer and longer...

Certainly not for vegetarians or anyone else unless reptiles and obesity are your chosen subjects.

Sphinx Adventure for the BBC Microcomputer Model B. Price £9.95 incl. VAT.
A full-sized classic adventure in which you move through caves, fight with trolls, collect treasure, and finally make you way to the sphinx to collect your reward.
Full review of this and other Adventures at a later date.

Sliding-Block Puzzles for the BBC Microcomputer Model B. Price £9.95 incl. VAT.
The Sliding-Block Puzzles are based on the *14-15 Puzzle* invented by Sam Lloyd in the last century when it was the popular equivalent of today's Rubik Cube.

On this cassette are six Sliding-Block Puzzles: Alphabet, Numbers, Sunscape, Logo, Pattern, Swans.

You can choose how many shuffling moves are made before attempting to solve it, and the computer will tell you how long you take, how many moves you make, and will actually solve it for you if you get absolutely stuck.



A BBC Micro costs £299 for the A and £399 for a B machine.

Rocket Raid for the BBC Microcomputer Model B. Price £9.95 incl. VAT.
Your mission is to raid a heavily-guarded enemy fuel depot; fly your rocket over mountains and through caverns avoiding enemy missiles and dodging convoys of deadly fizzers. You have to bomb fuel tanks to replenish your fuel.

It can be vaguely likened to the end of Star Wars. At least that's how my brother saw it. It probably says more about him...

Cube Master for the BBC Microcomputer Model B. Price £9.95 incl. VAT.
Rubik Cube enthusiasts might well welcome this addition: you can choose the number of shuffling moves made to a completed cube, and then try to solve it.

The computer will keep track of the time and tell you how many moves you make.

What is special about this program is that it will also solve the cube of your choice: you colour in a cube on the screen to match the cube you are trying to solve, and then let the program take you through the solution at your chosen speed.

Illegal configurations will be spotted and dealt with.

Meteors for the BBC Microcomputer Model B. Price £9.95 incl. VAT.
Manoeuvre your laser-ship through a hail of meteors smashing them with your laser bolts as they hurtle towards you on all sides.

Avoid being hit by the missiles from hostile flying saucers which fire at you as they pass.

Your ship is equipped with as many laser bolts as you can fire and as a last resort you can escape through hyperspace. Complete with sound effects and table of Hi-scores.

After a while a little tedious. More for the unthinking killer rather than the sensitive assasin.

Chess for the BBC Microcomputer Model B. Price £9.95 incl. VAT.
A complete chess playing program is the claim with a high-resolution graphics display of the board, and the following features.

- 6 levels of play, giving novice to professional standards.
- Computer moves in two seconds at lowest level.
- Board display with coordinate entry of moves, and rejection of illegal moves.
- Computer and human castling.
- *En-passant* captures allowed and played by computer.
- Clock display for tournament chess.

Review in a later issue. This game has only recently become available.

Arcadians for the BBC Microcomputer Model B. Price £9.95 incl. VAT.
A fast-moving arcade-style space game, your task being to demolish an onslaught of warring aliens. Your laser-base moves along the surface of the planet while above you the arcadians fly in formation. Without warning, some of them suddenly swoop down towards you dropping bombs.

You are awarded a flag for each screen cleared, and the game gets harder as you progress. Arcadians is a challenging game, even for the expert player, and comes with music and sound effects.
For all Acornsoft games write to Acornsoft. 4A Market Hill, Cambridge CB2 3NJ or call Cambridge (0223) 316039.

VIC 20 GAMES

Five new games cartridges are available for a standard VIC 20. Called **Cloudburst, Satellite and Meteorites, Spiders of Mars, Meteor Run** and **Renaissance** they each cost £24.99 except for **Satellite and Meteorites** which goes for £19.99. The graphics and sound work well on all of them. My only real complaint is the price and the size of the actual cartridges which because they are smaller the VIC's cartridge slot are sometimes difficult to fit.
Call Audiogenic on 0734 586334 for details.

BUSINESS

Gemini Microcomputers have intro-

SOFT RELEASE

duced **PolyDos,** a complete disc operating system designed specifically for the Nascom 1, 2 and 3 microcomputers.

The system is fully compatible with existing software written for NAS-SYS 1 or 3, which means programs can be saved on disc without any changes.

Installing PolyDos requires no hardware modifications, but the Nascom must have a minimum of 48K RAM and use either a GM815 floppy disc system with a Gemini GM809 floppy disc controller card, or a Gemini GM805 floppy disc system. Different PolyDos versions are available for the two systems.

Cost is £90 for the complete PolyDos package from any MicroValue dealer.

Further information from John Marshall, Gemini Microcomputers, 02403 28321.

Hooper Systems and Technology of Watford have announced the availability of a **stock control system developed specifically for food and beverage stock control.**

The system interfaces with HOST's Interactive Business Service (IBS) full accounting package, and development with London's Central Park Hotel has produced a number of modifications to this general purpose accounting package making it a reasonable solution to hotel back-office accounting problems.

Further information from Linda Elvin, HOST Ltd, 0923 38321.

Terodec announce a new **Data Base Management System, FMS-80,** which claims to be the first comprehensive file management system for CP/M, MP/M or CDOS.

Completely menu driven using a set of interactive integrated component programs, it allows the user to perform complex DBMS functions without writing any programs.

It leads the user interactively through its file definition process, making additions, deletions and corrections and generating reports from your data files.

FMS-80 will help define selection criteria, to extract information for reports by upper and lower limits, specific values for fields etc.

Further information from Ellie Joyce, Terodec, Unit 58, Sutton's Park Avenue, Earley, Reading RG6 1AZ. Tel. 0734 664343/6.

Asro Information Systems of Brighton have been appointed European distributors for **MicroShell,** a normal CP/M program which **adds a number of UNIX commands to CP/M.**

When MicroShell is executed, it loads itself just below CP/M and remains resident to process commands.

MicroShell allows the user to keep all programs on one disc drive, and will do the searching for files which your program needs — like Wordstar or Dbase II overlay files.

Further information from Alastair Robertson, Asro Information Systems, 8a Guildford Road, Brighton BN1 3LU. Tel. 0273 21979.



Now available on the ACT Sirius is the UCSDS p-System.

Precision Software exhibited a new UNIX-based business package at the European Computer Trade Forum at the NEC in Birmingham.

On show was the first of a new range of business packages designed specifically for UNIX-based 16 and 32 bit multi-user micros, including an **Environment Manager** and **Nominal Ledger.** Precision Software is also exhibiting the XED word processing and MULTIPLAN financial modelling packages.

Further information from John Tranmer, Precision Software, 01-330 7166.

Now available on the ACT Sirius 1 16-bit microcomputer is the special version **UCSD p-System,** which gives users access to over a thousand applications programs developed on the system.

The p-System offers a complete, portable software development environment, programs written on Apple, IBM, DEC, TI and all Z80's will now run on the Sirius 1.

As the p-System is more portable than any other micro computer system, applications programs written for one machine can be run on another without recompilation.

The system for the ACT Sirius 1 costs £250 from TDI, 29 Alma Vale Road, Bristol. Tel. 0272 742796, or ACT Sirius dealers.

A new software package from Lifeboat Associates called **The Programmer's Apprentice** generates application programs for CP/M based microcomputers in MBasic source code which can then be compiled to run under CP/M on either a floppy or hard disc.

Application programs are generated entirely on the screen, and this package includes the MicroB+ record retrieval system allowing the user the use of IBM's VSAM, providing fast record searches.

Price is £485 including manual from Lifeboat Associates.

Further information from Helen Smith, Lifeboat Associates, 01-836 9028.

Compsoft announce the availability of **DMS (Data Management System) for the IBM personal computer,** released under IBM DOS.

DMS keeps records of stock, personnel, client, library, contract or property. The DMS letter-writer allows users to utilise DMS as a complete 'select and mail' system for personalised letters.

Other uses for DMS include company mailing, patient, student and club mailing. **DMS also runs on the Sirius, the Commodore range and Sharp machines,** amongst others.

Further information from Heather Kearsley, Compsoft, Hallams Court, Shamley Green, Nr. Guildford, Surrey. Tel. 0483 898545.

Harrison Computer Services have announced a new **financial modelling package called MiCalc,** designed to run within a 10KB memory partition in a multi-tasking environment.

The object of MiCalc is to provide profit and loss and cash flow forecasting over a range of periods. There is no pre-set format and the user is free to model his own report by allocating each line a line type code, description, source code and period values according to his own particular requirements. MiCalc is available from Harrisons in Totnes, Devon or from MSC Mini-Computer Systems in Maidenhead at £850.

Further information from MCS Mini-Computer Systems, Park House, Park Street, Maidenhead, Berkshire.

Great Northern Computer Services can now supply the **IFO II database package for user on the Apple II.**

IFO II allows the 'first time' user to create a database, enter sample information and print out a user designed report. Applications include mailing lists, drawing registers and equipment schedules.

Cost is £175 from Great Northern Computer Services, 16 Town Street, Horsforth, Leeds LS18 4RJ. Tel. 0532 589980.

Raven Computers of Bradford, in conjunction with Great Northern Computer Services of Leeds, have launched an Information Processing Package, called **Sirius Dataflow,** for use on the ACT Sirius 1 microcomputer.

Any filing or data retrieval task involving 150 to 1500 records can be handled, applications include: survey results, mailing lists, sales analyses and loan applications.

Cost is £125 from Raven Computers, 153 Sunbridge Road, Bradford. Tel. 0274 306966/309386.

MCS Mini-Computer Systems has recently announced a new membership records management system, which is for all clubs, associations, unions etc. who have a large membership and require subscription maintenance and/or mailing facilities.

A selection of detailed information on members is held on-line for retrieval, categories of information can also be modified to meet particular requirements.

Further information from MCS Mini-Computer Systems, Park House, Park Street, Maidenhead, Berks.

The Surplus Software Division of Fulcrum Computer Products has been formed to provide a means where **CP/M users** will be able to buy off-the-shelf software and application packages such as stock control, accounts and incomplete records etc.

A range of competitively priced programs from top software houses such as Compsoft, Digital Research and Microsoft will be provided.

Further information from Fulcrum Computer Products. 0621 828763. ■

Here we review two micro printers

Epson MX80 printer

The Epson printers MX80 and MX100 are highly respected by microcomputer users, and so it is of considerable interest when Epson announce improvements.

The MX80 has now reached its third incarnation, if you ignore the Graphtrax Roms, which were a strange phenomenon, in that they were designed by Epson but never supported by Epson U.K.!

At first sight there is not a lot of change, indeed externally there is none, because you can upgrade your printer merely by replacing three EPROMS with the three new ones supplied (at an end user price of £25.00, including a very full manual). But the changes these chips achieve are considerable.

First you can now use all the various printing enhancements at will within a line, so that you can switch from normal to enlarged text, enhanced text or double strike, at will, within a line. Also the double-width mode may be entered and remained in until switched off, whereas previously the command died at the end of each line and had to be reinvoked.

True continuous underlining is now available, which is attractive. But the main new attraction is in the subscript and superscript mode of operation. This does not sound very impressive, but in fact is highly so.

At the outset you may say "As I don't use mathematical or chemical formulae, I don't need this". However what you get is the ability to print very small characters, by means of two sweeps of the print head (with loss of print speed of course), with the second sweep filling in the dots to such a degree that it looks as if the printing was done by a daisy wheel with very small characters.

Since the Epson permits the line spacing to be adjusted by very fine increments, (as small as 1/216"), you can print whole pages containing twice as many lines as usual, and at 16.5 characters to the inch!

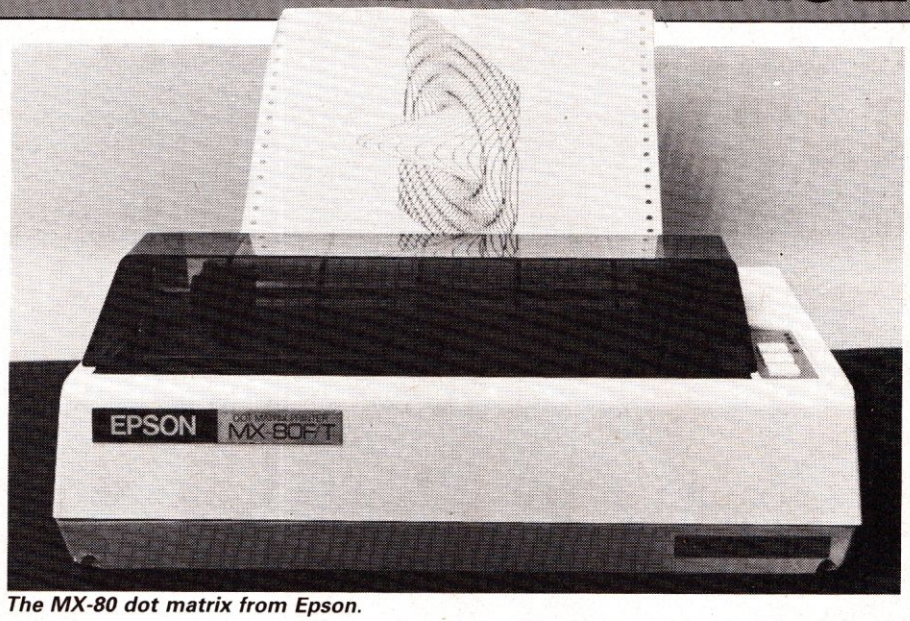
For phone lists, disc catalogues etc this is ideal, providing of course that you have 20/20 vision. If you are interested, demonstrations are available.

A slight word of warning however, if you are in the habit of using 12 pitch on your MX80, be warned that this is not supported in the new ROMS. If this is the first you have heard about 12 pitch, then try Escape "M", or chr$(27); chr$(77) and see what happens.

This is another feature not supported by Epson and we have been unable to get to the bottom of the reason — the best we can do is to say that one version of the technical facts sheet for their MX100 told of this facility, and later versions removed it from the fact sheet, although it was still actually in the ROMS! If you use it, you do so at your peril; it is possible that Epson found that it subjected the printer to abnormal wear!

Westrex also supplied an alternative option to replace the plastic cover on the machine, and provide a toothed plastic tear-off facility. Though quite good it was clearly designed for continuous roll paper, and so the teeth do not extend far enough to deal with that part of the paper at each edge.

However you will save a lot of paper by tearing off just below the last print line, and if this is important, then £10.00 will buy the accessory.



The MX-80 dot matrix from Epson.

Vic 1515 dot matrix

Now available for the Vic 20 is the **Vic 1515 Dot Matrix Printer,** costing approximately £230 from Vic 20 dealers.

The 1515 printer is designed to operate through software control, and contains a microprocessor system with RAM memory in which printing data can be stored.

It's an 'intelligent' peripheral and so uses none of the Vic's memory, will connect directly to the main terminal and can be daisy-chained with other serial bus devices. The output from the printer is very neat except for 'g', 'p' and 'q', which do not have true descenders and so tend to look like identical 'o's.

The printer comes complete with a 40-page user manual which, although adequate, is not particularly easy for the first time user to understand.

The printer cannot accept standard size paper, but uses paper up to 8 inches wide, which is slightly smaller than A4 size and is perforated on both edges. Unfortunately the paper cannot be moved backwards manually.

The printer can be operated in direct mode from the keyboard, or from within a basic program. The device must be 'opened' with a file number followed by either '4' or '5' depending upon the switch position at the back of the printer:
eg OPEN 1,4 prepares the 1515 for printing. If a program listing is required the command OPEN, 1,4,: CMD 1: LIST should be typed. On pressing return a listing is printed.
The print start position can be controlled by using CHR$(16) and assigning a two digit number:
eg PRINT 4, CHR$(16)"08 WHICH MICRO" will print Which Micro starting at the eight character position from the left hand side of the paper. Writing and running the appropriate basic program enables a hard copy of the screen to be obtained.

Specification

Impact 5 x 7 dot matrix.
Upper/lower case characters, numerals and Pet graphics.
Character size — Height 2.82 mm (7 dots), Width 1.76 mm (5 dots).
Print speed 30 characters per second, left to right unidirectional.
80 columns width — 12 characters/inch.
Paper feed — pin feed. Paper width 4.5 — 8 inches.
Dimensions — 172.5 D x 328 W x 132 H mm. Weight — 2.5 kg. ■



5 More great VIC Cartridge games from Audiogenic

Available from all VIC dealers or direct from Audiogenic Ltd. PO Box 88, Reading, Berks. (0734 586334) Credit cards accepted. Meteor Run, Renaissance, Spiders of Mars, Satellites and Meteorites £24.99, Cloudburst: £19.99 (inclusive of VAT and p&p). All titles copyright UMI INC represented in Europe by Audiogenic. Send for full catalogue.

CIRCLE NO 136







ILLUSTRATION BY STEVE DYLAN

ADVENTURE

Terry Pratt, famed editor of *Computer and Video Games,* claims that a particular kind of imagination is necessary to appreciate adventure games and that his is not one of them.

This is probably true both of him and the game, for just as chess requires a powerful interventionalist logic that is calm under pressure and relentless in attack, so adventure needs lateral imagination and a strangely clear and dogged sense of direction.

With the best examples of adventure you enter a 'mind fantasy' in which traditional methods of cause and effect are developed to work but only occasionally.

There are no dramatic screen graphics in the classic adventure models. The whole game just uses words. To play you type in pithy phrases and the machine responds with descriptions of where you are, what is happening and which direction new and old paths head.

The whole has the appearance of a man machine dialogue and has often been likened to the plot of a novel with you as the protagonist.

Which Micro? has an IBM Personal Computer with, amongst others, a copy of the original MIT/Softwin Adventure and ever since it arrived I've been hooked.

If anyone can help I still haven't really got any further than the sulphur volcanic cavern. I know *Plover* helps but . . .

Five plug in cartridges are now available for the VIC 20, each cost just under £25 and are all written by Scott Adams. I think this price is, for reasons I will explain later, a bit excessive.

Adventure 1 — Adventureland is the most traditional of all the five with most of the game taking place underground. You must contend with Dragons, Bees, Chiggers (an unpleasant insect creature) and Bears on your way to collecting 13 pieces of treasure.

Adventure 2 — Pirate's Cove is one of the most entertaining of all five. Beginning in a flat somewhere in London and then by using a clever device you are whirled to a deserted (or so you are led to believe) island from whence you must have the wherewithall to build a boat, sail to Treasure Island, collect two pieces of trove and return to your London flat.

Adventure 3 — Mission Impossible. If you remember the tv series then you will notice certain similarities. You are the good guy/girl stopping the saboteur from detonating a bomb at a nuclear power plant.

Adventure 4 — Voodoo Castle. Evil and magic seems to be etched into the very characters of the text. You must save the Count Christie from the evil curse before you are killed or cursed yourself.

Adventure 5 — The Count is a spoof version of the famous Dracula story except instead of beginning your adventure in England and having to travel to Transylvania you awake from a deep sleep within one of the Count's four poster beds.

The only real criticism I have of *The Count* is that I would have preferred a slightly more serious approach to the situation — my strange predilection I suppose but as a number of others have said, I would have preferred the plot to have been properly played out with some 'real' horror. I don't think this game lived up to its promise.

If Adventures are not only the most popular but more importantly the 'best suited game for the micro' one should be able to forward some criteria for the reasons and criticisms of particular examples.

For instance one of the purposes of reading a novel is basically 'to find out what happens' and similarly if the analogy applies this is also true for adventure. But like the novel the way in which things happen is all important and this is particularly dependent upon the plot.

With *Pirate's Cove* a real sense of beginning, middle and end is present, something lacking from many adventures. You need I think a 'half-way' reward and with this game the final boat construction is your stimulation. I saved the game and went out and got a bit drunk when I had got this far. I still had the pirate to find, the seas to cross, Treasure Island to explore and the treasure to find before my return.

(This element of being able to return to the adventure is all important. You can go so far, save it, think about your next move and then later return.)

