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MICRO COMPUTER PRINTOUT

A PLAIN MAN'S GUIDE TO PERSONAL COMPUTING

AUGUST 1982
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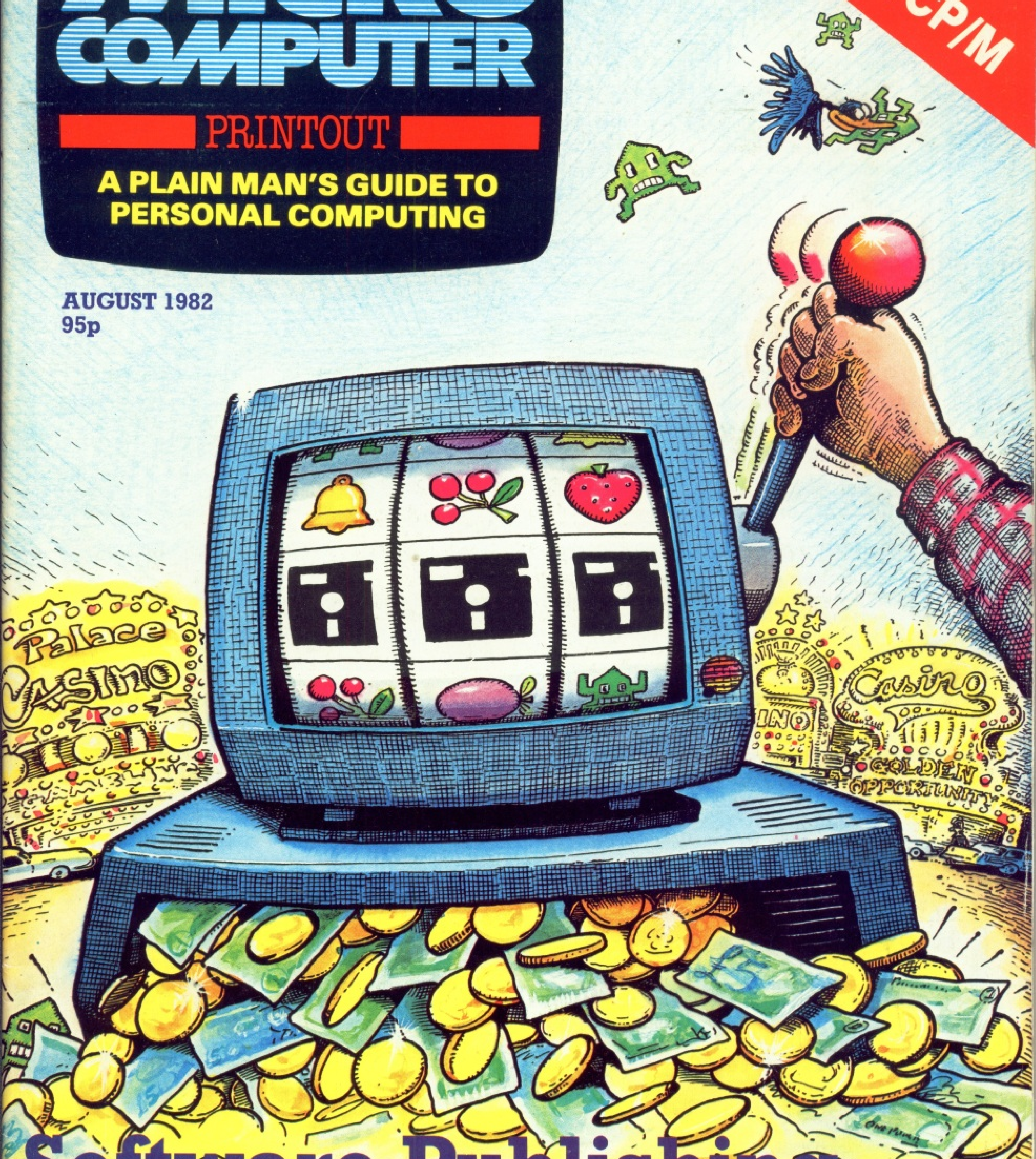