The clues should I think be sprinkled producing a series of imaginative plateaus, rather like 'crossing an intellectual terrain'.

All of this is experienced with *Pirate's Cove* making it a well rounded package. There are however a couple of general criticisms to be made of Scott Adams' Adventure series; one is the annoying sentence which appears after every command,

'What shall I do now?'

This really does become a little tedious and the second point is as I mentioned earlier, the price of £24.95 (incl. VAT).

Unlike a good novel, once you have 'read' an adventure game, it has completely lost its value so it must have an extensive life to make it worthwhile.

I finished *Pirate's Cove* in approximately four sittings of about an hour and a half each so I would reckon that half the retail price would be good value.

Nonetheless if you can afford it, do buy one of the five. They are also available for machines other than the VIC 20 — Atari for instance. All five for the Commodore are in cartridge form and do not require extra memory. ■

COMPUTER BLUFF

We begin the exclusive serialisation of a witty new book, which will be published in the Spring, about computers, their history, how they work and your future with new technology written by Stephen Castell

THE truth is, none of us could now get by without The Computer.

From controlling power stations to working out tax and social security payments. From scheduling jetliners into and out of major international airports — and booking their seats — to analysing medical diagnostic data.

Launching moonshots, Saturn spaceprobes, Space Shuttles; forecasting the weather; checking water reservoir levels — and working out home telephone, gas and electricity utility demands. Not to mention printing our salary checks to enable us to pay them.

Twentieth Century, Western industrialised life as we know it today would in just about all aspects be a little more difficult, a little less delightful, occasionally impossible, and in many cases even dangerous or deadly, without The Computer.

And the influence of this vital box of electronic tricks is destined to seep ever more pervasively into every corner of modern life with the spread of a whole new gamut of computer-based 'Information Technology' products.

Computer and communications systems incorporating microprocessors, those wizard little chips of silicon intelligence, are increasingly coming to assist us in every conceivable situation: in the factory or office, school and university, home and leisure.

So you had better start bluffing your way in computing. Now. This book is intended to help you do so. It is dedicated to dispelling the myth that computing is for computocratic high priests alone.

On the contrary, computing is creative *fun*. There is already a whole generation of bright-eyed children growing up with their sticky little fingers on computer control keyboards almost, it seems, from the cradle up. *You don't have to be a mathematical genius to appreciate the fundamentals and a few workaday practical principles.*

And if even that seems like too much effort, this book will reveal that there are really only Three Very Important Things to Remember in Computing. Don't put it down, therefore, once you have started reading, until you have mastered at least these three. Then you can get out there and start bluffing. Today.



. . . the latest micro

The evolution of computers

In this opening section, we gallop from the Greeks to the Jolly Giant (IBM). In the company of the lovely Lady Lovelace we take you safely through de Forest.



We have you speak smoothly of *valves, flip-flops, transistors* and *Large-Scale Integration*. And we chronicle the four generations of electronic computer from a war-time beast as big as a house to today's warmly personal microcomputer, small enough to sit on the sideboard of every home. . . .

Computer History

The initial objective was to create a machine to carry out calculations on numbers — adding, subtracting, multiplying, dividing (an objective which seems to have fascinated the Top Thinkers of mankind from earliest recorded time) — the roots of its fundamental conceptual design (ie a bright idea) go back to the principles of mathematics and logic as developed by the early Greeks.

The Indians and the Arabs, too, put in an appearance with their ancient contributions to the understanding of numbers and numbering systems.

From the time of the Renaissance and the Age of Reason, Europeans, whilst laying the foundations between applied mathematics and the sciences and technologies as we know them today, had a very good stab at creating a piece of working computer hardware, and it is fair to say that a thriving European *mechanical* computer industry might just about have come into existence in the last century had Victorian engineering and materials been as advanced as the "computing machine" concepts thought up at the time.

From the time of the Renaissance, Europeans have had a good stab at creating computers

But this would actually have been a shame, for without, finally, the Americans in this century (and also, incidentally an Irishman called George Boole!), we might never have had the speed, flexibility and robustness of *electronic* computers.

We may as well face the fact that there are two definitive versions of

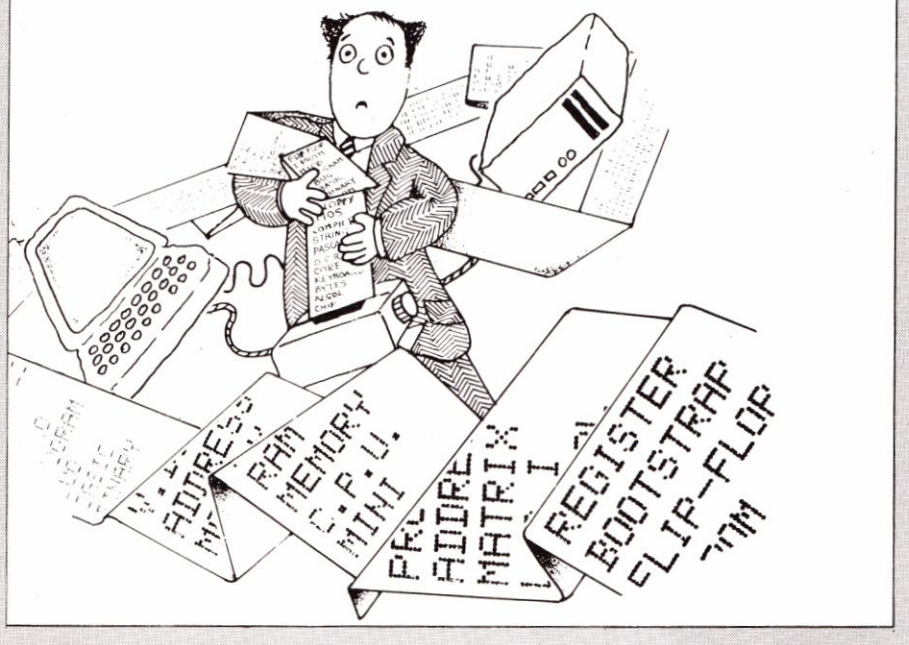
PART 1

The Which Computer? book of

COMPUTER BLUFF

. . . for people who know nothing of bits, bytes, BASIC, bootstraps and binary buzzwords and would like to have left it that way!

COMPUTER BLUFF Dr. Stephen Castell



Modern Electronic Computer History — a British version and an American version. To avoid controversy (and keep from damaging the sales of this book) we are not going to describe either. . . .

If we go back a bit however, we can get to some facts on which all can agree, and most are *names*. The first names to remember are:

PASCAL and LEIBNITZ

In the seventeenth century, these two top-class mathematicians both designed machines to perform fixed calculations (addition and multiplication). "Hand-cranked" these machines had no *memory*, and were not, in modern parlance, *programmable*.

The next name to recall is:

BABBAGE (1792-1871)

Now Charles Babbage, a Victorian Englishman, is not just *a* name to remember but the *First Very Important Thing to Remember: (FVITTR)* and therefore, indispensable ammunition in Bluffer's armoury. Learn it well.

He it was who is credited with the design of the first mechanical computer, in that this non-triumph of mechanical engineering identified and utilised the crucial computer concepts of *"data"*, *"store"*, *"process"*, *"instruction"* and, most importantly, *"stored program"*.

This latter "stored program" concept means no more nor less than that Babbage perceived the significant breakthrough idea that the *instructions* to tell a computer "what to do" could be stored *within the computer*, just like the *data* (numbers) upon which the instructions were to operate.

Babbage's first machine, the "Differencing Engine", could generate mathematical tables of many kinds by the "method of differences". But before any model of the "DE" had been built, he became obsessed with a much more revolutionary idea: his "Analytical Engine".

Unlike any previously designed machine, the AE was to possess both a "store" and a "mill" (calculating and decision-making unit). These units were to be built of thousands of intricate geared cylinders interlocked in incredibly complex ways.

Babbage had a vision of numbers swirling in and out of the mill under control of a *program* contained in punched cards — an idea inspired by the Jacquard loom, a card-controlled loom that wove amazingly complex patterns.

Babbage, in the best traditions of the dedicated, committed British inventor, died a broken, definitely commercially non-viable man, defeated, it seems by the non-availability of sufficiently advanced precision engineering which might have turned his metal cog-wheel-ridden monstrosity into working, commercial reality (Definitely not one of Life's Natural Bluffers).

Feminists, both male and female, can incidentally take joy in hearing that the name of a woman, *Ada*, Lady Lovelace, figures equally prominently, in its way, in the pioneering saga of Charles Babbage.

The Countess of Lovelace (who, would you believe, was Lord Byron's daughter) corresponded with Babbage contributing, in quite an inspirational way, we think, to his developing theory of the "stored program".

In an 1842 memoir, she wrote that the Analytical Engine "might act upon other things besides numbers". She suggested that Babbage's Engine, with pitches and harmonics coded into its spinning cylinders, "might compose elaborate and scientific pieces of music of any degree of complexity or extent."

Finally, she put forward the still definitive "obedient idiot" view of the programmable computer: "The Analytical Engine has no pretensions whatever to *originate* anything. It can do whatever we *know how to order it to perform*".

Thus, as all agree that Babbage's was the first computer, so too do they concur that the bright Lady Ada was the first *computer programmer*.

We show you how to bluff your way through modern computer programming in Chapters 5-7 and introduce you (gently) to the concept of a *high-level computer programming language*: it is very pleasing to note that PASCAL, BABBAGE and ADA are all now immortalised in the names given to three different high-level programming languages.

We suggest, incidentally, that there is no finer way for the Computer Bluf-

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fer to show his or her firm commitment to the reality of the computer revolution than to add these illustrious names to those of any children he or she may currently be about to christen: Kevin Babbage Bloggs, for example, Tracy Ada Buggins or Joe Pascal Doe, will we confidently predict, add a certain sound technology *cachet* to the lives of currently new infants when they later grow to maturity in the twenty-first century . . .

If we make a quantum (a Bluffer's word for "pretty enormous, and qualitatively significant") leap from the adorable Ada's day to the early part of the twentieth century, we land right beside an American called Lee de Forest, a father of modern electronics, who followed the early success of the electronic *diode* by inventing the *triode.*

Connect up two triodes in a particularly neat way and you have a circuit called a *flip-flop.*

This flip-flop circuit was essentially the historical reason for the *binary* numbering system being used, then and still, in electronic computers: associate a "0" with one stable state of the flip-flop, and a "1" with the other and, by stringing together sufficient flip-flops, an array can be created able to store the largest or smallest number desired, in "base 2", or binary, arithmetic.

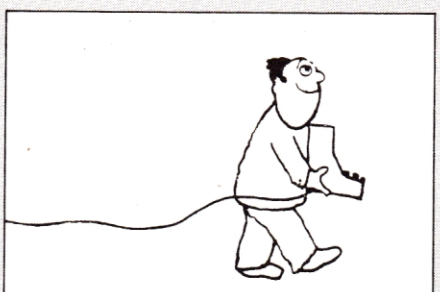
(The fact that flip-flop storage deals only with individual, discrete binary numbers — *binary digits*, or *"bits"* — is the reason that computers, utilising this form of data storage are described as *digital computers.*)

Add in a further range of electronic circuits called *logic gates* which can be used to carry out addition, subtraction, division and multiplication of the digital (whole) numbers stored in the flip-flops and, hey presto!, one has all the essential conceptual elements which Babbage identified for the stored program computer — but this time rendered electronically, not mechanically.

Ah yes! It didn't need a Computer Bluffer to realise that, for the precision and accuracy required for calculation machines, "valve" electronics was infinitely more powerful, versatile and reliable than mechanical engineering: and pretty soon this in turn was overtaken by the even greater reliability of the "solid-state" electronics of *transistors.*

At about the same time, *"ferrite cores,"* small rings of a special material capable of being in one of two opposite stable *magnetic* states, took the place of flip-flop circuits.

Then, "thin-film" technology was able to etch many transistorised components on to a single "chip" of silicon, giving us the *integrated circuit.*



. . . the proud new father

Rapid developments in the '70s provided vast increases in the density of such circuits which could be packed on to a single silicon chip, with dramatic improvements in speed, reliability and versatility — and immense reduction in cost.

This *"Large-Scale Integration" (LSI)* brings us right up to date with *"Very Large-Scale Integration" (VLSI),* which today can pack the equivalent of tens of thousands of those early flip-flop circuits on to a wafer of silicon no bigger than a little fingernail.

As importantly, another manifestation of LSI and VLSI is an integrated processing unit made up of logic gates, timing elements, registers and working storage we call the *microprocessor.*

It should be noted by the way, that it is very definitely no longer good Computer Bluffing to talk earnestly and at length about just simply microprocessors themselves, since even politicians and pop newspapers now seem to understand them.

With the advent of the microprocessor, the wheel has turned full circle

Quite allowable, however, is to talk about *applications* and *implications* thereof provided the vital word "ubiquitous" prefaces "microprocessor" as in the definitely OK:

"Well, of course, the *ubiquitous microprocessor* as applied in *fifth generation computers* will create a *machine species* capable of *artificial intelligence* which is bound to challenge our current concepts of the *ontology of expert systems* . . ."

A slight, quizzically knowing shake of the head and an almost *sotto voce* "I just wonder what *Babbage* would have made of it all . . ." to follow, completes an almost perfect example of Bluffmanship . . .

We shall have something more to say about various applications of microprocessors later: let us just finish this brief, definitive, Computer Bluffer's history by adding to our armoury of names.

It was the fashion in the early valve-driven days of electronic computing (at round about the time of the Second World War) to give each new 'model' (and sometimes there were only one or two units ever produced in the 'range') splendid names, which even today trip portentiously off the tongue.

Examples are ENIGMA, ACE, ENIAC, DEUCE, LEO and ATLAS, and the good Computer Bluffer should learn to salt his conversation at appropriate moments with these arcane names.

The middle period of contemporary computer history, when the semiconductor began to force a dramatic growth in an emergent world-wide computer industry, is however characterised by a rash of rather less-than-splendid machine names often made up of a mix of the word "system," a number, and sometimes other hieroglyphics.

Thus: IBM 1130, IBM 360/50, ICL SYSTEM-4, ICL 4120, DEC PDP 11/34, Honeywell Level-6, System/10, etc., etc.

With the advent of the microprocessor, the wheel has turned full circle and we are now back with a rich vein of names — rather less than splendiferous this time, since the physically small (but nevertheless big-hearted) microcomputer is a distinctly more personal, friendly machine than the early valve-driven monsters.

Microcomputer Bluffers can delight in names such as Altair, Apple, Pet, Sorcerer, Video Genie, Pear, Sirius, Atom, Challenger, Rainbow, Spectrum, Proton . . .

Finally, in tackling the history of the development of the computer industry, Computer Bluffers should make special note of the IBM 360 machine.

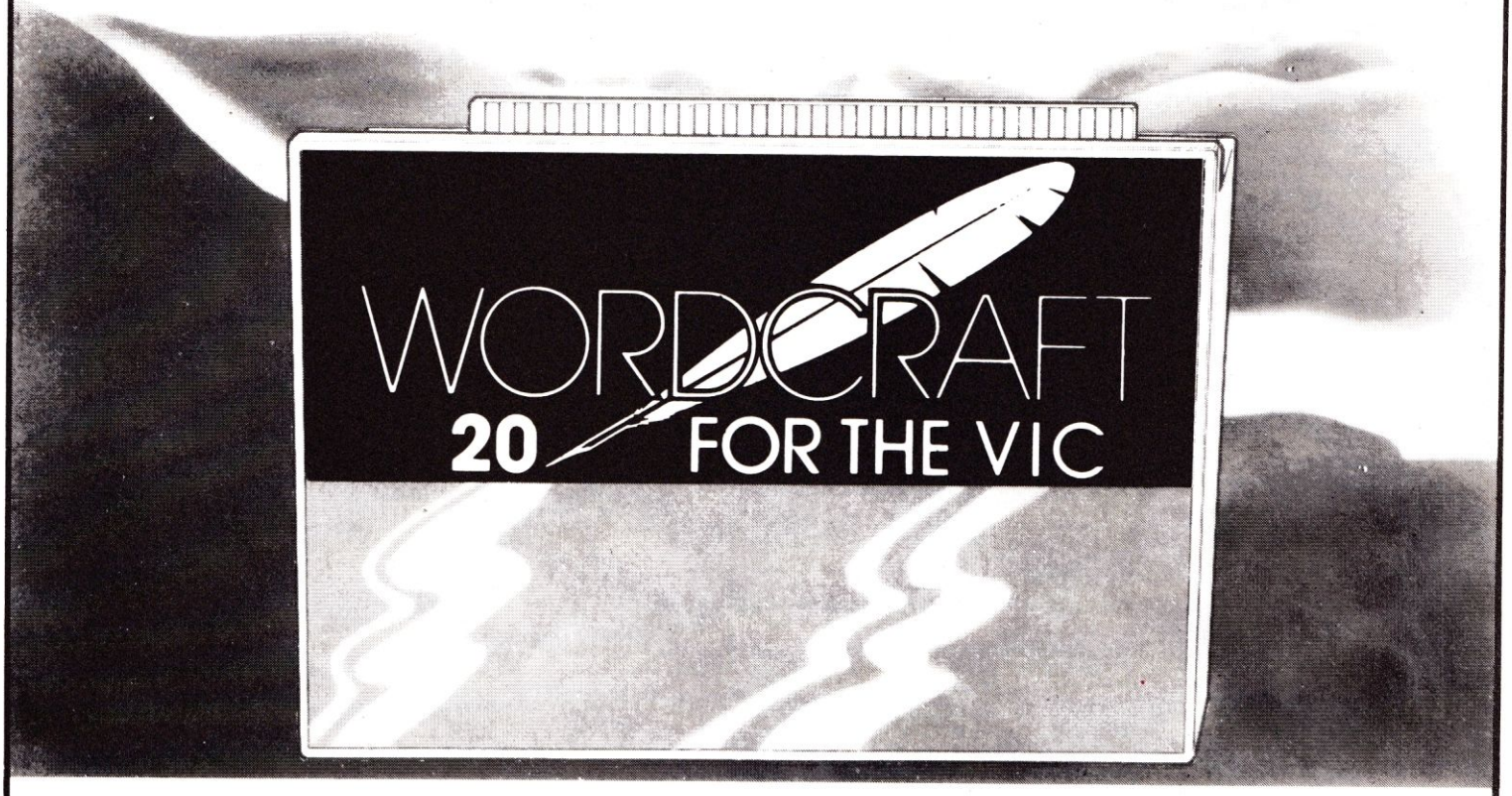
In the mid-1960s IBM (International Business Machines, the world's largest computer corporation, affectionately known as the Jolly Giant or the Blue Whale — the renegade computer in the film *2001,* HAL, was named by taking the immediately preceeding alphabetic letters of IBM.) effectively defined the major parameters of the industry with the launch of this machine, with concepts and features which are now standard.

The IBM 360 was, *inter alia,* the first realistic commercial *range* of computer systems hardware. More importantly, perhaps, this range had available to it a compatible set of *Operating System Software* and *High-Level Programming Languages,* such as *FORTRAN* and *COBOL.*

We explain FORTRAN and COBOL, and show you how to bluff your way in High-Level Language Programming, a little later in this series . . .

Next month's Bluff — *Computers Today* in which we focus on the electronic computers of today, in addition we look at the developments of hardware and the way in which the manner of usage of such computers can be identified. . . . ■

A NEW ERA OF WORD PROCESSING



The introduction of Wordcraft 20 for the VIC brings the benefits and advantages of full scale word processing directly to the general public.
Until now only the business world could afford word processing systems but this amazing price breakthrough makes it available to everyone.
Wordcraft 20 comes on a cartridge ready to plug into the back of the VIC. Included in the cartridge is an extra 8K of RAM that is also available for use with other programs – so not only do you get a word processor but you also get a memory expansion thrown in. The system also comes with complete documentation catering both for the inexperienced user and for those already familiar with Wordcraft 80.
Just look at these features:

★ Full use of colour and sound.
★ Full compatibility with VIC 1515 printer, parallel printers or RS232C serial printers.
★ Full control over margins, document width, tab stops, decimal tabs, justified output, multiple copies. Complete control of the final output.
★ Automatic underlining and emboldening.
★ Full screen display with automatic paging.
★ Full storage and retrieval facilities from disk and tape.
★ Full compatibility with Wordcraft 80.
★ Name and address capabilities – including labels.
★ Full document merging facilities.

Wordcraft 20. The package that the VIC user has been waiting for. A word processor of proven quality at a low price.
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CIRCLE NO 137

BBC ★ DRAGON 32 ★ SHARP MZ80K/A/B

Buy 2 — take 1 FREE!!! or all 6 for £69.95

BBC SOFTWARE REVIEWED IN THIS ISSUE

BBC WORDPROCESSING

This program, written for the BBC/B or 32K BBC/A by John Marriage, features routines found in much larger packages, but it is essentially designed to be used with relatively short files. In a 32K BBC micro there is enough space for the program itself (under 7K), the necessary overhead for screen memory and operating system, and nearly 6K for text.

The memory is efficiently used, and if you use a typical word length of 5-6 letters, it allows for around 1,000 words in memory at one time. This is two closely typed pages of A4, or a typical 3 page letter — ideal for the domestic user who requires a simple program to write letters on his computer with.

Powerful features include:

Block delete, block insert, letter delete add and replace, search and replace, block move, edit text, display text, line width adjustment etc. etc.

The red function keys on the machine are used and the program comes complete with a set of labels to use with the keys.

Wordprocessing packages can be so complex and it is probably true to say that the more expensive they are, the more complex they are and this holds good for this program. Ideal for the home/small business user and easy to learn and understand. Supports all usual printers, e.g. Tandy, Epson, Centronics etc.

DATABASE

What is a 'database management' program?

This question must have been asked many times by the micro user and unfortunately the answer is most relevent to him. In fact we recommend that 'Database' is really the first program to buy and if you don't have one then you should! It will surely be the most valuable and versatile program in your collection.

The simplest and most convenient way to describe our database is to aliken the system to that of a manual CARD INDEX box or filing cabinet. In just the same way as you could set up a manual card file, this may be done electronically using our database package and your computer. The flexibility is apparent when you consider the possible uses, e.g. record collections, stamps, employee data, simple inventory control, photographic cataloguing, gardening records, customer file, sales enquiries, etc. etc. etc. The list is endless. To draw further parallels, the software program is the card box, the data file produced within the program is the collection of cards inside the box, and a particular record on the file is a single card in the box.

If you were to fill out a card in your box, you would assign your data under various 'fields' or 'headings'. These concepts are explained in greater detail in the manual itself. The essential difference between 'database' and 'mailing list' for example is that the latter is a 'dedicated database', and although you can manipulate the contents of the mailing list file you are restricted to the manner in which it has been set up, or structured and 'dedicated' to its pre-defined task. It is worth mentioning that dedicated databases are written because they are best designed to do the job in question — in theory you could set up a mailing list on 'database' but you would be lacking certain obvious dedicated features inherent in a mailing list proper such as printer tabulation to suit label formatting and elaborate multi-conditional address selection criteria etc.

Having purchased 'database' you may then create as many of your own dedicated databases as you wish, with as many cassette data files per database as you wish. In other words, you could formulate your own customer file for example, with 1,000 customers therein spread over a number of data files on cassette.

No doubt you will appreciate that the data file is the file produced on tape by the database program in which all your own entered information is stored separately from the program tape itself.

Main menu options on 'database' include add, find, change, delete, total, sort, search, list, print etc.

MAILING LIST

You will find mention of mailing list and 'dedicated databases' on page 4 and the section on 'Database Management System'.

Our mailing list program provides the means to store names and addresses on cassette and selectively print, sort and otherwise manipulate them. This function is greatly extended and made more powerful by our unique 'searchkey' system which allows further selectivity over simple fields such as 'name' or 'address' or 'town', 'county' etc. The Gemini searchkeys give you a further ten USER-DEFINED parameters by which you may make your own selection of qualifying names and addresses for printout or display etc. To give an example, it is a simple matter to get a mail list program to produce labels for you simply for all those names on file whose businesses are situated in London, or whose names begin with 'J' or 'T'. With our searchkey mailist, you can now select names and addresses for printing or display under the following criteria which are just by way of example:

1. Every name selected to have a turnover in excess of £50,000
2. Every name selected to have a good credit rating
3. Every name selected to have a staff canteen
4. Every name selected to have an overseas office
5. Every name selected to not have been mailed within 1 year
6. Every name selected to have over 30 employees

etc. etc. up to 10 extra criteria to just field names which number 9, so you have up to 19 criteria in all for selection.

The Gemini mailist program is extremely 'user-friendly' and features an on-screen guide label which prompts you for the necessary information at all stages during data entry, and shows the current record number and user-allocated cassette reference for that particular file.

Menu operations include sort, search, add, browse, change, delete, print labels, set up printer, set tabulations, set line spacing etc. etc.

A very useful program for any business. In fact it is surprising how useful this program can be for just a simple database for names and addresses and telephone book (a telephone list may be printed separately) AND YOU DON'T HAVE TO HAVE A PRINTER to use it usefully.

INVOICES AND STATEMENTS

Surely one of the most tedious of office routines this.

The Gemini invoices and statements program will allow you to print formatted sales invoices and monthly (or otherwise) statements on your micro and line printer. These routines are all available from a cassette based program which is one of the most popular in our range.

On running the program, you are asked for all the details of your company for the invoice/statement heading. This routine also asks for your VAT number if any. Once entered, the information is stored on cassette tape and does not have to be entered again until your details change. You are then asked for all the necessary transaction information, and the name and address of the recipient of the document which is again stored on cassette file to save entry in the future. Also available is the facility to add your own defined footer messages to both invoices and statements; for example "nett 30 days please" or "please pay within 7 days" etc. etc.

On completion of data entry the invoice is then printed in a neat format for you automatically. Facilities are included for VAT rate, carriage, discount etc.

An example of printouts is included with this catalogue and show the result on the VIC-20 (16K) computer with VIC printer. The format and result is essentially the same for every computer for which this program is available. (See details at end of catalogue.)

Please note that the invoices and statements sections are not integrated and both require manual input of data for each transaction although this is made as simple as possible with as little repetition as necessary being required.

One of the advantages of using this program in your business is one of presentation. Computerised invoices and statements always look that much more professional. Of course, one can produce as many copies as one likes of any invoice and statement produced.

COMMERCIAL ACCOUNTS

We do not try to compare this program with disk ledger systems and of course there are limitations as to what you can do on cassette with the minimum configuration of 16K of memory.

Having said that, this program has a lot to recommend it and contains some extremely useful routines for office accounting. The system comprises essentially a simple debit and credit ledger system which has been structured to provide facilities for the following:

Daily Journal	Record of each transaction
Credit Sales	Records your sales on credit by a/c name
Sales (Other)	Records cash sales etc.
Credit Purchases	Records your commitment to suppliers
Purchases (Other)	Records other cheque payments
Sales Ledger	Accounts receivable summary
Purchase Ledger	Accounts payable summary
Bank Account	Complete transaction record
Year to date Summary	Complete record of progress by month
VAT input and output	(BBC only) complete VAT summary

Although VAT is only catered for within the program in the BBC, Pet Newbrain and TRS 80 versions, provision may be made by the user for recording all his VAT by the simple allocation of a debit and credit account for VAT to which postings may be made. Transaction files are saved to and loaded from cassette and totals may be carried forward from one cassette file to another which greatly overcomes the nuisance of RAM limitations for business programs such as this.

The program is particularly useful from a cash flow point of view as there is immediate accessibility to totals for debtors and creditors by name or as a total of them all. The bank account routine is totally interactive with the rest of the program and shows all debits and credits to the account, quoting cheque numbers, dates, deposits and of course running balance.

Strongly recommended this one and it does work!

We do not however suggest that you will be able to immediately throw all your manual paperwork out of the window and say that your entire accounting system is fully computerised but this program will surely have a place in your business.

HOME ACCOUNTS

This one contains all the necessary routines for keeping a strict control on your domestic expenditure. It has the facility for you to set out a budget and basically tells you if you are not sticking to it!

Everything is clearly laid out in columnar format and there is an inbuilt routine for recurring figures which only have to be typed in once if they are applicable to the whole 12 month period. Mortgage would be an example of this. The field headings are as follows but may be changed by the user if not found applicable...

Mortgage, Rates, Hire Purchase, Insurances, Maintenance, Gas, Electricity, Housekeeping, Subscriptions, Medical, Legal, Telephone, Entertainment, Motoring, School Expenses, Clothing, Papers, Holidays, Computing, Sundries.

Another feature of the program is the plotting of expenditure by histograms which give a graphic representation of your outgoings by month.

Amendments and changes are made simple by extensive and time saving editing techniques and there is a totally separate bank account database which may be called from the main program and keeps track of all transactions within your account.

COMING NOVEMBER —
BBC ★ DISK ★ BUSINESS SOFTWARE!!!

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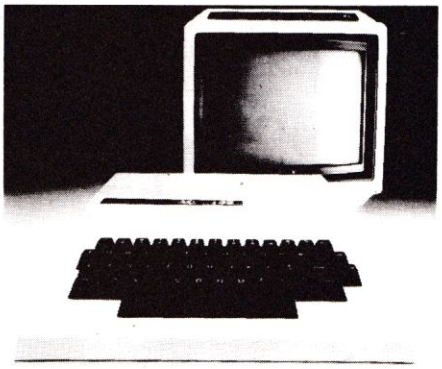
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Credit card orders taken on above telephone no.

CIRCLE NO 138

jade AND THE DRAGON



THE DRAGON 32 THE BEST CHOICE IN HOME COMPUTERS



HARDWARE SPECIFICATION

- 6809E Microprocessor, a great advance on the original 6502 — still used by PET, Apple, Atom, Atari 400, BBC Micro, VIC 20.
- 32K RAM memory as standard — At least twice as powerful an other computers at the same price, expandable to 64K — 26K user available after 4 pages of high resolution graphics.
- DRAGON 32, unlike most units, gives EXTENDED MICROSOFT COLOUR BASIC as standard — Microsoft basic has become the industry standard (e.g. IBM, Apple, Commodore, Tandy, Atari). THIS HAS — Advanced graphics features; set, line, draw, circle, paint, print using — Advanced sound feature — Automatic control of cassette recorder — Full editing features; insert, delete, change.
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Investment Analysis. Helps you make financial decisions. Determine interest, present values, stock and bond yields. Save figures for review or update with optional recorder. Avail. Nov. 30. **26-3102** **£25.95**

Colour File. "Electronic" filing makes it easy to store, retrieve, change and use data. Files include names, addresses, inventories, etc. — or create your own. Requires cassette recorder. **26-3103** **£17.95**

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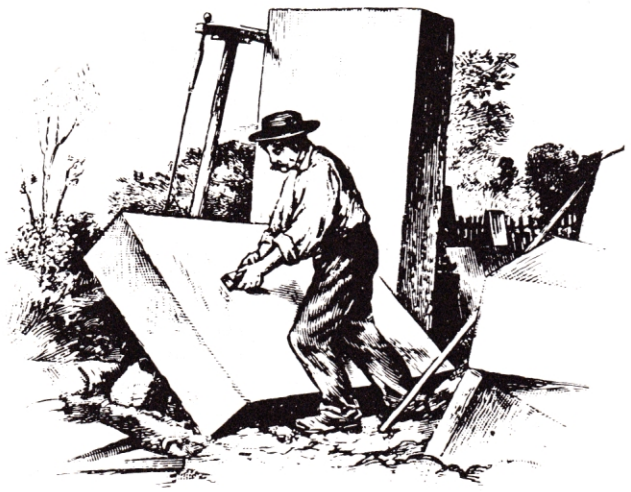
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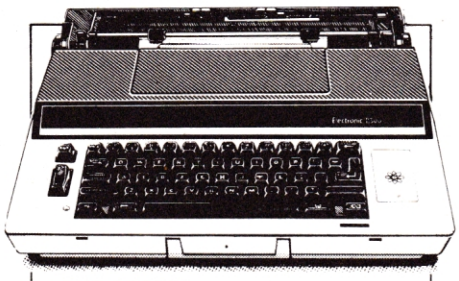
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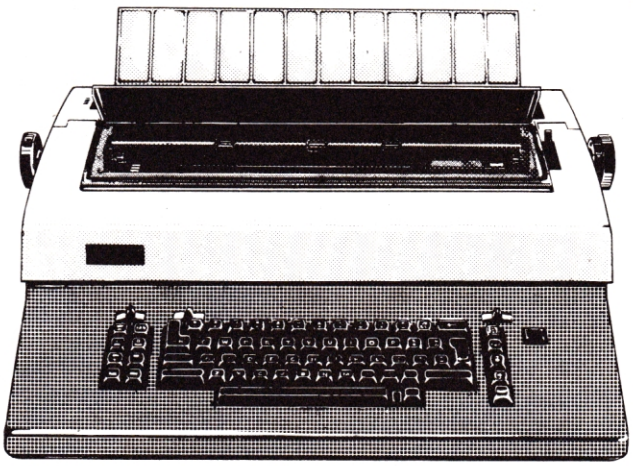


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CIRCLE NO 143

BUYER'S GUIDE

NOVEMBER 1982

This month we introduce a new and expanded buyer's guide giving information on over 130 microcomputers currently available in the UK for under £5000. And we include a look at the important question of what software is available to go with them.

With this in mind the listings include whether a machine accepts the widely used CP/M operating system. Machines with CP/M will usually have access to much of the wide range of software written for it.

With less well known operating systems it is even more important to check that the type of software you might require is available.

Similarly with interfaces — which allow the connection of such peripherals as printers — the provision of an RS232 or IEEE 488 socket will allow a wide range of equipment to be connected. With less well known interfaces the choice of what can be connected may well be more limited so should be checked before purchase.

Every effort is made to keep the information accurate but please send any changes or updates to *Which Micro & Software Review,* Petersham House, 57A Hatton Garden, London EC1N 8JD.

UNDER £500

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Sinclair ZX81	£49.95	Home Education	1K- 64K	No	No	Basic	Other	Sinclair Research 0276-685311

COMMENT: The classic "starter" computer now available for less than £50. Considered best for learning rather than doing anything too serious. Cassette tape storage only. Memory can be expanded to 16K with plug in extra memory and even further with the independent suppliers. This additional memory can cost more than the ZX81.
SOFTWARE: Plenty of software available at around £5, but anything useful tends to require the extra RAM pack. Includes limited graphics but it won't look like an arcade game. Wide range of independent companies supplying software packages.

Microtan	£79- £90	Home	1-32K	No	No	Basic Forth	RS-232 available	Tangerine 0223-60422

COMMENT: Supplied either in kit or ready assembled form, the Microtan is based on the 6502 chip and consists of a basic motherboard with the keyboard or numeric keypad extras. You view the image on your own domestic television set. Provision for growth to 32K of memory. While programs can be loaded from your own cassette recorder, the system expands to include disk drives. The Microtan appeals to both the beginner and enthusiast who wishes to expand his basic system from the essentials to include larger memory capacity and hi res graphics.
SOFTWARE: Limited range available. Tan Forth — available on cassette £29.95, on disk £35. Zodiac — adventure game £7.50.

TRS-80 PC-1	£89	Home Business	1.9K	No	No	Basic	Other	Tandy 0922-648181

COMMENT: Genuine pocket computer with integral 24 character display. Separate numeric keypad with 15 arithmetical functions and ten digit numeric accuracy. Limited business use with 1.9K memory. A printer/cassette interface available as an extra produces hard copy 16 characters wide.
SOFTWARE: Range of cassette software with 15 programs ranging from games and business statistics to surveying and aviation. Prices start at £5.95 and go up to £15.95.

Jupiter Ace	£89.95	Home Education	3K- 19K	No	No	Forth	Other	Jupiter Cantab 0954-80437



COMMENT: Designed by two people involved with the Sinclair Spectrum, the Ace is unusual in using Forth as its native language. However Forth is ten times faster than Basic and easy to learn. Your own domestic television is used with the Ace, together with your cassette tape recorder. The Ace has chunky graphics and a sound facility. There will be a 16K memory expansion and a parallel printer interface available soon.
SOFTWARE: A catalogue is sent with each machine, but as yet there is only a small choice for Ace users. But with increased popularity of the machine, the independent software companies may produce packages for this model.

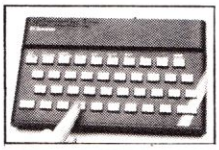
Acorn Atom	£120- £250	Home Education Business	2-12K	Optional	No	Basic Forth Lisp	Other	Acorn 0223-245200

COMMENT: Acorn, manufacturers of the BBC machine, supply their own machine in kit or assembled form. You have the choice of cassette or disk drive loading, and viewing with your domestic television set. A special communication module is available to link your Atom to any number of Atoms or even an IBM mainframe computer. So it's a good starting point at a price well below the BBC machine.
SOFTWARE: Acorn have their own range of Acornsoft programs for the Atom micros and currently there are over 50 programs ranging from games, to household and business applications, plus interactive teaching. Though the range of truly business programs is limited only by the machine's memory space. A number of independent software companies are now producing programs for the Atom, so there must be over one hundred packages in total available.

Nascom 1-2	£125- £265	Home Education	1-2K	No	No	Basic	RS-232C	Lucas Logic 0926-497733

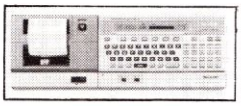
COMMENT: Two kit form micros that can also be supplied ready assembled, both using IBM style keyboards. The Nascom 1 has 47 keys, while the model 2 increases it to 57 including more controls. Both models produce a 16 line 48 character display on the monitor bought separately. Essentially for the enthusiast. Now the basis of a range of commercial/industrial systems.
SOFTWARE: Using Basic many programs can be adapted and there is a limited range available.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Sinclair Spectrum	£125-£175	Home Education	16-48K	Yes	No	Basic	RS-232 soon	Sinclair Research 0276-685311



COMMENT: On specification the Spectrum is a best seller, with the colour graphics facility, 16-48K memory and Teletext compatibility. Add the sound facility, plus the low cost printer and cheap disk drives and you have potentially the strongest contender in the under £200 market. However it has suffered from long delivery times just like the BBC machine, but not as long. Once the £50 disk drives and networking facilities become available and the delivery problems are solved, the Spectrum will have few competitors.
SOFTWARE: Initially there is a small amount of software available for the Spectrum, mainly in the games field, but this is increasing fast. There should also be some business programs available in the near future.

Sharp PC1500	£169.95	Home Business Education	3.5-11.5K	No	No	Basic	RS-232 available	Sharp 061-205-2333



COMMENT: A true pocket micro computer with single line display replacing the conventional monitor. Large typewriter style keyboard with separate numeric keypad. Add-on memory chips increase total RAM to 11.5K, while CMOS circuitry retains data even when the PC1500 is switched off. Accessory printer/cassette interface produces a printing facility in four colours using ballpoint pens.
SOFTWARE: Limited range available in cassette form for the PC1500. Mainly from independent companies like:– Kuma Computers of Maidenhead, Microl of Cambridge, Elkan Electronics and Micros for Managers — London.