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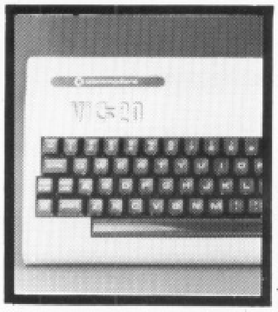
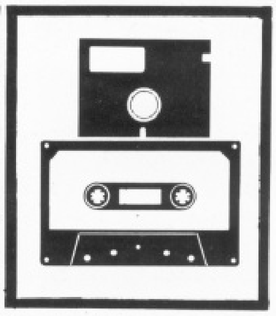
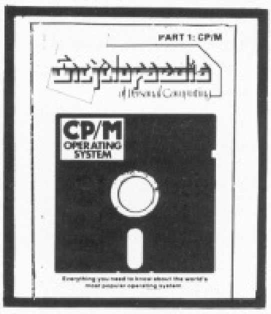
AUGUST 1982 VOLUME 3 NUMBER 9







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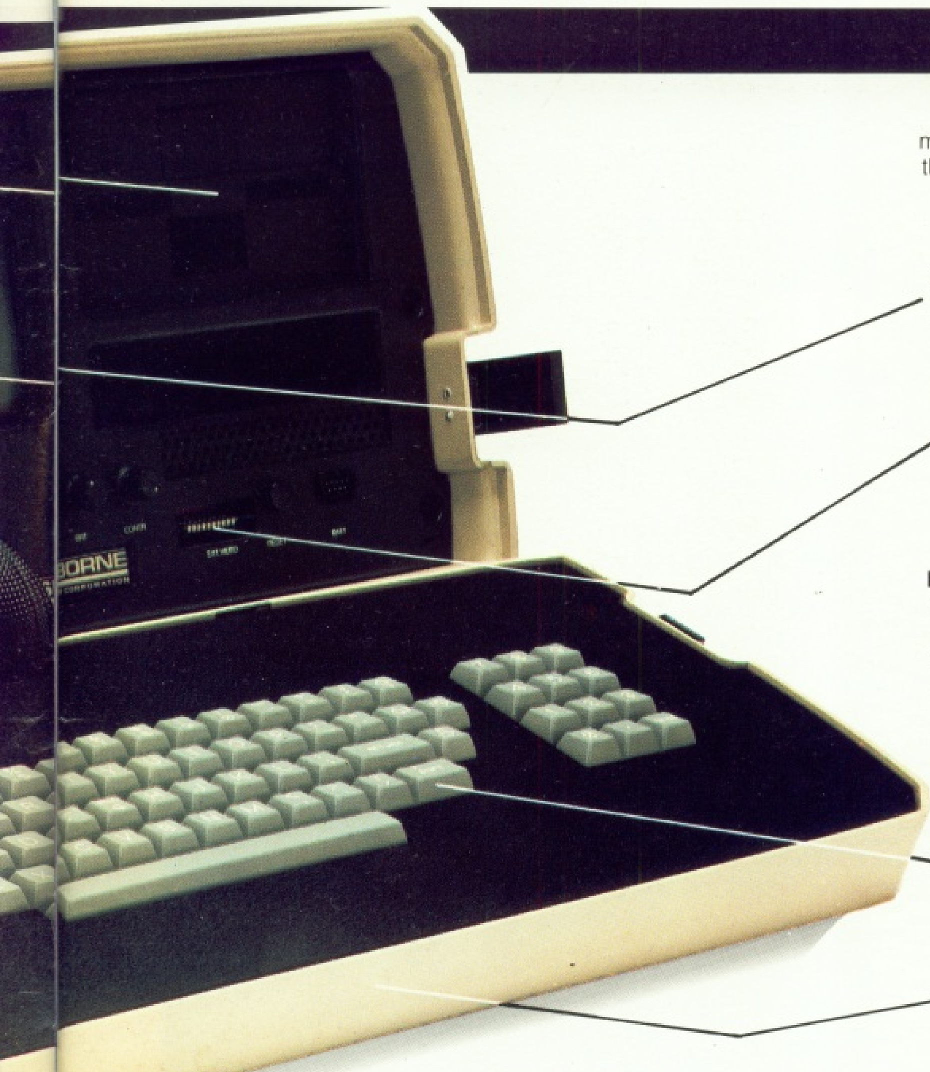

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The VIC Printer, like all VIC peripherals, offers a very high specification at a very competitive price.