Vic 20	£170	Home Education	5-29K	Yes	No	Basic	RS-232C	Commodore 0753-79292



COMMENT: Apart from the Sinclair ZX81, probably the fastest selling home computer in the UK. A complete departure for Commodore from their chunky Pet days. The Vic 20 has a typewriter style keyboard with special function keys. The colour is excellent and the graphics make it ideal for games. Programs can be loaded from cassette or disc drive, but the drives cost twice as much as the Vic. You also have the choice of plug-in cartridges. Sinclair is going to produce disc drives at £50, so the price of Commodore drives should drop. **See p.13 for VIC discount.**
SOFTWARE: You have three different systems for your software, cassettes — takes the longest time, but the cheapest; cartridges — most convenient — but expensive and disks if you can afford the drives. There must be over two hundred different games for the Vic ranging in price from £5 upwards. Cartridges cost around £20 each, with disks £2 more than the equivalent cassette. An increasing number of educational programs are being produced for the Vic, but as yet little business software.

Texas Instruments TI99/4A	£174	Home Education	16-48K	Yes	No	Basic Pascal TI Logo Editor/ Assembler	Other	Texas Instruments



COMMENT: Uses a 16-bit chip and has three ways of loading programs. Cassette, floppy disks and plug-in cartridges. Used with your domestic television the TI99/4 hasn't reached the popularity expected and the price has been reduced from £399.
SOFTWARE: Mainly available on cassette and cartridge, there is less independent software for this micro than others in this price range.

TRS-80 PC-2	£179	Home Business	3.5-11.5K	No	No	Basic	Other	Tandy 0922-648181

COMMENT: This pocket computer looks very similar to the Sharp PC1500, the main difference being the name at the left hand end of the micro. Sharing the features of the Sharp PC1500, the PC-2 also has the printer/plotter/cassette interface for printing out results in four different colours.
SOFTWARE: Limited range of software available in cassette form for the PC-2, mainly from independent companies like Kuma Computers, Microl of Cambridge, Elkan Electronics and Micros for Managers.

Atari 400	£199	Home Education	16-32K	Yes	No	Basic	RS-232	Atari 01-900-0511



COMMENT: Advertised extensively on television, the Atari has extremely effective graphics where you can choose from 128 colour combinations and 18 screen arrangements. There are four sound channels with a range of three octaves. The Atari 400 has a touch sensitive keyboard and loads from cassette recorder or disk drive. Programs in cartridge form can also be slotted into the micro. In the under £200 market the 400 faces strong competition from the Dragon and the Colour Genie apart from the Spectrum.
SOFTWARE: Several hundred different programs are available for the 400, including utility and educational programs. One dealer is even offering 100 free programs with each Atari 400 and that's a real bargain.

Colour Genie EG2000	£199	Home Education	16-32K	Yes	No	Basic	RS-232	Lowe Electronics 0629-4995

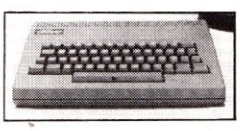
COMMENT: Another contender in the under £200 market with 128 programmable graphic characters and three sound channels, plus music synthesiser. Full size typewriter keyboard, cassette loading, view on your domestic television set.
SOFTWARE: Genie computers are very similar to the TRS-80 range and there is a degree of interchangeability with software. As more programs are available for the TRS-80 range, even than the Apple, there should be no shortage of programs for the Colour Genie.

Dragon 32	£199	Home Education	32-64K	Yes	No	Basic	RS-232	Dragon Data 0792-580651



COMMENT: A new contender in the under £200 market, with 32K RAM, nine different colours and a range of nine octaves of sound. Standard typewriter keyboard with space bar. Eight graphics pages for five different resolutions and scale from 1/4 to 15 times magnification. The Dragon uses the 6809 chip, more powerful than the 6502 fitted to the Pet, Apple, Atari and similar machines. Programs are loaded by cassette from your own recorder and viewed on the domestic television set. Disc drive units will be available soon.
SOFTWARE: Currently you have a very limited choice of cartridges or cassettes. Cartridges are expensive but load faster.

Lynx	£225	Business Education Games	48-192K	Yes	Com-patible	Most	RS-232C	Camputers Ltd., 36a Hills Road, Cambridge, CB2 1LA



COMMENT: Claimed to have an extremely simple Enhanced Basic and easy to understand manual plus a typewriter style keyboard. Unlike most low priced micros that use a lot of memory for the colour display, the Lynx produces true hi-res graphics. Currently uses a cassette interface, but disk drives, monitors and printers should be available soon. Provision for expandability to 192K, puts the Lynx streets ahead of many of the £200 competitive machines.
SOFTWARE: CPM compatibility puts the Lynx ahead of many of its competitors as far as business and professional use is concerned. So you could use Wordstar with a £200 micro. However Camputers are working on their own range of software.

FROM THE SCIENCE LAB TO THE LIVING ROOM

WHETHER you work with computers or have a micro in your home **ELECTRONICS & COMPUTING MONTHLY's** December issue has something for you.

Using the BBC Micro, Dr. Tony Allen describes how to employ this popular system in the science laboratory.

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Le Stick	£24.95
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Programming Aid Cartridges	
Super Expander 3K RAM and Hi-res graphics	£34.95
Programming Aid Additional commands, function Key programming etc	£34.95
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Backgammon Cassette (+3K)	£7.00
VIC Men Cassette	£7.00
VIC Asteroids Cassette	£7.00
Business Programs	
Simplicalc Disk (+16K)	£24.95
Simplicalc Cassette (+16K)	£19.95
VIC Stock Control Cassette (+8K)	£19.95
VIC File Disk (+16K)	£24.95
VIC Writer Disk (+8K)	£24.95
VIC Writer Cassette (+8K)	£19.95
Education (CSE & GCE O Level Revision) All cassette based and require at least 8K expansion memory	
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Mathematics 2	£9.99
Biology	£9.99
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Physics	£9.99
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Reading for 9 to 11 year olds	£9.99
General Knowledge for 9 to 11 year olds	£9.99
Spelling for 9 to 11 year olds	£9.99
Home Programs All cassette based and require at least 8K expansion memory	
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Programming Aids Package 1	£9.95
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Epson MX80T Mk III	£398.95
Epson MX80F/T Mk III	£447.35
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CIRCLE NO 152

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Newbrain A/AD	£233-£267	Business Education	32K upwards	No	Yes	Basic	RS-232	Grundy Business Systems 01-977 1171



COMMENT: Almost pocket sized micro with full size keyboard. You have the choice of loading programs from an extra tape recorder or disc drive depending on the application. Two versions, with the AD having a calculator type 16 character blue-green display. Optional battery back-up module and videotext module for communications with Prestel and all types of viewdata.
SOFTWARE: Initially little available, covers a graphs pack, simple graphics and a text processing package. However the CPM option lets you have access to over 2000 programs including Wordstar.

BBC A & B	£299-£399	Home Education	16K upwards	Yes	Extra	Basic Pascal Forth Lisp	RS-232	BBC Microcomputer Systems P.O. Box 7, London W3 6XJ



COMMENT: Developed from the Atom, by Acorn, the BBC machine has a full keyboard with ten user definable keys. Programs can be loaded either from a cassette recorder or a disk drive. Extensive graphics facilities and tone generator. Extremely versatile through built-in connections for taking telesoftware direct from Prestel and Teletext services. The BBC uses the Econet networking system using ordinary telephone cable. The model B machine has more sophisticated graphics facilities and an RS-232 compatible interface. This specification makes an attractive,package and to avoid the months and months delay buy your BBC machine direct from one of the handful of dealers stocking it.
SOFTWARE: Acornsoft have their own range of programs for the BBC machine and an increasing number of independent suppliers have a range of packages. Acornsoft themselves have:– Business games, Tree of Knowledge, Algebraic Manipulation and Peeko Computer. For business use:– word processor, desk diary, games are available in the usual range from Invaders to Flight Deck and the solution of the Rubik Cube to name just three. Special plug-in ROM cartridges are also available and can be used with a special extra interface socket.

Commodore 64	£299	Home Business Education	64K	Yes	Extra	Basic Logo Pascal Comal Assembler	RS-232 IEEE 488	Commodore 0753-79292

COMMENT: Far more powerful version of the Vic 20 with a massive 64K for £130 more than the Vic. Hi-res graphics with bit mapped screen. The dedicated video chip lets you use hi-res Sprites — moveable object blocks — which can give full three dimensional effects. Three independent voices available with the sound chip giving a range of nine octaves. Wide range of interface adaptors lets the Commodore 64 communicate via networking, printers, plotters and Prestel. Typewriter style keyboard with special function keys. Program loading either from cassette recorder or disk drives, both extra. View the image on your domestic television set.
SOFTWARE: While a special range of business software is being produced, existing Vic and 40 column Pet programs can be easily converted. Apart from these programs, a machine port accepts plug-in ROM cartridges for business, home and educational applications, while the CPM optional facility gives you the choice of 2000 plus packages.

Genie 1	£299	Home Education	16-48K	No	No	Basic	RS-232C	Lowe Electronics 0629-4995

COMMENT: The Genie 1 comes complete with its own cassette tape recorder and full keyboard with space bar. It's used with your domestic television. The Genie has a programmable internal sound unit and the keyboard gives upper and lower case letters.
SOFTWARE: The Genie 1 uses Microsoft Level 11 Basic, developed for use with the TRS-80 model 11, so there is an extremely wide range of programs available for this machine. Apart from Tandy products, Molimerx Ltd. specialise in TRS-80 software and other independents offer quite a range of programs.

Genie 11	£299	Home Business Education	16-48K	No	No	Basic	RS-232	Lowe Electronics 0629-4995

COMMENT: Supplied without the tape recorder built into the Genie 1, but with its own separate numeric keypad. The keyboard has 71 keys with full typewriter style section and four special function keys. Your own cassette recorder is used for loading programs and the results are viewed on your domestic television set. Disc drive available.
SOFTWARE: The full range of programs for the TRS-80 Model 11 can be used with the Genie 11, as both machines use Microsoft Level 11 Basic. Molimerx specialise in TRS-80 software and have an extensive range apart from the range handled by Tandy. In fact more programs are available for the TRS-80/Genie range than any other micro.

TRS-80 Colour Computer	£299-£369	Home Education	16-32K	Yes	No	Basic	RS-232	Tandy 0922-648181

COMMENT: Lowest priced of the TRS-80 range with 16K memory producing eight different colours. Instant loading program packs or choice of loading from cassettes or disk drives. Upgrade kit £69.95 for extra Basic ROM and hi-res graphics.
SOFTWARE: Wide range of programs covering games and education available from Tandy and Molimerx Ltd.

Tuscan	£309-£1149	Home Education Business	8-24K	No	Yes	Basic Cobol Lisp Pascal	RS-232	Microsystems 01-405 5240

COMMENT: Starter kit available at £309 intended for first time users and schools and skill centres. Exapandable to full CPM, for the person who likes building computers. The home computer is ready assembled with printer and cassette interface expansion slots and has a professional keyboard as optional extra, price £499.
SOFTWARE: Use of CPM opens the door to around 2000 different programs from Wordstar onwards. Plus the extensive range of programs in the Microsystems catalogue.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Midwitch Microcontroller	£375	Education	16K	No	No	Basic	RS-232C	Midwich 0284-701321

COMMENT: Aimed at the education market and a potential competitor for the Research Machines 380Z, the Midwitch MC is a control computer for schools and universities, for research and teaching. Intended for cassette loading of programs the Midwitch uses a version of Basic which is quite close to Microsoft Basic.
SOFTWARE: As this micro uses Basic of a slightly different type, it should be simple to adapt programs that can be run with it. In the education market, most of the users will most likely be producing their own programs rather than relying on commercially produced products.

Nascom 3	£376-£506	Home Education	8-48K	No	Yes	Basic Pascal	RS-232	Lucas Logic 0926-497733



COMMENT: Single piece micro with typewriter style keyboard complete with cassette interface. Disk drives available as optional extras. Graphics facilities and plotting commands in Basic. 16 parallel input/output lines available. Video controller for 40 or 80 column display.
SOFTWARE: CPM opens the door to over 2000 programs. There's also NAS-Pen — Nascom's own word processor plus specialised debugging aids and editor assemblers.

Sharp MZ80A	£477	Home Education Business	48K	No	Extra	Basic Pascal	Other	Sharp 061-205 2333



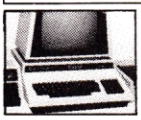
COMMENT: Single unit micro incorporating 9in green screen monitor, cassette recorder and standard typewriter keyboard with numeric keypad. Optional disk drives for faster loading of data.
SOFTWARE: Limited range of software available, but ample for the home user. Small range of business and education programs. Adding the CPM option opens the door for specialist programs including Wordstar.

Atari 800	£499	Home Education Business	16-48K	Yes	No	Basic	RS-232	Atari 01-900 0511



COMMENT: The Atari 800 is the top model of their range and features a typewriter style keyboard and memory expansion to 48K. It retains the excellent graphics facilities of the model 400. Loading of programs from cassettes or cartridges or a disk drive.
SOFTWARE: Apart from the hundreds of software packages for the Atari range, there has been a new trend to produce business programs for the model 800. There is the Chipsoft range from Silicon Chip of Slough who offer:– Stock control, sales ledger, purchase ledger, mail shot and PAYE for around £150 each.

Commodore Series 4000	£550-£695	Home Business Education	16-32K	No	No	Most	IEEE 488	Commodore 0753-79292

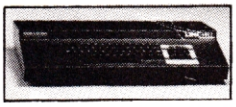


COMMENT: Updated version of the first micro available in the UK, the Commodore Pet. The Series 4000 is a one piece micro with integral monitor with separate disk drives available as extras. You could use cassette loading. Now looking long in the tooth against the competition.
SOFTWARE: The Commodore applications brochure lists hundreds of specialised programs from word processing to most of the applications needed in modern business. A large number of games and educational programs are also available.

DAI Personal Computer	£595	Home Business Education	48K	Yes	Com-patible	Most	RS-232	Data Applications UK 0285-61828

COMMENT: Micro with 16 colour hi-res graphics offering program loading either from cassette or disk drives extra. Sound commands for music generation. The 24K ROM based software includes a fast Basic interpreter, scrolling screen editor, machine code utility program, twin cassette file handling and disk support.
SOFTWARE: CPM compatibility offers a vast range of programs from Wordstar to the most advanced application. Plus a range of Dainasoft programs covering games, education, word processing and viewdata — Prestel.

Link 480Z	£550	Education Business	32-256K	Yes	No	Basic Forth TXED Assembler	IEEE 488	Research machines 0865-49866



COMMENT: Micro specifically designed to be used in a networking system at far lower cost than competitive systems. Basically a simplified 380Z with cassette program loading and choice of 40 or 80 characters on your domestic TV screen or monitor. Full graphics facilities of the Research Machines 380Z, with memory not eaten up by the use of graphics.
SOFTWARE: Compatible with the wide range of programs available for the 380Z.

Hewlett Packard HP75C	£694	Business	16-120K	No	No	Basic	RS-232C HP-IL	Hewlett Packard 03446-3100



COMMENT: Pocket computer with potential for using Visicalc and producing graphics presentations. Battery powered, the memory is retained even when the computer is switched off, making it ahead of larger micros. Plug-in memory modules can increase the ROM memory to 120K. Built-in 32 character liquid crystal display acts as moveable window on a 96 character line. Magnetic card reader gives off-line storage capacity apart from the cassettes normally used to load programs into this pocket micro. Real time clock and non-volatile memory so the HP75 can remind the user of future appointments and run programs unattended. The HP75C comes complete with an HP interface for communications with a range of peripherals and other computers.
SOFTWARE: Two different types. There will be plug-in ROM modules designed to answer specific problems covering finance, real estate, surveying, data analysis and electrical engineering. These will become available in early 1983, while there will also be software ROM based, for graphics presentations in full colour, plus personal time management, data communications, memo writing and Visicalc file management. Tape cassettes will also be available from the HP users library to be used with the HP82161 Digital Cassette Drive.

Commodore 510	£695	Home Education Business	64-256K	Yes	Extra	Most	RS-232C IEEE 488	Commodore 0753-79292

COMMENT: Combines the features of the Commodore 720 and 64 in a single package. Full QWERTY keyboard with programmable special function keys and separate numeric keypad. Display on your domestic TV set 40 characters by 25 lines. High resolution graphics 320 × 25 pixels and 16 colours available simultaneously. Provision for loading programs from cassettes or disk drives. SID — Sound Interface Device controls the sound and provides three voices each with a nine octave range. The 6567 chip lets you create three dimensional graphics.
SOFTWARE: Currently no software has been specifically produced, however it's likely that many of the existing Commodore programs will be compatible with the 510.

BUYER'S GUIDE
HARDWARE

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Apple 11 Plus Europlus	£699	Home Business Education	48K	Extra	Extra	Basic Pascal Fortran Cobol Logo	RS-232 other	Apple UK 0442-60244



COMMENT: One of the first major products in the micro boom, the others being Pet and TRS-80, the Apple 11 Plus is still going strong, basically because it can be all things to all people. With eight slots in the back, you can start with a disk drive and printer and develop to using an 80 column card, colour and CPM with a Z80 card. You can even increase the memory to over 256K by the use of independent cards that slot into the back of the machine. Apple were the first to have extensive colour graphics facilities hence their popularity for games. The basic Apple has a fairly standard keyboard, without a numeric keypad and programs can be loaded from cassette recorders or the disk drives. Independent companies provide 8in disk drives and Winchester hard disks. Depending on your choice of separate monitor or domestic television set, you can have a black and white image or colour, just by adding the appropriate card in the back of the Apple.
SOFTWARE: Apart from the TRS-80, there is more software available for the Apple than any other micro on the market.
Plus hundreds from the independent companies including Visicalc responsible for selling more Apples to businessmen than any other software package. There is a very wide choice of specialised programs for most types of small business. Add the Z80 card and you have access to the 2000 programs using CPM. So your choice of programs is literally unlimited.

Sorcerer	£790	Business Education Home	48K	No	Extra	Most	RS-232	EMG Micro 01-688 0088

COMMENT: Desktop micro that has typewriter style keyboard with separate 16 key numeric keypad. Provision for cassette program loading or floppy disks or even a hard Winchester disk, depending on the application. Special video/disk unit incorporating 12in green screen monitor and twin 5¼in floppy disk drives and CPM operating system available as optional extra.
SOFTWARE: EMG have programs available covering business and education. Their current list has around 20 different business packages and 50 educational programs. Using CPM you have the vast range of over 2000 packages available.

Canon TX10/15	£800	Business	15-31K	No	No	Basic	RS-232C	Canon 01-680 7700

COMMENT: Two desk top micros using the 6809 processor with built-in 20 column display and 26 column dot compact printer giving red or black originals with two copies. The TX10 keyboard has a separate numeric keypad and uses a program controlled key block, which can be tailored to your exact needs. This allows one touch program selection. The TX15 has a typewriter keyboard with individual keys used for easy program selection. Both the TX10 and 15 can be used with a modem for data communication with mainframe computers.
SOFTWARE: Both the TX10 and 15 are intended for specific applications like banking, money exchange, car dealers and telecommunications with special packages for each type of operation.

Commodore Series 8000	£895-£1195	Business Education	32-96K	No	Extra	Basic Pilot Pascal Assembler Lisp Forth	IEEE 488	Commodore 0753-79292



COMMENT: Commodore had the first micro in this country, known as the Pet. This is their vastly updated version with typewriter style keyboard, built-in monitor, with disk drives separate from the basic unit. Unlike the smaller models the 8000 series gives you a full 80 columns for word processing. Design and specification wise it's now being overtaken by the newcomers who offer more advanced specifications for similar prices.
SOFTWARE: Commodore have built up a wide range of programs for the 8000 series, from information management, through word processing to management planning and finance. Further programs cover costing, retail, planned maintenance, construction and engineering. A 42 page brochure called "Using your computer" details the comprehensive range of software for the Commodore range.