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Its main features include: 80 characters per line • Tractor feed dot matrix • 30 characters per second print speed • Full alphanumerics and graphic printing • Double-size character capability • All cables and leads.

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Special plug-in cartridges are available to expand VIC's memory. 3K, 8K and 16K RAM packs plug directly into the computer.

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For full details of VIC 20, its peripherals and software, and a list of your local dealers, contact: The Commodore Information Centre, 675 Ajax Avenue, Slough, Berkshire. Tel: Slough 79292.

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VIC 20
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SPECIAL • VIC SUPPLEMENT

The Commodore VIC has now been on sale for nine months in this country – and is currently selling at a rate of more than 6,000 units per month. The VIC is now supported by a vast range of both software packages (games and business apllications) and hardware addons. *MicroComputer Printout* conducted an in-depth survey of the world of the VIC: its history and future, together with a technical overview, and a survey of compatible products. The background information should be useful to anyone considering the purchase of a home microcomputer.

R.P.

How VIC came to be.....

Microcomputers, in common with most anthropological species, evolve and adapt themselves to suit the environment in which they live.

The Commodore VIC is a direct descendant of the Commodore PET, one of the first microcomputers to be mass-produced way back in 1977. Though the early PETs (at that stage unsupported by floppy disks and printers) were widely sold for 'home' and 'educational' use, the first customers were almost entirely computer enthusiasts – who wanted to be able to write programs without the restrictions encountered using the computers at their college or work.

As public computer awareness increased, it became apparent that a much larger market existed amongst those who were not already programming enthusiasts, but who wanted to play arcade games or to give their children a chance to learn about computers. But before that could happen, computers needed to become cheaper and more friendly, offering colour displays, sound effects and the like.

Commodore took the PET design and ruthlessly chopped out all the expensive bits. Usable memory (RAM), for example, was truncated to 5K; the power supply moved outside the main casing so it could easily be adapted for different countries; even the casing itself was changed from preformed steel to tough snap-together plastic; most important of all, the display screen was replaced by an interface to a domestic T.V. set.

As the design was being stream-lined, Commodore's semiconductor plant, MOS Technology, came up with a development that would provide colour and sound – the Video Interface Controller (from which VIC derives its name). All the electronic components needed to drive a TV set in full colour were reduced to a single chip which, once again, could easily be changed to cater for the different colour T.V. systems employed in the USA and Europe. The VIC chip also incorporated tone generators and sensor devices to cope with joysticks and light pens *(see ANATOMY OF THE VIC)*.

The fact that Commodore were employing existing technology and that the design had been adapted from the PET obviously helped to keep the price down. Commodore took this policy too far, however, and it is now generally considered to have been a mistake to re-use the PET BASIC and most of the operating system – instead of a more user-friendly set of commands to cope with the sound and colour.

Though prototype VICs first appeared as early as January 1980 at the Las Vegas Consumer Electronics Show, it was not until Autumn '81 that UK shipments commenced; deliveries to Japan and USA had commenced a few months earlier.

Despite fierce competition from Atari, Texas, Sinclair et al, Commodore claim to have sold over 200,000 VICs worldwide already, with some 6,000 moving through the UK warehouse each month.

Meanwhile, Big Brother PET, has moved upmarket into the business sector. The species has therefore not only evolved, but multiplied!

ANATOMY OF

Interfacing

VIC comes with a built-in cassette interface – though you have to use Commodore's own unit (the C2N, which costs around £40) as it won't work with an ordinary cassette player.

A separate serial interface is incorporated to manage the various peripherals which Commodore and other suppliers will be offering. A single drive floppy disk is already available (£395) and the low cost dot matrix printer will follow shortly.

Finally, there is an 8-bit parallel user port which can be used to link into your own circuits – ideal for the electronic experimenter. Software exists in the VIC operating system to turn this port into an RS232 (which would give access to a wider range of printers and modems etc) though it is necessary to add on a small piece of hardware to give the correct voltage levels.