Pearcom	£895	Home Business Education	48-96K	Yes	Extra	None supplied	RS-232	New supplier to be announced

COMMENT: Apple clone offering 14 slots, 6 more than Apple 11 Plus. The Apple keyboard has been replaced with a board having a separate numeric keypad and special function keys. Pearcom gives four more colours than Apple 11, so programs working correctly on Apple may give different colours on the Pearcom. But this is something easily solved with software. The additional slots at the back let you add far more cards to expand your outfit. You have an upper and lower case facility, by the use of software. Programs can be loaded from cassettes or disc drives.
SOFTWARE: Supplied without monitor or operating system, so these must be purchased before you can use the Pearcom. Then you have access to the extensive range of Apple software. Add a Z80 card and add the vast range of CPM software.

Sharp MZ80B	£899	Home Education Business	64K	No	Extra	Basic Assembler Pascal	RS-232C	Sharp 061-205 2333



COMMENT: Desktop micro with built-in 9in green screen monitor and cassette drive. Standard keyboard with separate numeric keypad and ten special function keys. Optional graphics facilities and disk drive units for when you find the tape system takes too long.
SOFTWARE: Currently 15 business programs are available and the number is increasing all the time. By adding the CPM facility, you have an almost limitless range of programs covering most business applications.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Commodore 700 series	From £995	Home Business Education	128-256K	No	Extra	Basic	RS-232C IEEE 488	Commodore 0753-79292



COMMENT: Desktop micro with adjustable monitor, typewriter style keyboard and twin 5¼in floppy disk drives, in a single unit. Second processor capability (Z80, 8088, 6809). Adjustable monitor produces an 80 column by 25 line display. Four models in the 700 range from £995 to the top of the range at £1995. All models have 80 column display monitor.
SOFTWARE: Though no software has been currently announced, it's likely that the 700 series will be compatible with the wide range of existing Commodore programs.

Genie 111	£999	Business Education Home	64K	No	Yes	Basic	RS-232	Lowe Electronics 0629-4995

COMMENT: Single cabinet houses 12in green screen monitor, disk drive and keyboard, which is detachable. Second disk drive can be added making a total price of £1175. Floppy disks can be replaced by a 5¼in hard disk. Monitor provides 80 column display with graphics facilities. Keyboard has 85 keys with numeric keypad. CMOS real time clock with battery backup.
SOFTWARE: The Genie 111 is compatible with CPM or Level 11 Basic, which means that there is an almost unlimited range of software packages for this micro.

£1,000-£1,999

Basic 108	£1095	Business Education Home	64-128K	Yes	Yes	Extra	RS-232C	Community Computers 07308 7567

COMMENT: The Basic claim to fame comes from its Apple 11 compatibility, while offering a more advanced specification. Unlike the Apple, the Basic has both the 6502 and Z80 processors, so the whole range of CPM software is available without any extra cards for the operation. Apple drives can be used with the Basic and there is provision for mounting two drives above the computer unit. Colour is available as standard and the Basic produces an image 80 characters wide on your monitor. The keyboard is connected to the computer by a ribbon cable and has standard typewriter layout with numeric keypad and programmable function keys.
SOFTWARE: Any of the Apple software for the Model 11 Plus can be used, one of the largest ranges of software for any computer on the market. Plus the Z80 facility opening the door to 2000 plus CPM programs.

Cromenco Personal Computer	£1095-£1795	Business Education	64K	No	Yes	Basic Cobol Fortran	RS-232	Comart 0480 215005

COMMENT: Three piece system including software and optional printer. Ergonomically designed keyboard which is detachable and the 12in monitor shows an 80 character by 25 line display. The single 5¼in floppy disk drive has a capacity of 390K. At £1795, this outfit also includes a 120 characters per second daisy wheel printer.
SOFTWARE: The Cromenco Personal Computer is supplied complete with a word processing package and a financial spreadsheet, so it's ready to use. Plus the vast range of CPM based software available when you need it.

Osborne 1	£1250	Business	64K	No	Yes	Basic Most	RS-232C IEEE 488	Osborne 0908 615274



COMMENT: First of the truly portable micros that comes with its own built-in case to produce a weatherproof package. The keyboard folds down on the computer to form a lid with the total package weighing 24lb. Standard typewriter style keyboard with separate numeric keypad. Built-in twin 5¼in floppy disk drives producing up to 60 pages of typed text on each disk. Small monitor measuring 5in across fitted in between the two disk drives providing a 52 character window on a 128 character line. Optional extras include modem, battery pack and double density disk drives.
SOFTWARE: The Osborne comes complete with CPM as its operating system, plus Wordstar including Mail Merge, Supercalc, M & C Basic. £800 worth of software in a micro costing £1250 complete. Plus the possibilities of using CPM, the most popular operating system in the world for any extra software you need.

Hewlett Packard HP86A	£1251	Business	54-500K	No	Yes	Most	RS-232	Hewlett Packard 03446-3100



COMMENT: Desktop micro using separate disk drives for program loading and a separate monitor. Typewriter style keyboard with separate numeric keypad and 14 user definable function keys.
SOFTWARE: The HP86A uses the Hewlett Packard Series 80 software including statistics and engineering packages costing from £68 to £143. There are also four specialised programs for the HP86A. These are Visicalc Plus £178, Graphics Presentation £178, Basic Training Pack £68 and Word 80 £178. Plus the vast range of programs under CPM.

Compucolor 11	£1275	Home Education Business	64K	Yes	No	Basic	RS-232C	Dyad Developments 08446 729

COMMENT: Single piece micro with single disk drive and colour monitor with detachable keyboard. Typewriter style keyboard with options of boards with special function keys or numeric keypad. Standard keys have clearly marked dual functions. Extensive colour graphics facilities.
SOFTWARE: Range of programs in Basic available.

Andromeda 12L	£1299	Business	64K	No	Yes	C-Basic	RS-232	Kram Electronics 0533-27556

COMMENT: The Andromeda has twin 5¼in floppy disk drives mounted alongside the monitor, while the keyboard is separate and has typewriter style plus a numeric keypad. There is also a light pen facility.
SOFTWARE: Using CPM there is a choice of over 2000 programs available including Wordstar.

Mimi 802	£1350	Business Education	64K	No	Compatible	Most	RS-232C	British Micro 0923-48222/43956



COMMENT: British made micro with twin double sided, double density 5¼in disk drives included in the price. Colour coded keyboard with numeric keypad and 17 programmed function keys. Options include a Winchester hard disk, high resolution graphics and matching monitor with choice of orange or green display. Disk format conversion facility. Light pen socket.
SOFTWARE: Mimi uses OS/M as its operating system, which is compatible to CPM, so there is a wide range of programs already available including Wordstar. British Micro are developing Trojan — a major software innovation that simplifies the learning process and makes creating programs simple. British Micro are already using this product themselves to generate new programs for the Mimi.

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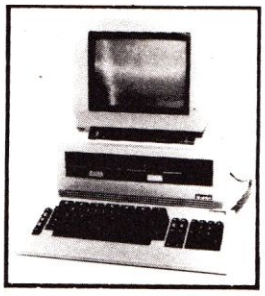
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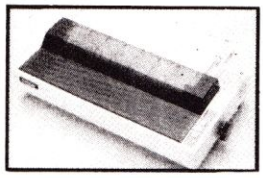
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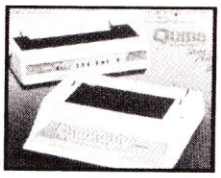
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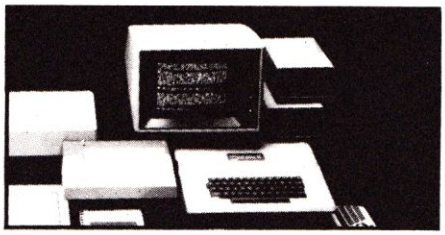
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£110	QUME Form Tractor TEC Starwriter 40/55		

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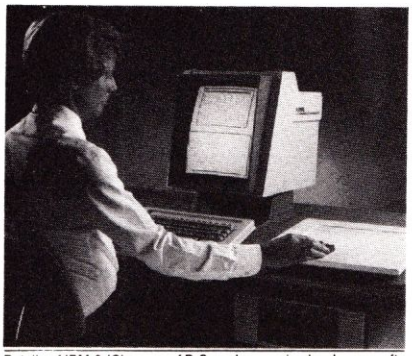
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CIRCLE NO 147

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
TRS-80 Model 111 Business	£1399-£1699	Business	48K	No	No	Basic Cobol Fortran	RS-232C	Tandy 0922-648181

COMMENT: Desktop machine incorporating 12in monitor, one or two 5¼in disk drives and a keyboard with separate numeric keypad. The TRS-80 Model 111 can be bought with one or two disk drives and an extra two can be added later on. In the USA TRS-80 was the first large selling microcomputer and it had been the largest seller until Sinclair came along.
SOFTWARE: Programs for the TRS-80 are available in a wider range than even Apple packages. Apart from the range of programs from Tandy, Molimerx have an extensive range of software for this micro. Most of the independents also have TRS-80 programs.

Signet 202S	£1400-£1750	Business Education	64K	No	Yes	Basic Fortran Cobol Pascal	RS-232C	Micro APL 01-834 2687

COMMENT: Compact machine with twin 5¼in drives each 188K. Supplied complete with the Micro Span self-teaching interactive software system, taking the beginner through the entire system in 14 days. Similar version with double sided, double density drives available £1750.
SOFTWARE: Using CPM a vast range of packages are available including Wordstar. The APL Z-80 4.1 Interpreter and Micro Span self-teaching system costs £450. Microtask project development utility £200, Microfile data storage utility £200, Microphot graphics utility £200, Microlink communications utility £200. Microform forms generator £200. Wordstar £300. Mail Merge £100, Spellstar £125, Supersort £125, Calcstar £150. Three compilers are also available for Pascal, Fortran and Basic £200 each.

Canon TX25	£1450	Business	15-31K	No	No	Basic Assembler	RS-232C	Canon 01-680 7700

COMMENT: Desktop computer using the 6809 processor with built-in 20 column display and 26 character dot impact printer producing red or black originals and two copies. Built-in disk drive for Canon floppy disks, 4in diameter with 8K capacity. The principal use for the TX25 is creating application software.
SOFTWARE: None supplied. User creates the packages in Basic or Assembler.

Galaxy 1	£1450	Business Education	64K	No	Yes	Most	RS-232C	Gemini 02403 28321

COMMENT: Two piece computer with the twin 5¼in floppy disk drives housed separately. Twin Z80 processors with each of the disk drives having 400K storage. 80 column display on monitor — extra — with pixel graphics facility. Cassette and light pen interfaces also supplied.
SOFTWARE: CPM is the operating system chosen for the Galaxy and supplied with each machine you have — Comal-80 structured Basic, GEM-Pen text editor formatter, GEM ZAP Z80 editor/assembler and GEM DEBUG, a de-bugging utility. With the vast choice available, under CPM, you can use everything from Wordstar to the most specialised program.

Tuscan Dual	£1449-£2365	Home Education Business	60K	No	Yes	Basic Cobol Lisp Pascal	RS-232	Microsystems 01-405 5340



COMMENT: Supplied with either twin 5¼in or twin 8in floppy disk drives and typewriter style keyboard with 71 keys and separate numeric keypad. Additional monitor shows 64 columns and 32 graphics characters.
SOFTWARE: Using CPM over 2000 programs are available. Plus the Microsystems catalogue that contains over 100 packages.

Kaypro 11	£1495	Business	64K	No	Yes	Most	RS-232	LSI Computers 04862-23411

COMMENT: Kaypro is another portable computer on the lines of the Osborne. However the Kaypro has larger capacity disk drives and a 9in monitor. The keyboard has a separate numeric keypad and there are programmable function keys. The entire system is housed in a steel case with the keyboard folding on top to provide a lid.
SOFTWARE: Although the Kaypro uses CPM, it's supplied with software ready to use. Microplan — a financial modelling package, Select — the latest word processing package and M-Basic a powerful programming language. Options include dBase 11, Spellguard and a whole range of CPM based programs currently over 2000.

Research Machines 380Z	£1601-£3347	Home Education Business	32-56K	Extra	Yes	Basic Forth	RS-232 IEEE 488	Research Machines 0865-49866



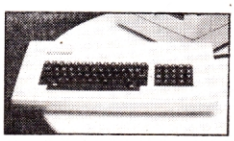
COMMENT: The RML range has sold largely to schools and colleges with its CPM operating system and wide range of interfaces. It has been included in the Department of Industry Micros in Schools Scheme. The basic micro consists of the typewriter style keyboard with separate disk drives. A wide range of plug-in boards extend the RMLs possibilities. It can be bought complete with monitor and can load programs and data from disks or cassettes. To reduce the cost of an RML outfit, deduct the cost of the drives and load your programs from a cassette recorder.
SOFTWARE: Apart from the vast range of programs available under CPM — currently over 2000 including Wordstar, RML also supply a catalogue of software from a wide range of independent companies. Currently there are over 75 programs covering education, games, commercial and financial programs and statistics. Prices range from £5 to £80.

Hewlett Packard HP87	£1739	Business	32-544K	No	Yes	Most	RS-232	Hewlett Packard 03446-3100



COMMENT: Single piece desktop business micro with integral monitor for 24 line display combined with typewriter style keyboard having separate numeric keypad and special function keys. Can be connected to mainframe computers. Program loading and data storage from separate 5¼in floppy disk drives with hard disks available as optional extras.
SOFTWARE: Accepts the Hewlett Packard range of Series 80 software including statistical and engineering packages, a whole host of programs under CPM, plus Visicalc Plus, Graphics Presentation and Word 80 each £178 and Basic Training pack £68.

Xerox 820 & 820-11	£1750-£2350	Business	64K	No	Yes	Most	RS-232	Rank Xerox Uxbridge 51133



COMMENT: Based on the Z80 chip, the Xerox 820 range is a three part system comprising monitor, keyboard and floppy disk drives. The new 820-11 has a monitor with 80 character display with green on black option. The keyboard is typewriter style with a separate numeric keypad. Though the 820 is supplied with 5¼in drives, 8in drives and hard disks can be used. Provision for communication with other micros making the 820-11 an intelligent terminal.
SOFTWARE: Apart from the range of over 2000 programs available under CPM, Rank Xerox also have a wide range of application programs in their catalogue.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Haywood 9000	£1795	Business	64K	No	Yes	Basic Fortran Cobol Pascal	RS-232C	Haywood Electronics 01-428 0111



COMMENT: Desktop micro computer with detachable keyboard, using twin 5¼in floppy disks mounted alongside the 12in monitor producing an 80 column display. W version available with Winchester hard disk for greater data storage. Plug-on Wordstar keyboard available. Sculptured keyboard with numeric keypad and 35 special function keys.
SOFTWARE: Using CPM as an operating system, the Haywood 9000 has access to over 2000 programs from Wordstar to the most sophisticated applications package.

System M-Three	£1795- £3150	Business	64K	No	Yes	Most	RS-232	LSI Computers 04862-23411

COMMENT: British made single piece micro with detachable keyboard. Cabinet houses the 12in green screen monitor and twin disk drives. These disks can be single, double or quad density according to the application. Another version of the System Three uses 8in disks for greater storage capacity. The monitor produces an 80 column display plus graphics. While the keyboard has 109 keys including the standard QWERTY plus editing, cursor control and 24 programmable function keys, and a numeric keypad.
SOFTWARE: System M-Three uses CPM, the most popular operating system giving a range of over 2000 programs, plus the following programs from LSI:– Modular accounting package comprising sales ledger 2000 accounts, purchase ledger 2000 accounts, nominal ledger 1000 accounts, stock control 3500 items. Plus packages for word processing, prospect mailing, payroll and the Oasis range of accounting systems.

Superbrain 11	£1800- £2415	Business Education	64K	No	Yes	Most	RS-232	Icarus 01-485 5574



COMMENT: Single unit housing 12in monitor, twin disk drives and typewriter style keyboard with numeric keypad. Twin Z80 processors for efficient data transfer to other peripherals like printers. Real time battery operated clock. Three versions with 5¼in floppy disks, the JR with twin 160K drives £1800, QD with twin 338K drives £2150 and the SD with twin 750K drives at £2415.
SOFTWARE: The Superbrain uses the CPM operating system, so there are 2000 packages available covering most applications from Wordstar and Spellbinder for word processing to the most specialised use.

Hewlett Packard HP125	£1845- £2690	Business	64K	No	No	Basic	RS-232	Hewlett Packard 03446-3100



COMMENT: The HP125 uses twin 5¼in disk drives to provide 512K of on-line storage. The Model 20 in this series uses 8in disks and other versions are available that include a green screen monitor and thermal printer. Detachable typewriter keyboard with separate numeric keypad and eight user definable keys.
SOFTWARE: Visicalc 125 on 5¼ and 8in disks £134, Graphics both sizes also at £134. Word 125 available in both versions price £336. Link 125 at £84. Basic 125 £218 and HP125 programming pack £50.

Grundy 8202/ 8222	£1850- £4500	Business	64- 256K	No	Yes	Most	RS-232C	Micro Memory Systems 0635-40405

COMMENT: The Grundy is a two piece computer with twin disk drives and a 12in monitor housed in a single cabinet. The typewriter style keyboard is separately connected by a short lead. This keyboard has a numeric keypad. Both the drives are 5¼in of 0.5 Mbyte capacity. The 12in green screen monitor shows an 80 column display. The model 8222 replaces the twin floppy disks, with one floppy and one Winchester hard disk which can be 6, 12 or 18Mbyte depending on the application. Security lock to prevent unauthorised use.
SOFTWARE: Vast range of over 2000 packages available including Wordstar to cover most applications.

Sord M23 Mark 1	£1870- £2266	Business	128K	Yes	No	CBasic	RS-232C	Sord 01-930 4214

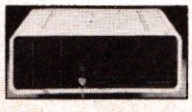
COMMENT: Three part system including 12in green screen monitor (colour 14in at £2266), twin disk drive and typewriter style keyboard. First micro using the new micro-floppy disk, 9cm diameter with storage of 290K. Uses Sords own graphics language SGL.
SOFTWARE: No specific software announced, however using Sord PIPS you could write your own programs with no knowledge of any programming language although this is not advisable for a first time user.

Sord M23 Mark 111	£1870- £2266	Business	128K	Yes	No	CBasic	RS-232C	Sord 01-930 4214



COMMENT: The Mark 111 version of the Sord M23 uses standard 5¼in floppy disks and can be supplied complete with a 14in colour monitor (£2266). The typewriter keyboard has a separate numeric keypad and special function keys. The M23 uses Sords own SGL graphics language with a separate plug-in cartridge with its own 64K RAM, making a total of 192K when installed.
SOFTWARE: While no programs have been announced, using Sord PIPS you could it is claimed create your own programs without needing to know any programming language at all. Sord also intend to introduce a range of cartridges so you can use the M23 without floppy disks. First products will be PIPS, Basic and a word processing package.

Comart Communicator CP range	£1895- £2495	Business	64K	No	Yes	Basic Fortran Pascal Cobol	RS-232	Comart 0480 215005



COMMENT: Basic computer, keyboard and monitor extra. Built-in expandability including being ready for Prestel and Viewdata. Twin 5¼in floppy disk drives each with 390K capacity. Seven expansion slots for growth. CP200 has higher capacity disks at £2495.
SOFTWARE: Database management, word processing, production and stock control, business systems and financial planning. CAP Application software for:– invoicing, sales, purchase, nominal ledger, payroll, inventory control. Plus the range of 2000 programs available under CPM.

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CIRCLE NO 148

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Caltext 1/1A	£1899-£2149	Business	64-256K	No	Yes	Basic Microcobol Fortran Pascal	RS-232C	Computer Ancillaries Egham 36455

COMMENT: Desktop micros with detachable keyboards. 12in green screen monitor with 80 column display. Typewriter style keyboard with numeric keypad. Twin 5¼in floppy disk drives. Special function keys on keyboard for word processing. Provision for link-up with IBM mainframe computers. Model 1 64K, 1A 256K.
SOFTWARE: Apart from the vast range of over 2000 programs available under CPM, Computer Ancillaries also supply the range of Oasis business software and Microplan.

Seed System One 32SS5	£1900	Business	32K	No	No	Cobol Basic Assembler	Other	Strumech 054-33-78151

COMMENT: Business system based on the 6809 chip. The twin 5¼in disk drives are housed in a single cabinet with the monitor. The System One is expandable to 56K and can support up to 8 input/output devices. This was the first system of its type based on the 6809 chip. Double headed version available £2300.
SOFTWARE: Wide range of system software available including text editor, processor, assemblers and compilers. Business packages available include stock control, sales and purchase ledger and a mailing program. These programs are available as separate modules or as a fully interactive package.

Seed System 19	£1900-£4895	Business	32K-1MB	No	No	Basic Pascal Cobol	RS-232	Strumech 05433-78151

COMMENT: Micro computer system using the Motorola 6809 processor expandable from 32K to 1 megabyte. Choice of single user operating systems or the OS-9 multi-user/multi tasking system. Variety of storage systems from 5¼in floppy disks through 8in floppies to 10 MByte hard disks. Monitor and disk drives extra.
SOFTWARE: Under the Microware OS-9 and SSB DOS 69 software there are a range of programs available for the Seed System 19, including the Styleograph Word Processor £130.

Hewlett Packard HP85A	£1917	Business	16-32K	No	No	Basic	RS-232	Hewlett Packard 03446-3100

COMMENT: Single piece desktop unit with built-in 5in monitor with 32 character display and thermal moving head printer. Typewriter style keyboard with separate numeric keypad and plug-in tape cartridges. Plug-on modules are also available for extending the memory.
SOFTWARE: Special Application packs are available for the HP80 series micros. They include general statistics, finance, application circuit analysis, linear programming, wave form analysis and statistical programs. All costing £68. The HP85A also has Visicalc Plus, File Manager, and Graphics Presentation as three of a range of programs all costing around £140 each.

Zenith Z100	£1973-£2453	Business	128-768K	Yes	Yes	Most	RS-232	Zenith 0452-29451

COMMENT: Single piece micro with both 8 and 16 bit micro processors, incorporates single 5¼in disk drive with 320K capacity. Hi-res graphics facilities with resolution of 320,000 dots normally found only with dedicated graphics terminals. Unlike most colour micros the Zenith controls eight colours for higher resolution results. Multi-user capability and compatible with mainframe computers. Another version has twin disk drives and costs £2453.
SOFTWARE: Apart from the vast range of programs available under CPM, Zenith also supply their Multiplan — an electronic spreadsheet costing £135.

Transtec BC2	£1975-£2400	Business	64K	No	Yes	Most	RS-232	Transtec 0272-277462

COMMENT: Single unit computer with all three components, monitor, twin disk drives and keyboard housed in a single cabinet. 12in green screen monitor with 80 column display. Typewriter style keyboard with eight way cursor control, nine special function keys and a numeric keypad. Capacity of 5¼in disk drives 800K. Eight multi-level expansion connectors. The outfit comprises the BC2 plus a choice of printer depending on the package chosen. The Olivetti DM5050 print head matrix printer operating at 100 characters per second is used for all the packages apart from word processing. The word processing package uses the Smith Corona daisy wheel printer.
SOFTWARE: Transtec financial package comprising BC2, Olivetti printer and Calcstar £1975. Transtec Total Database includes the same hardware plus the Datastar set of programs £1990. Transtec word processing package includes the BC2, Smith Corona daisy wheel printer and word star, £1990. Transtec total accounting package including the BC2, Olivetti printer and Business Desk a fully integrated accounting software suite £2400.

Philips P2000	£1990	Business	16-48K	Yes	No	Basic	Other	Philips 01-580 6633



COMMENT: Business micro that can run programs from cartridges or floppy disks and can accept data from cassettes. 12in green screen monitor with twin 5¼in floppy disk drives. 80 column display shown on the monitor with full colour graphics. The P2000 has slots for insertion of program cartridges and a special slot for mini-cassettes which can hold up to 39,000 characters per side. Typewriter style keyboard with separate numeric keypad and special function keys.
SOFTWARE: Range of special programs covering Payroll, nominal ledger, purchase ledger, stock recording, sales ledger and analysis ledger. Prices of individual programs averages £150. A special word processing package costs £230, while the BIS — Business Information System, has just been launched which has a universal application from graphics to moving effects, set up announcements and can be used for presentations and training. Price on request.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Director System	£1999	Business	64K	No	Yes	Most	RS-232C	Anglotech Slough 74201

COMMENT: Desktop micro with built-in 7in monitor and twin double sided, double density 5¼in floppy disk drives and detachable keyboard. Can also be linked to Anglotech hard disk system. 16 bit video RAM allows the system to be Prestel compatible.
SOFTWARE: Another micro using CPM with a choice of over 2000 programs.

£2,000-£3,000

Haywood 3000	£2100	Business	64K	No	Yes	Basic Fortran Cobol Pascal	RS-232C	Haywood Electronics 01-428-0111

COMMENT: Single board computer with separate disc drive unit and monitor. Programmable counter/timer with four channels. The twin disc drive unit takes 5¼in disks which have a capacity of 350K per drive. This equals 130 pages of A4 on each disk.
SOFTWARE: Micromass business programs are fully integrated through stock control, invoicing, sales and purchase ledger. The entries, payroll, management accounts, P11D through to trial balance complete this powerful business system. You also have the facility of using any of the extensive range of programs using CPM, which includes Wordstar.

System M-Four	£2150	Business	128-256K	No	Yes	Most	RS-232	LSI Computers 04862 23411

COMMENT: Two systems in one with the 8088 16 bit chip and the Z80 8 bit chip, offering the choice of either type of operation. Single unit with detachable keyboard. Range of disk drive options from 5¼in floppies to hard disks. Up to three concurrent users. 12in monitor with green screen, graphics facility plus 80 column display.
SOFTWARE: The System M-Four uses five operating systems MSDOS, CPM, CPM86, MPM86 and LSI NET for the widest range of programs. CPM alone gives a choice of 2000 programs, the additional operating systems offer the widest range of any micro on the market.

North Star Advantage	£2195	Business	64K	No	Yes	Basic Fortran Cobol	RS-232C	Comart 0480 215005

COMMENT: Desktop machine with 12in green screen monitor, twin 5¼in floppy disk drives and Selectric style keyboard in a single cabinet. Monitor offers choice of 80 character display or bit-mapped graphics from simple line charts and bar charts to three dimensional charts and complex three dimensional forms. Typewriter style keyboard has 87 keys including 15 special functions and 14 key numeric keypad. Versions available with Winchester hard disk.
SOFTWARE: North Star Application Support Orogram Operating system provides sequential and random file management for North Star packages:– ACCPAC order entry/invoices, accounts receivable and payable, general ledger, Northword a word processing package, Mail manager for mailing list management and Info management for Data management. Plus the vast range of programs available under CPM, around 2000 including Wordstar.

Pasca 640	£2200	Business	64K	No	Yes	Most	RS-232C	Westrex 01-578-0950

COMMENT: Single unit micro with twin disk drives, 8in IBM format, green screen monitor and keyboard with separate numeric keypad, all housed in a single cabinet. Typewriter style keyboard with 18 special function keys for user defined operations or CPM control sequences.
SOFTWARE: Another CPM operating system means over 2000 programs available to cover most applications.

Scorpion (available early 1983)	£2200	Business Education	64K-1MB	Yes	Yes	Most	RS-232	Dyad Developments 08446-729

COMMENT: Desktop micro using both the Z80 and 8088 chips offering the advantages of an 8 and 16 bit machine. Colour monitor 14in producing an 80 column display plus high speed colour vector generation, allowing the Scorpion to define multicolor shapes or text of any size. Single cabinet contains both the monitor and twin disk drives each having 380K capacity. Typewriter style keyboard with numeric keypad.
SOFTWARE: Using CPM and both Z80 and the 8088 chips makes the choice of packages vast indeed. Over 2000 programs are available.

Acclaim	£2225-£4450	Business Education	64K	Extra	Extra	Most	RS-232	Country Computers 0527-29826

COMMENT: If you wanted an Apple 11 Plus, but weren't satisfied with the 40 column display, extra monitor and limited disk storage, the Acclaim is the answer. In a single cabinet you have a green screen monitor and a choice of single 5¼in disk drive, twin floppies right up to Winchester hard disks. The keyboard is detachable and has a separate numeric keypad, plus 12 programmable function keys. The monitor gives you the choice of 40 or 80 character displays, so you have all the Apple compatibility plus extra features in a single unit.
SOFTWARE: The Acclaim accepts all the Apple software, so you have a choice thats unlimited, plus when you add the Z80 softcard the whole 2000 plus CPM packages become available including Wordstar.

Cromenco System 1/2	£2295-£2620	Business Education	64-512K	Yes	Com-patible	Basic Fortran Cobol RPG 11 Ratfor	RS-232	Comart 0480 215005

COMMENT: Desktop system needs keyboard and monitor as essential extras. 8 slots for expansion. Twin 5¼in floppy disks drives. The System 2 is designed for rack mounting and has 17 slots for expansion. Both micros produce colour graphics using the SD1 interface, with 16 shades of 256 colour ranges, giving a total choice of 4096.
SOFTWARE: Packages available for Database management, word processing, CAP applications, sales ledger, invoicing, purchase and nominal ledger, payroll and inventory control. Plus the extensive range of programs available under CPM.

Eagle 11	£2350-£3650	Business	64K	No	Yes	CBasic	RS-232	Mediatech 01-903-4372

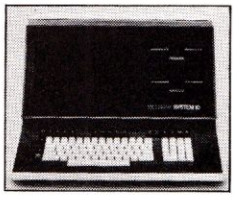


COMMENT: Single unit desktop micro computer comprising the 12in monitor with 80 column display, twin 5¼in floppy disk drives and an IBM Selectric keyboard with separate numeric keypad. The twin drives have a total storage capacity of 768K.
SOFTWARE: The Eagle 11 is supplied complete with software, so its ready to use rightaway. In the Office Management configuration you receive the Spellbinder word processing package including Mail Merge and Mail List. Plus the electronic spreadsheet Ultracalc and CPM and MBasic. This system costs £2350. The Business set-up includes the Accounting Plus suite of programs plus Spellbinder, CBasic and CPM for £3650.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
DEC Rainbow 100	£2359	Business Education	64-256K	Extra	Yes	Most	RS-232	Digital Equipment 0256-59200

COMMENT: The Rainbow uses the Z80 and 8088 chips, so you have a dual 8-16 bit machine which automatically senses the type of program and selects the correct processor. Complete system including the disk drives, monitor and typewriter style keyboard. There are two 5¼in disk drives, and optional Winchester hard disks. The 12in monitor produces an image 80 columns wide with an optional colour monitor available. The ergonomically designed keyboard has special function keys and a numeric keypad.
SOFTWARE: Using a combination of CPM and CPM 86, you have a choice of over 2000 programs plus those available through the DEC catalogue. So if you want a machine to use for the future, the DEC Rainbow is a good choice.

Millbank System 10	£2395-£2895	Business Education	65K	No	Yes	Basic Fortran Pascal Cobol PL/1	RS-232 1EEE 488	Millbank Computers 01-788-1083



COMMENT: Single piece desktop machine with 12in monitor showing an 80 column display, with twin 5¼in disk drives and a typewriter style keyboard with separate numeric keypad. Power down protection device. 32 bit arithmetic processor. Direct memory addressing makes the system 10 faster than other micros claiming 4 MHZ processing speed. Can be used with the Millbank CTX10 Telex system. Using this system the CTX10 can be combined with other CPM based packages to offer a simultaneous word processing, business computing/telex combination. The CTX costs £1600. The System 10 is also available with a 5 Mbyte hard disk.
SOFTWARE: Apart from the vast range of CPM based software that can be used with the System 10, Millbank have these specialised packages:— Financial Director — a complete suite of interactive British Accounting Software, R.E.A.M.I.S. — Residential estate agents management information system, Instrumentation/Process control — a range of scientific/industrial packages for specialist users, Solicitors — User specific data retrieval/work processing package utilising standard legal terms and phraseology.

Olivetti M20	£2395	Business Education	160-500K	No	Extra	Basic Pascal Fortran	RS-232 1EEE 488	Olivetti 01-785-6666



COMMENT: True 16 bit micro with twin 5¼in disk drives above an Olivetti typewriter style keyboard which has a separate numeric keypad. Monitor supplied, fully adjustable, in green or monochrome. Provision for using Winchester hard disks up to 11 Mbytes. Full graphics facility outside RAM. Wide range of printers available.
SOFTWARE: The M20 uses MSDOS and PEKOS, CPM 86 will be available soon. Olivetti already have a full range of accounting packages for the M20, plus Multiplan £175, Oliword £300, Oliterm a TTL emulator £150 and Oli Com a communications program £300. The Olivetti catalogue contains around 100 programs.

Sirius 1	£2395	Business Education	128K-1MB	Extra	CPM86	Basic Cobol Fortran Pascal	RS-232C 1EEE 488	ACT 021-501-2284



COMMENT: Certainly the most publicised 16 bit computer apart from the IBM, which isn't even officially imported yet by IBM. Using the Intel 8088 chip offers far more possibilities and expansion to 1 Mbyte. The Sirius is self-contained with its own 12in green screen monitor showing 80 or 132 characters to the line. The twin 5¼in disk drives have a total capacity of 1.2 Mbytes. While the keyboard features an IBM style nucleus with separate numeric keypad. Hi-res graphics included for charts, graphs and half tone pictures. Codec audio controller for verbal prompts and operating instructions. Ergonomically the monitor screen tilts and swivels and has a glare proof screen. The keyboard is separate.
SOFTWARE: CPM 86 is the latest version of the popular operating system. Already you have Micromodeller, Supercalc, Wordstar, Spellstar and Mailmerge available. In addition ACT themselves have developed the range of Pulsar range of business programs including sales and purchase ledger, analysis, product management reports and nominal ledger. ACT also have a registered product list with a range of applications totalling one hundred at the moment including applications like double glazing, golf clubs, coach operations, patient records, video library, pharmacy, travel agents, technograph analysis and a recruitment program.

Apple *III*	£2418	Business Education	128-256K	Extra	No	Basic Pascal Cobol Assembler	RS-232	Apple UK 0442-60244



COMMENT: Big brother to the best selling Apple 11 Plus, the Apple 111 hasn't had the same success. Having a typewriter style keyboard and separate numeric keypad, the Apple 111 uses a new type of operating system known as SOS — Sophisticated operating system. There is one disk drive built-in with provision for another three to be used. A special hard disk known as Profile gives a storage capacity of 5 MBytes and up to four can be used with the Apple 111. Unlike the Apple 11, the model 111 provides an 80 column display on a special green screen monitor supplied as part of the system. There is a special emulation mode to let you use Apple 11 software on this new model, so the Apple 111 offers the features of a larger machine plus access to the best selling packages for the model 11.
SOFTWARE: Apart from the vast supply of Apple 11 software that can be used in the emulation mode.

ICL Model 10-31	£2421-£4321	Business	64-128K	No	Yes	Basic Cobol Fortran Lisp Pascal	RS-232	ICL 01-788-7272

COMMENT: Range of micros ranging from the twin 5¼in floppy disk drives to hard disks. Available without keyboard or monitor or as system. Complete systems comprise the computer model 10, twin disk drives, keyboard and printer producing 120 C.P.S.
SOFTWARE: Wide range under CPM. Over 2000 programs, plus the range from ICL.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Altos Series 5-15D	£2425	Business	192K	No	Com-patible	Most	RS-232C	Logitek 0257 426644

COMMENT: Single board computer requiring keyboard and monitor for use. Supplied with two double sided 5¼in floppy disk drives in single cabinet. Three users can use the system without contending for memory.
SOFTWARE: Logitek supply the range of Peachtree software for the Altos range. These programs cover the following areas:– sales ledger, inventory management, payroll, nominal ledger, purchase ledger. Plus the extensive range of CPM programs, as the Altos uses MPM, the multi-tasking/multi-user version of the popular operating system CPM.

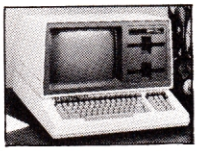
Metrotech Dynabyte 5200/5300	£2440-£3350	Business	64-400K	Yes	Yes	Basic Cobol Pascal Fortran PL/1	RS-232C 1EEE 488	Metrotech 0895-58111

COMMENT: Basis of building block multi-user system with the monitor and keyboard forming a single unit. Twin 5¼in floppy disk drives which can store up to 630,000 characters of information, 8in floppy disk drives also available. Standard typewriter keyboard with separate numeric keypad. Can be supplied configured complete with desk and printer. Optional Metrotel facility for creating in-house viewdata system and Prestel.
SOFTWARE: Using the CPM operating system, over 2000 packages are available from Wordstar to the most sophisticated programs. With the 5¼in drives up to 600 customers can be on the sales ledger, 1500 stock items and 150 employees for payroll. Using the 8in disks these figures increase to 1000 customers, 2500 stock items and 250 employees.

Windrush 6809	£2442-£2953	Business	56K	No	Other	Most	RS-232	Windrush Micro Systems 0692-405189

COMMENT: Single piece desk top machine specifically designed for development work in industrial control using the 6809 processor. The monitor shows an 80 character display and emulates a SORC terminal. While the 56K of Static MOS RAM has immunity to data errors. Battery back-up available. Programmable real time clock and battery backed time of day clock. Choice of twin 5in floppy disk drives or 8in drives, with Winchester hard disk also available.
SOFTWARE: Supplied complete with Screditor 111 word processor — which is screen/cursor oriented. Wide range of specialised software available including general ledger, payroll, accounts plus, scientific and arithmetical programs.

Zenith Z100/ 120-22	£2467	Business	128-768K	Yes	Yes	Most	RS-232	Zenith 0452-29451



COMMENT: Single unit desktop computer with single cabinet housing a 12in green screen monitor with 80 column display, twin 5¼in floppy disk drives and keyboard with separate numeric keypad. Uses both 8 and 16 bit processors offering a far wider choice of software. High res graphics with resolution of 320,000 dots normally only found on dedicated graphics terminals. Unlike most micros, the Zenith controls eight colours, where most colour computers control three. Multi-user capability and compatible with most mainframe computers in use today.
SOFTWARE: Apart from the vast range of programs available under CPM and the newer ones under CPM86, Zenith also supply their own Multiplan — an electronic worksheet at £135.

Seed System One 32DS8	£2480	Business	32K	No	No	Cobol Basic Assembler	Other	Strumech 054-33-87151

COMMENT: Business system based on the 6809 chip having twin 8in disk drives, monitor and keyboard in two chassis. The system is expandable to 56K and up to eight input/output devices or serial or parallel type. There is a double headed version costing £2865.
SOFTWARE: Wide range of system software includes Text editor, processor, assemblers and compilers. Business packages available include stock control, sales and purchase ledger, and a mailing program. These are available as single modules or interactive packages.

Canon CX-1	£2500	Business	64-128K	No	No	Basic Assembler Cobol	RS-232C	Canon 01-680-7700

COMMENT: Single unit micro comprising 12in green screen monitor, twin 5¼in floppy disk drives and typewriter style keyboard with separate numeric keypad. Each disk has information storage of 320K and a maximum of 128 programs can be stored on each disk. Uses the Canon MCX operating system, which includes text formatting and a spool function to save data for printing out later. 8in drives available as optional extras plus printers.
SOFTWARE: Special programs for the CX-1 are available from Canon and outside sources. Holland Automation programs cover sales ledger, purchase and general ledger, payroll and stock recording. Each program costs £275. Plus the Filekeeper foundation package for the other programs costing £135. Other programs available from Holland Automation include Report Generator, Bill of materials, General Ledger, Budgets, Financial Statement and Analysis. These cost from £100 to £275 according to the application. Canon have a range of statistical programs and CXCAT — a combination record keeper, sorter database — lets you write your own programs in English. Wordplay for wordprocessing is available £300 and Business Desk from Paxton Computers.

Tele Video TS802 range	£2535-£4349	Business	64K	No	Yes	Most	RS-232	Encotel Systems 01-686-9687

COMMENT: Single user system with twin 5¼in floppy disk drives integral with the green screen monitor showing an 80 column display. Typewriter style keyboard detachable with separate numeric keypad and special function keys. One model of the Tele Video range replaces one of the floppy disks with a 5¼in Winchester hard disk for greater storage capacity.
SOFTWARE: CPM means a choice of over 2000 programs including Wordstar.

DEC Professional 325	£2677	Business Education	256K	Extra	No	Most	RS-232	Digital Equipment 0256-59200

COMMENT: Three piece professional system compatible with the mainframe PDP-11/23 series. Supplied complete with 12in monochrome monitor and dual 5¼in double density floppy disk drives. Bit mapped graphics. Essentially existing users of the PDP range of mini-computers will find compatibility with the Professional 325.
SOFTWARE: As the PDP-11/23 is extremely popular, both DEC and the independent companies are in the process of converting programs for use with this micro.

TRS-80 Model 11	£2699	Business Education	64K	No	No	Basic	RS-232	Tandy 0922-648181

COMMENT: Desktop machine with single 8in drive combined with keyboard and 12in monitor producing 80 column display. Keyboard is detachable with separate numeric keypad. Hi-res graphics option £399.
SOFTWARE: Vast range of programs of all types, in line with the TRS-80 being the largest selling micro until the ZX81 came along.

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CIRCLE NO 149

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
ITT 3030	£2700	Business Education	64- 256K	Extra	Yes	Basic Cobol Fortran Pascal	RS-232 IEEE 488	ITT 0268-3040

COMMENT: Three part system with the twin disk drives housed in a separate cabinet. Green screen monitor produces 80 column display. Each disk drive has a capacity of 280 bytes and double sided, double density drives are also available. Provision for using IBM format 8in disks and Winchester hard disks. Typewriter style keyboard, with optional numeric keypad, eight programmable function keys. Provision for various character sets, 16 colours in graphics mode, background colour and hi-res graphics.
SOFTWARE: Apart from the large range of CPM software amounting to over 2000 programs, ITT supply their own range of business software. These packages are:– payroll/salaries, invoicing, sales ledger, purchase ledger, nominal ledger, stock control, index file, word processor and a program generator.

Sharp PC3201	£2750	Business	64K	No	Extra	Basic	Other	Sharp 061-205-2333



COMMENT: Unlike most micros, the Sharp PC3201 is supplied as a complete business system including the monitor, disk drives and a printer. Plus an electronic spreadsheet. So you really can plug-in and use the system as soon as its on your premises. The 12in green screen monitor produces an 80 character display including graphics. While the keyboard has a separate numeric keypad and special function keys. This system is in four separate parts, so that it can be adjusted to the users practical needs. The printer is marked Sharp, but bears a very close family resemblance to the Epson MX80 range.
SOFTWARE: There are over 70 business programs covering most of the popular subjects plus specialised programs for the wholesale fruit market, coin machine accounting, farmers payroll, insurance broking and surveyors. With the addition of CPM, another 2000 packages are available from Wordstar to the most sophisticated and specialised programs.

Columbia	£2800	Business Education	128K- IBM	No Extra	CPM86	Most	RS-232C	Icarus 01-485-5574

COMMENT: A 16 bit machine looking just like an IBM Personal Computer, with full compatibility of IBM PC Software and hardware. 12in green screen monitor, twin 320K 5¼in floppy disks and Winchester hard disk interface. IBM compatible keyboard with 83 keys, full numeric pad and 10 special function keys.
SOFTWARE: CPM 86, the latest version of the popular operating system already has Micromodeller, Supercalc, Wordstar, Spellstar and Mailmerge. The software for the IBM Personal Computer is compatible with the Columbia. Plus the Pulsar range of business programs which cover sales and purchase ledger, analysis and product management reports plus nominal ledger.

Fox	£2900	Business	64K	No	Yes	Most	RS-232	Digital Micro Systems 0734-343885

COMMENT: Another single unit micro, with integral 9in green screen monitor and twin 5¼in floppy disks with capacity of 1.2 Mbytes. Detachable typewriter style keyboard, with numeric keypad. Can work as workstation in an area network.
SOFTWARE: Over 2000 programs available under CPM.

Triumph Adler Alphatronic P2	£2935	Business	48K	No	Yes	Basic Fortran Cobol	RS-232	Triumph Adler 01-250-1717

COMMENT: Word processing micro computer supplied as complete system including monitor and printer. Uses dual 5¼in floppy disk drives mounted above the typewriter style keyboard which has a separate numeric keypad. Marketed as a word processing micro computer with other facilities added afterwards.
SOFTWARE: Using the CPM operating system, over 2000 packages are available from Wordstar onwards. Adler themselves supply:– word processing packages plus programs for accounts, stock control and payroll.

IBM Personal Computer	£2950	Home Business Education	16- 768K	Extra	CPM86	Basic Pascal Cobol Fortran	RS-232C	Electronic Office Services 01-248-6971 NOT EXCLUSIVE

COMMENT: IBMs first personal computer is still not being imported by IBM themselves, but a number of companies are bringing this new micro into the UK. Using the 8088 16 bit chip, this is one of the new generation micros which is a three part system, monitor, processor and keyboard. The 80 character green screen monitor and typewriter style keyboard with separate numeric keypad, has special function keys and provides an easy to operate system. Full four colour graphics facility with 16 colours in the text mode. Full growth potential to Winchester hard disks. Direct competition for the Sirius 1, Columbia and other newly introduced 16 bit machines. With the Dec Rainbow and Zenith competing with their 8/16 bit capability.
SOFTWARE: CPM86 is the latest version of the most popular micro operating system. Programs now available in this new format include Micromodeller, Visicalc, Wordstar, Pulsar software from ACT and TIM 111 a new database management system. Systemics and Tabs accounting packages will also be available in this new format.

Eagle 111	£2950- £4250	Business	64K	No	Yes	CBasic	RS-232	Mediatech 01-903-4372

COMMENT: Similar to the Eagle 11, with greater capacity disk drives, and also supplied complete with software packages for the end user. A desktop micro combining monitor, twin drives and keyboard in a single package. The twin drives have a total capacity of 1.56 Mbytes.
SOFTWARE: The Eagle 111 is supplied complete with software so the system is ready to use rightaway. The Eagle 111 Business System comprises the seven program Accoutning Plus package and Spellbinder the word processing package including Mail Megge and Mail List. CPM and CBasic complete the system. This system costs £4250. While the Office Management set-up costs £2950 and includes Spellbinder and Ultracalc — an electronic spreadsheet, plus CBasic and CPM. And you have access to the 2000 plus programs available under CPM.

Equinox Series 5000SX	£2950	Business Education	64K	No	Yes	Most	Other	Equinox 01-739-2387

COMMENT: System selected by the government computer advisory service for use in government departments. Highly expandable system. This single user system uses dual double density, double sided 5¼in drives and the viewpoint VDU.
SOFTWARE: CPM offers the vast range of programs amounting to over 2000 including Wordstar. Turbo DOS is available which lets you load programs up to six times faster and process files up to five times faster.

Vector V4 20/30	£2995- £3995	Business	128- 256K	Yes	Yes	Most	RS-232	Almarc Data Systems 0602-52657

COMMENT: The Vector V4 is an 8/16 bit computer using the Z80 and 8088 chips. You have the advantage of both systems with the facility of upgrading without any additional hardware cost. Twin 5¼in floppy disk drives housed at the base of the green screen 12in monitor, with 80 character format and graphics facility. Colour available using external extra monitor. Detachable keyboard with 91 keys, including 15 programmable special functions and numeric keypad. Programmable sound generator can be controlled by application programs. The /30 replaces one of the 5in floppy disk drives with a 5 Mbyte Winchester hard disk.
SOFTWARE: Use of the 8 and 16 bit chips plus CPM offers the widest choice of programs, total available well over 2000. An ideal situation to give the maximum possible choice for every conceivable application.

£3,000-£3,999

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
BMC Oki 800 Model 20	£3150	Business Education	Up to 256K	Yes	Yes	Most	RS-232	Encotel Systems 01-680 6040

COMMENT: Single unit micro combining a colour monitor with integral twin 5¼in floppy disk drives and a printer. The monitor provides 64 colours and the keyboard has a separate numeric keypad and 30 programmable soft keys. The OKI 800 can also be used as awork station to a mainframe computer.
SOFTWARE: Use of the CPM operating system lets you use over 2000 packages from Wordstar and Spellbinder to Supercalc and dBase 11.

Vector Series 801	£3255	Business	64K	No	Yes	Most	RS-232	Almarc Data Systems 0602-52657

COMMENT: Single user system in three basic parts:– monitor 12in, keyboard with numeric keypad and twin floppy disk drives with a total of 1.6 Mbyte capacity. Designed for ease of use, simple maintenance and operation.
SOFTWARE: Choice of CPM gives over 2000 programs including Wordstar.

Sord M223 MK 111	£3285	Business	64K	No	No	Most	RS-232C	Sord 01-930 4214

COMMENT: Complete outfit including 12in monitor and twin 5¼in floppy disk drives with 350K capacity plus a keyboard that has a separate numeric keypad. Three separate units.
SOFTWARE: Currently no packages have been specifically announced for the Sord, however using the Sord PIPS you can always write your own programs in English.

Panasonic JD 800M	£3300	Business	60K	No	Yes	Basic Fortran Cobol Pascal	RS-232C	Panasonic Slough 75841

COMMENT: One piece unit housing the monitor, twin 8in single sided, single density disk drives and keyboard. Typewriter style keyboard with separate numeric keypad.
SOFTWARE: Having CPM operating system opens the door to over 2000 programs. Plus products from CAP Microproducts, The Computer Company, IAL Gemini and CPS Data Systems. There are also specialist programs for doctors, dentists and hotel accounting.

DEC Professional 350	£3317	Business Education	256K	Extra	No	Most	RS-232	Digital Equipment 0256-59200

COMMENT: Top of the range DEC micro computer supplied as part of three part outfit, with 12in monitor, showing 80-132 characters, plus twin 5¼in floppy disk drives and optional Winchester hard disks. The keyboard has been ergonomically designed with typewriter style keyboard plus numeric keypad and special function keys. Bit mapped graphics. Compatible with the PDP- 11/23 mini mainframe computers.
SOFTWARE: As the PDP 11/23 range is extremely popular, both DEC and independent suppliers are producing or converting software for this micro.

Sord M23 MK V	£3380-£3776	Business	128K	Yes	No	CBasic	RS-232C	Sord 01-930 4214

COMMENT: Complete system including printer, with the option of a colour monitor and complete with twin 8in floppy disk drives. With colour monitor the price is £3776. Uses Sord's own graphics language SGL. Capacity of the 8in disks 1MB per drive. While the SLP160 printer has a speed of 120 characters per second.
SOFTWARE: While no software has been announced, using Sord PIPS you can write your own programs without having to learn a special programming language.

Signet 211	£3435	Business Education	64K	No	Yes	Basic Fortran Cobol Pascal	RS-232C	Micro APL 01-834 2687

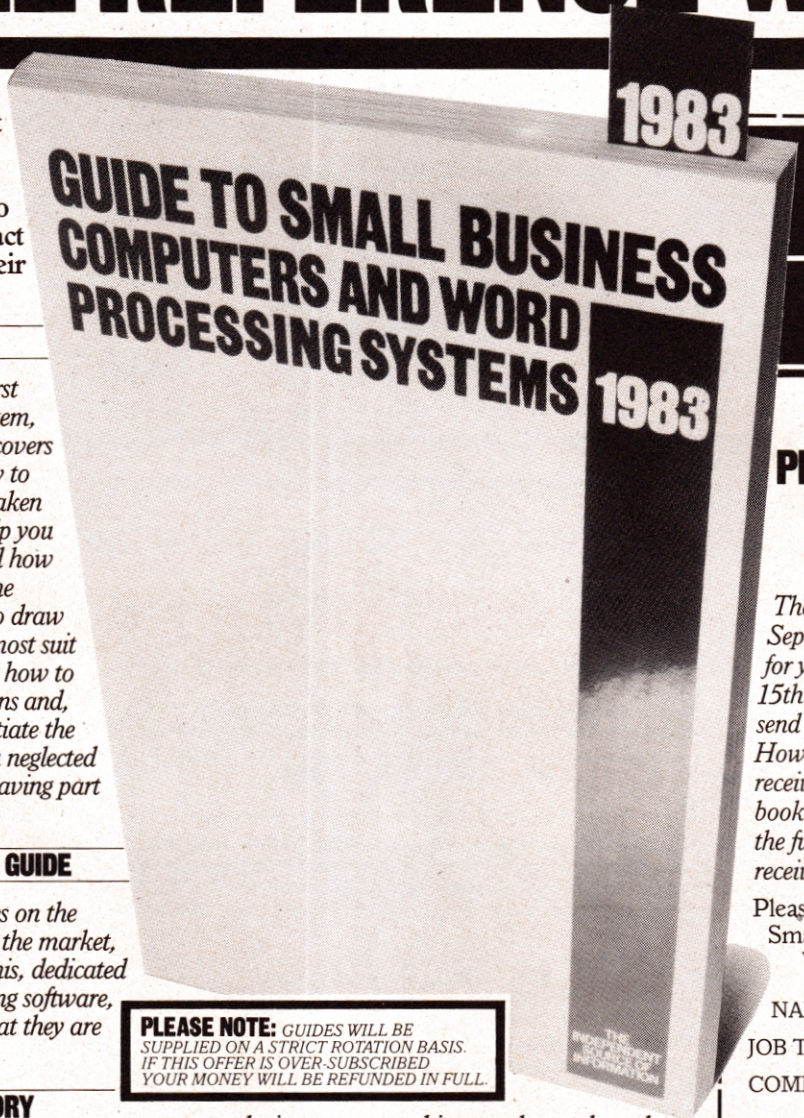
COMMENT: Compact machine using two disk drives, one 12 Mbyte Winchester hard disk and one 5¼in floppy disk. Keyboard and monitor extra.
SOFTWARE: CPM offers an extremely wide range of programs currently over 2000, plus the programs available for the Signet 202S.

Caltext 2/2A	£3485-£3735	Business	64-256K	No	Yes	Basic Microcobol Fortran Pascal	RS-232C	Computer Ancillaries Egham 36455



COMMENT: Intended for the user who needs more disk capacity than two floppy disks on the Caltext 1/1A range. One of the 5¼in floppy disk drives has been replaced with a 5¼in Winchester hard disk with a capacity of 5 Mbytes. The Caltext 2 has 64K and the 2a 256K. Monittr 12in green screen with 80 column display. Typewriter style keyboard with numeric keypad. Provision for link-up with IBM mainframe computers.
SOFTWARE: CPM offers the choice of over 2000 programs including Wordstar. Computer Ancillaries also handle the range of Oasis business software and Microplan.

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We detail the main features on the different types of equipment on the market, covering micro-computers, minis, dedicated word processors, word processing software, and dual purpose systems. What they are and what they do.

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We look at the important systems, with all the information on these systems in detail, clearly laid-out for fast, easy reference, plus summaries of other systems on the market.

MINI DIRECTORY

Designed to the same format on the Micro-Directory, covering all the machines available.

WORD PROCESSOR DIRECTORY

A special section, again laid-out as the other directories, giving you all the information you need on the important machines on the market, plus summaries of all other significant systems available.

WORD PROCESSING SOFTWARE DIRECTORY

We also detail available software packages, summarised by computer system. What each does and where to get it.

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We examine in detail extra services you can use like consultants, software houses, bureaux, maintenance companies and consumables suppliers.

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CIRCLE NO 150

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Torch	£3499	Business	64K	Yes	Com-patible	Basic Pascal Fortran Cobol Algol Lisp Forth	RS-232	Torch Computers 0223-84100



COMMENT: Desktop computer with detachable keyboard. Monitor shows colour display 80 characters wide plus wide range of graphics facilities. The twin disk drives use 5¼in drives, double sided, double density. Combination of 6502 and Z80 processors for flexibility. Handles communications via Teletext, dial up, telex, Econet and the RS-232 as standard. The basic board from the BBC micro forms the base for the Torch micro, plus all the added features making an extremely advanced micro, especially for sending information locally or worldwide. A complete screen of information can be sent in just ten seconds.
SOFTWARE: Apart from the vast range of packages including Wordstar available under CPM, the Torch programming team are also working on their own range of packages.
Torchcalc, electronic mailing, secretary's aid and integrated accounting packages cover most needs. Edword is their new word processing package and is integrated with the communications software and enables letters to be typed, corrected, edited and then automatically sent along a dial-up line to its destination. True electronic mail.

YD 8110	£3500-£3900	Business	128K	No	CPM 86	Most	RS-232C	Wilkes 0272-25921

COMMENT: Two-piece business computer with detachable keyboard and single unit containing monitor and twin 8in floppy disks IBM format floppy disk drives. Total capacity of drives 1.2 Mbytes. The 8110 uses the 16 bit 8086 chip with compatability to use CPM packages. Hi-res graphics plus 80 column capacity on the monitor. Version with 256K RAM meant as basis of multi-user system costing £3900.
SOFTWARE: Compatibility with CPM and CPM 86 opens the door to around 2000 programs from Wordstar to the most sophisticated and specialised programs.

Iona	£3600	Business	64K	Yes	Yes	Basic Forth	RS-232C	10 Technology 01-248 4876

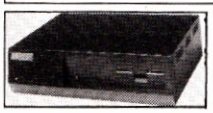
COMMENT: The Iona is the only micro supplied as a complete outfit that includes a colour monitor and colour printer. It also includes twin 5¼in disk drives. The monitor supplied as part of the outfit has a 14in screen and there are full graphics facilities. Cassette loading of programs is provided if required. The Iona keyboard has a separate numeric keypad and 15 special function keys. While the printer operates at 125 characters per second and works in seven colours. First seen at the PCW show, the Iona can also be turned into a telephone dialler for connecting to Prestel and the phone network.
SOFTWARE: CPM offers a choice of around 2000 plus programs covering all possible applications. Plus a new range of software from Iona which will cover sales ledger, purchase ledger, general ledger, stock control, payroll, word processing and financial modelling.

Kalamazoo K1000	£3750	Business	48K	No	No	Most	RS-232	Kalamazoo 021-475 2191



COMMENT: Four part system using a 12in monitor with green screen, twin double sided, double density 5¼in disk drives with storage capacity 500K. Typewriter style keyboard with separate numeric keypad. Fourth part of the system is a dot matrix printer which has a speed of up to 200 characters per second, and bi-directional printing.
SOFTWARE: Programs are available for:– sales invoicing, accounting, sales analysis, purchase accounting, payroll, stock control, stock management, general accounting and word processing. There are also specialised trade packages for the Motor Trade, Construction Industry and Hotels.

Rair Black Box 3/30A	£3750	Business Education	64K	No	Yes	Basic Fortran Cobol Pascal PL/1	RS-232C IEEE 488	Rair 01-836 6921



COMMENT: The Black Box uses an ingenious combination of a 5¼in hard disk for data storage plus a mini-floppy disk for back up and transferring data. The hard disk is 6 Mbytes and the floppy disk 500K. This system uses the CPM operating system and you need a monitor to complete the configuration.
SOFTWARE: Apart from over 2000 programs available using the CPM operating system Rair have a range of compilers and assemblers available.

Superbrain 11/W6	£3800-£4360	Business Education	64K	No	Yes	Most	RS-232	Icarus 01-485 5574

COMMENT: These Superbrain micros offer all the features of the floppy disk models, but replace one of these disks with a Winchester hard disk. There are four versions:– the W6QD5 with 338K floppy disk and 5 MByte Winchester; the W6DT5 with 750K floppy disk and 5 MByte Winchester; the W6QD10 with 338K floppy disk and 10 Mbyte Winchester and the W6DT10 with 750K floppy disk and 10 MByte Winchester. All self-contained desktop units with built-in monitors, typewriter style keyboards and extensive storage capacity.
SOFTWARE: The Superbrain uses CPM, so there are around 2000 packages covering almost every possible application from Wordstar and Spellbinder for word processing to the most specialised application.

Caltext 3/3A	£3845-£4095	Business	64-256K	No	Yes	Basic Microcobol Fortran Pascal	RS-232C	Computer Ancillaries Egham 36455

COMMENT: The Caltext 3/3A is a development from the 2/2A replacing the 5 Mbyte hard disk with a Winchester having a capacity of 10 Mbytes. 12in green screen monitor with 80 column display. Typewriter style keyboard with numeric keypad. Provision for link-up with IBM mainframe computers.
SOFTWARE: Apart from the range of over 2000 programs available under CPM, Computer Ancillaries also have the range of Oasis software and Microplan.

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£4,000–£5,000

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Eagle IV	£4195	Business	64K	No	Yes	CBasic	RS-232	Mediatech 01-903 4372

COMMENT: Top of the line Eagle machine replacing one of the twin floppy disk drives with an 8 MByte mini Winchester hard disk. All in one unit, comprising the two drives, 12in monitor and typewriter style and feel keyboard.
SOFTWARE: Supplied as an Office Management System including Spellbinder — the word processing package including Mail Merge and Mail List, Ultracalc — an electronic spreadsheet, CBasic and CPM.

Corvus Concept	£4250	Business	256K	No	Com-patible	Pascal Fortran	RS-232C	Keen Computers 01-236 5682

COMMENT: 16 bit micro processor combined unit with keyboard and monitor which has unique bi-directional screen measuring 11 × 8½in. So the whole page being typed can be seen, when the Corvus is being used for word processing. Graphics facility and unusual type fonts can be displayed. Built-in Omninet interface so that extra work stations can be added just by connecting a twist-pair cable. Optional hard disks from 5.7 to 19.7 Mbytes for increased capacity.
SOFTWARE: Apart from a whole host of programs available through the CPM compatibility, the following specialist business packages are available:– Edword a powerful word processor, Corvus Logicalc — an electronic spreadsheet. New Corvus software for launch in 1983 includes electronic mail, business graphics and a database manager.

Equinox Series 8000SX	£4250	Business Education	64K	No	Yes	Most	Other	Equinox 01-739 2387

COMMENT: This is the multi-user version of the Equinox 5000SX. The system uses the dual 8in double sided, double density disk drives. Another highly expandable system, using the Viewpoint VDU and selected by the government computer advisory service.
SOFTWARE: CPM offers a choice of over 2000 programs including Wordstar. Turbo-DOS is available to increase program loading by up to 6 times and to process files five times faster.

Multicomputer M210	£4250	Business	64K	No	Com-patible	Most	RS-232C	Multicomputer 01-568 5272

COMMENT: Multi-user architecture system expandable to 255 users. Winchester hard disk storage 10 Mbyte plus 8in floppy disk. Intended as the basis of a system where the monitor and keyboard are added later to complete the system.
SOFTWARE: Compatibility with CPM using the nStar system opens the door to over 2000 programs including Wordstar and an extremely wide range of specialised application programs.

Vector Series 803/12	£4275-£4995	Business	64K	No	Yes	Most	RS-232	Almarc Data Systems 0602-52657

COMMENT: This range of micros has three component systems. The 12in monitor, keyboard with numeric keypad and special function keys plus the combination of hard and floppy disk drive systems. The 803 has a 3 Mbyte hard disk with an 0.8 Mbyte floppy disk £4275. While the 806 has a 6 MByte hard disk and 0.8 MByte floppy at £4500. The 809 has a 9 Mbyte hard disk and 0.8 floppy at £4775. Top of the range the 812 with 12 Mbyte hard disk and 0.8 Mbyte floppy disk drive. All can be extended to five terminals.
SOFTWARE: CPM gives you a choice of over 2000 programs.

Panasonic JD-850M	£4350	Business	64K	No	Yes	Basic Fortran Cobol Pascal	RS-232C IEEE 488	Panasonic Slough 75841

COMMENT: Desktop machine with separate keyboard that has numeric keypad. Supplied with 12in monitor which also houses the twin 8in disk drives in the same cabinet. Optional hard disk with provision for cartridge take back-up.
SOFTWARE: Apart from the extensive range of CPM software available from Wordstar onwards, there's also a range of packages from CAP-CPP microproducts:– Microcobol, Auto Index, Auto Clerk and a range of accounting programs. Products from the Computer Company:– Compac software, Compact VI a full accounting and business set of packages; Panaword — a word processing package; general ledger, payroll and specialised programs for doctors, dentists and hotel accounting. There are also business packages from IAL Gemini Ltd., and CPS Data System.

Caltext 4/4A	£4457-£4657	Business	64-256K	No	Yes	Basic Microcobol Fortran Pascal	RS-232C	Computer Ancillaries Egham 36455

COMMENT: Most powerful of the Caltext range fitted with a 5¼in Winchester hard disk with a capacity of 15 Mbytes. Complete with green screen monitor with 12in screen and 80 column display. Typewriter keyboard with numeric keypad. Provision for link-up with IBM mainframe computers.
SOFTWARE: Extensive range of over 2000 programs available under CPM.

Cromenco System 3	£4495	Business Education	64-512K	Yes	Com-patible	Basic Fortran Cobol RPG 11 Ratfor	RS-232	Comart 215005

COMMENT: Rack mounted system which uses twin 8in floppy disk drives giving 1.2 Mbytes and 17 card slots for expansion. Extensive colour graphics available through the SDI graphics interface giving a total of 4096 shades.
SOFTWARE: Apart from the extensive range of programs available under CPM, there are also packages available from Comart covering:– Database management, word processing, CAP applications, sales ledger, invoicing, purchase and nominal ledger, payroll and inventory control.

PBM 1000	£4500	Business	80K	No	Yes	Most	RS-232C	Terodec 0734-664343

COMMENT: Uses 5¼in Winchester hard disk and 5¼in floppy disk drives with separate bit-slice processor, controls both disk drives so that 70% of the main processor is available for the Winchester disk transfer and 97% for the floppy disk transfers.
SOFTWARE: Using CPM choice of over 2000 programs available including Wordstar. Especially as the PBM 1000 uses an enhanced version of CPM making it the most powerful machine in its class.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Rair Black Box 3/30B	£4500	Business Education	128K	No	CPM	Basic Fortran Cobol Pascal PL/1	RS-232C IEEE 488	Rair 01-836 6921

COMMENT: A two user system with a combination of 6 Mbyte hard disk and 500K floppy disk. Needs a monitor to complete the outfit.
SOFTWARE: Use of a wide range of languages makes the choice of software easy. In addition five compilers are available for Basic, Fortran, Cobol, PL/1 and Pascal.

Metrotech Dynabyte 5505	£4690	Business	64-400K	Yes	Yes	Basic Cobol Pascal Fortran PL/1	RS-232C IEEE 488	Metrotech 0895-58111

COMMENT: The basis of an advanced multi-user system using the 5¼in Winchester hard disk and 5¼in floppy disk drive. Combined monitor and typewriter style keyboard with separate numeric keypad. Can be supplied configured complete with printer and desk. Metrotel option for in-house viewdata system and communication with Prestel.
SOFTWARE: Using the CPM operating system over 2000 packages are available from Wordstar to the most advanced application package. With this system storage is available for up to 4000 customers, 12,000 stock items and 800 employees' payroll records.

System M-Three	£4750	Business	64K	No	Yes	Most	RS-232	LSI Computers 04862-23411

COMMENT: Top model of the M-Three range, instead of twin floppy disks, this version replaces one with a 10 Mbyte Winchester hard disk. The combination of a hard disk and 1.2 Mbyte floppy disk gives a vast increase in storage capacity.
SOFTWARE: Uses the most popular operating system CPM, plus packages available from LSI including the Modular Accounting Package, word processing, prospect mailing, payroll and the Oasis range of accounting programs.

Tele Video TS806	£4788	Business	64K	No	Yes	Most	RS-232	Encotel Systems 01-686 9687

COMMENT: The Tele Video model 806 is a multi-tasking machine which can accommodate up to six users and uses a combination of Winchester hard disk and 5¼in floppy disk. Typewriter style detachable keyboard with separate numeric keypad and special function keys.
SOFTWARE: Use of CPM means a choice of over 2000 programs including Wordstar.

Sord M223/V	£4795	Business	64K	No	No	Most	RS-232C	Sord 01-930 4214

COMMENT: Three part business system comprising 12in green screen monitor, twin 8in floppy disk drives and typewriter style keyboard with separate numeric keypad.
SOFTWARE: Currently no packages have been announced by Sord, however you could write your own applications program using Sord PIPS — a program generator.

BASF 7100	£4800	Business	64K	No	No	Basic Cobol Assembler	RS-232	BASF 01-637 8971

COMMENT: Desktop unit with integral monitor, three 5¼in disk drives and typewriter style keyboard in a single cabinet. 12in green screen monitor with 80 column 24 line disllay. Keyboard has 60 typing keys, 14 edit keys and 12 adding machine keys, plus 24 functional keys. Each 5¼in disk uses single sided, double density disks. Compatible with IBM mainframe computers.
SOFTWARE: Specialised range available from BASF.

Altos Series 5-50	£4950	Business	192K	No	Com-patible	Most	RS-232C	Logitek 0257-426644

COMMENT: This Altos micro replaces one of the 5¼in drives of the 5-15 series, with a Winchester 5in hard disk for greater storage capacity. Three users can use the system without contending for memory.
SOFTWARE: Logitek supply the range of Peachtree software for the Altos range. These programs cover the basic business areas of sales ledger, nominal ledger, purchase ledger, payroll and inventory management. Plus the extensive range of CPM based programs, as the Altos uses a multi-tasking/user version of CPM. So over 2000 programs including Wordstar are available.

Fortune System 2	£4950	Business	256K	Yes	No	Basic Cobol Fortran Pascal CBasic	RS-232C IEEE 488	Fortune 01-631 3383

COMMENT: A 16 bit super micro with 32 bit architecture, extremely similar to the Wang word processor. Up to 16 terminals can be used with the System 2. Instead of CPM, Fortune uses Unix as its operating system. The system is supplied complete with 2 × 800K 5¼in disk drives and a 12in monitor with detachable keyboard.
SOFTWARE: Database management system — IDOL, Word processing system Forword, Professional system.— Multiplan Business accounting system — fully integrated single entry.

Durango F85	£4995	Business	65.5K	No	No	Star Basic	RS-232C	Computer Ancillaries Egham 36455

COMMENT: The Durango incorporates the Micro Winchester technology with an integrated fixed disk for increased storage capability. The four elements in the system, keyboard, video display, disk drives and printer are integrated into a low profile package. The 9in screen of the monitor shows an 80 column display. Durango are one of the few brands to provide a complete outfit including the printer for a single price, something other companies should consider. A feature of all Durangos is the multi-tasking facility for better value from the system.
SOFTWARE: Star Basic is used by the Durango, with the Durango Executive operating system for initialising and housekeeping. Essentially business packages are available.

D—I—C—T—I—O—N—A—R—Y

Terms used in this issue

Access time: The time taken from the moment of executing an instruction to call for data to the moment when the data has been stored in the appropriate location. (eg. magnetic tape has a longer access time than magnetic disc).

Address: The position in which items of information are stored inside the computer's memory.

Alphanumeric: Letters and numbers mixed.

Applications: These are the things that you can actually do with the help of a computer. Application programs are written to be applied in a particular context: word processing, financial modelling etc.

Assembler: A conversion program to change assembly language into binary code which can then be read by the computer.

Basic: A high level language (close to written English) used by many micros. The name is an acronym for Beginner's All-purpose Symbolic Instruction Code.

Binary: A numeric system involving two possibilities in which the only digits used are 0 and 1.

Bit: The smallest piece of information in a computer. The word comes from Binary Digit. A bit is therefore either 0 or 1.

Bus: A number of wires that 'bus' (carry) the signal around a computer.

Byte: A group of bits (usually eight in microcomputers) operated as one unit.

Cassette: Same as a music cassette. Stores information as sounds using magnetic tape cassettes.

Compiler: A program which converts instructions from a computer language into machine operations.

CP/M: A Control Program for Microcomputers. The best known and most widely compatible operating system. If a machine has CP/M there is a good chance that a lot of software will be available.

CPU: Central processing unit — the part of a computer which obeys the instructions of a program.

Crash: The result of a hardware or software malfunction usually when a program loses control of the operating system.

Cursor: A (sometimes flashing) blob or line which indicates the point on the screen at which the next character will appear.

Data page: Usually a set of programs which make it easy to handle data in different ways. A substitute for a filing system, so that information can be put in, cross referenced, altered, and got out.

Disc: Similar in looks to a plastic 45 pop record. Information is recorded on to it for later retrieval (other name 'floppy disc').

Disc Drive: A machine used to write on to and read from discs.

End-user: The person who buys a machine and sits at the keyboard.

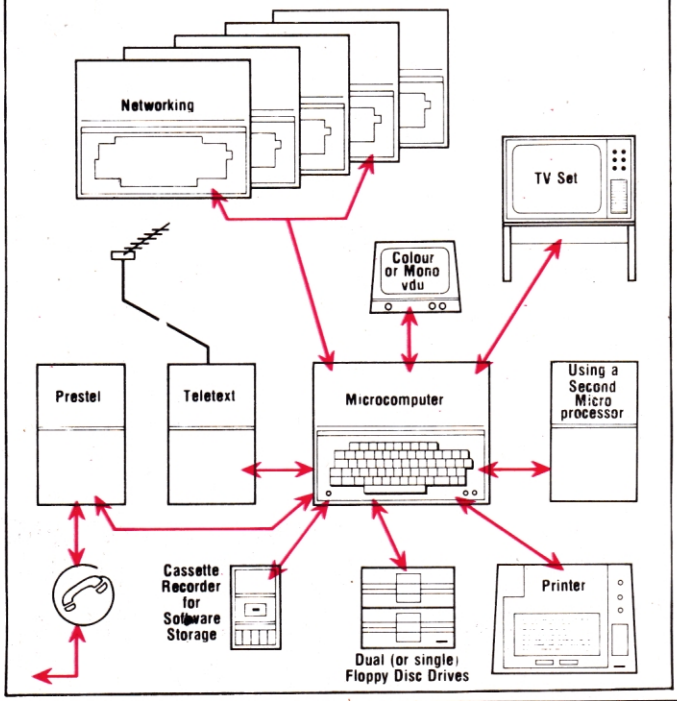
Hard copy: A permanent form of computer output usually coming in the form of printout from a printer.

I/O or Interface: Input and Ouput. The way in which a computer 'talks' and listens to equipment connected to it ie. printers, monitors etc. The most common interface is the RS232.

K: An abbreviation of Kilobyte. 1K is 1024 bytes, not 1000.

Machine code: Instructions to the machine reduced to their final binary form so that the circuitry can treat them as switches or gates. All higher level codes have to be translated into this by an interpreter.

Ways of Enlarging a Micro System



Network: Linking several computers together in order to share common facilities.

Operating System: The program which handles communication between the user and the computer.

Package: A program which is bought 'complete' ie without need of programming. It will carry out useful general functions such as word processing.

Program: A set of instructions to the computer sufficient to produce some desired result. There must be a beginning, middle and end.

RAM: Random Access Memory. You can write information on it as well as read from it. It is memory that is available as a blank page.

ROM: Read Only Memory. You can get information or instructions from it but not put any on it. This is like a printed book of information which can be read but not written on.

Scroll: A method of moving the display up and off the screen to make room for more text at the bottom.

Software: Programs which control the computer's activity. This is the brain which is placed into the machine's hardware body to make it perform.

Winchester: Now a generic term for hard discs. That is discs in a rigid form compared to the usual 'floppy disc'. On a Winchester more information can be stored and the time taken to retrieve the said information is faster than using floppies. Winchester was the place that IBM developed these discs and the name became synonymous with hard discs. ■

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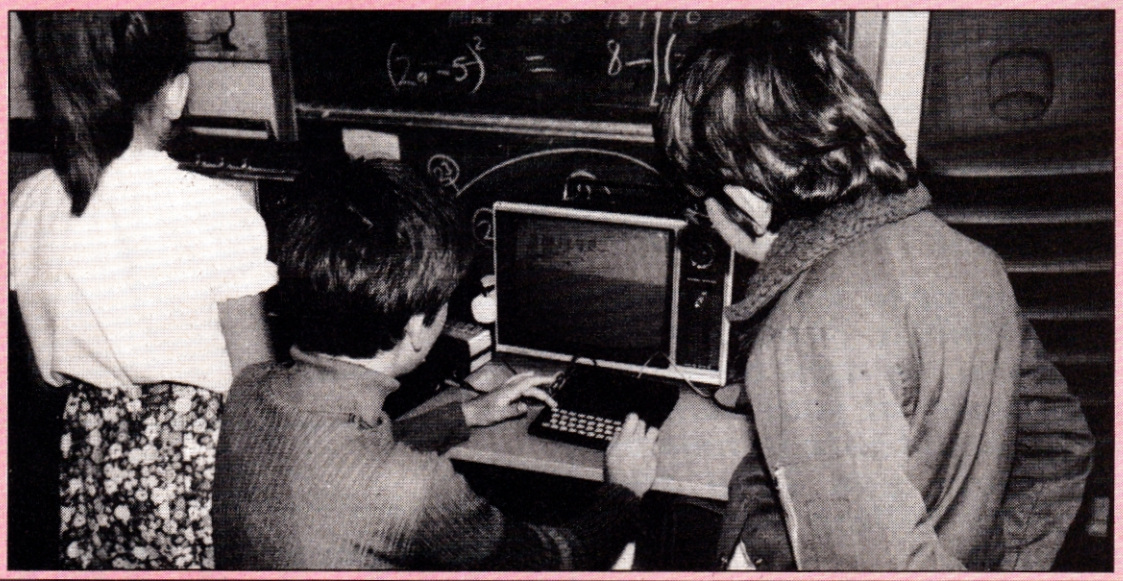
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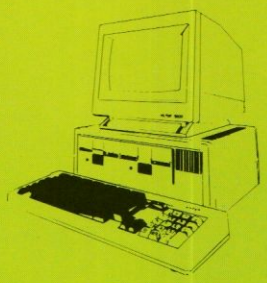


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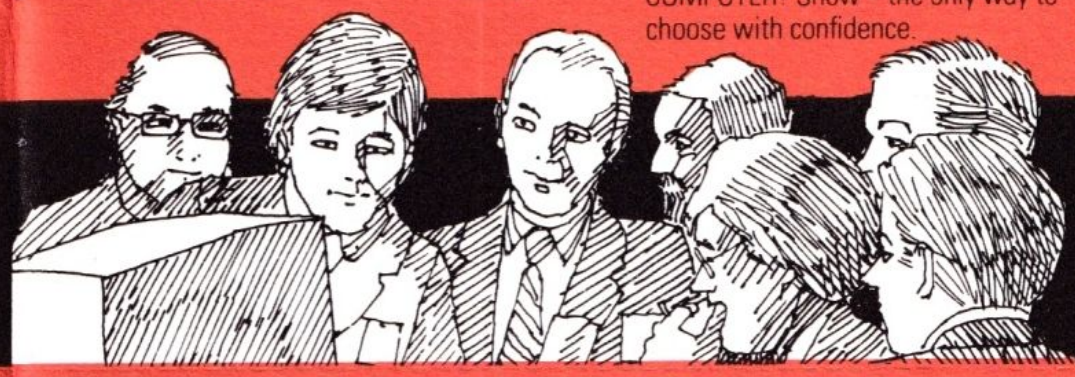
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