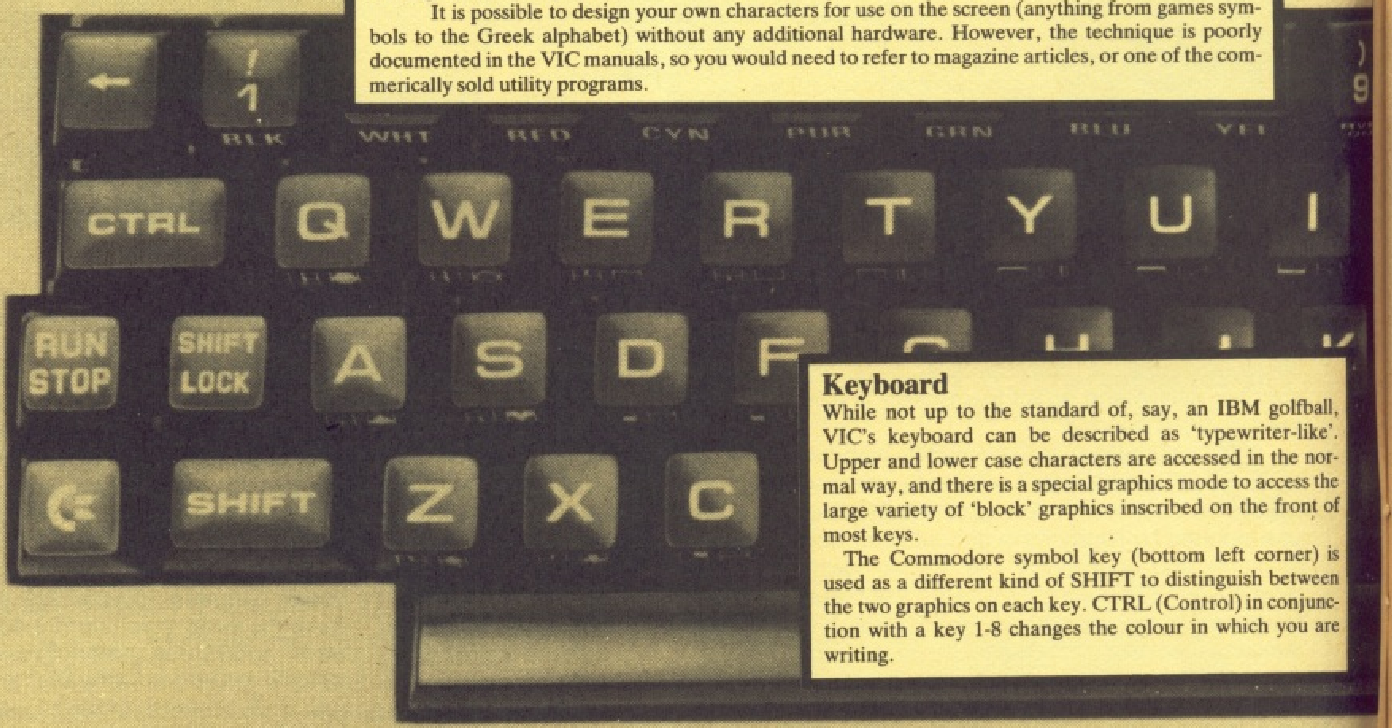
Colour/Graphics

For colour purposes, the screen has three different properties: the border around the edge of the screen which can be any one of eight colours; the foreground colour (which is like the ink you are drawing characters in) may also be one of eight. The background colour (equivalent to the colour of the paper you are writing on) includes eight lighter shades – i.e. 16 in all. Changing the foreground colour involves pressing CTRL and one of the top row of keys. Changing background and border colours requires the use of a POKE command.

Any one of the graphic symbols appearing on the keys, can be displayed in any one of the 22x23 block positions, in any one of eight colours – making possible some attractive pictures and abstract patterns.

If you want to draw fine lines and curves it is necessary to purchase a plug-in cartridge that offers high-resolution graphics in addition to the normal block graphics.

It is possible to design your own characters for use on the screen (anything from games symbols to the Greek alphabet) without any additional hardware. However, the technique is poorly documented in the VIC manuals, so you would need to refer to magazine articles, or one of the commerically sold utility programs.



Keyboard

While not up to the standard of, say, an IBM golfball, VIC's keyboard can be described as 'typewriter-like'. Upper and lower case characters are accessed in the normal way, and there is a special graphics mode to access the large variety of 'block' graphics inscribed on the front of most keys.

The Commodore symbol key (bottom left corner) is used as a different kind of SHIFT to distinguish between the two graphics on each key. CTRL (Control) in conjunction with a key 1-8 changes the colour in which you are writing.

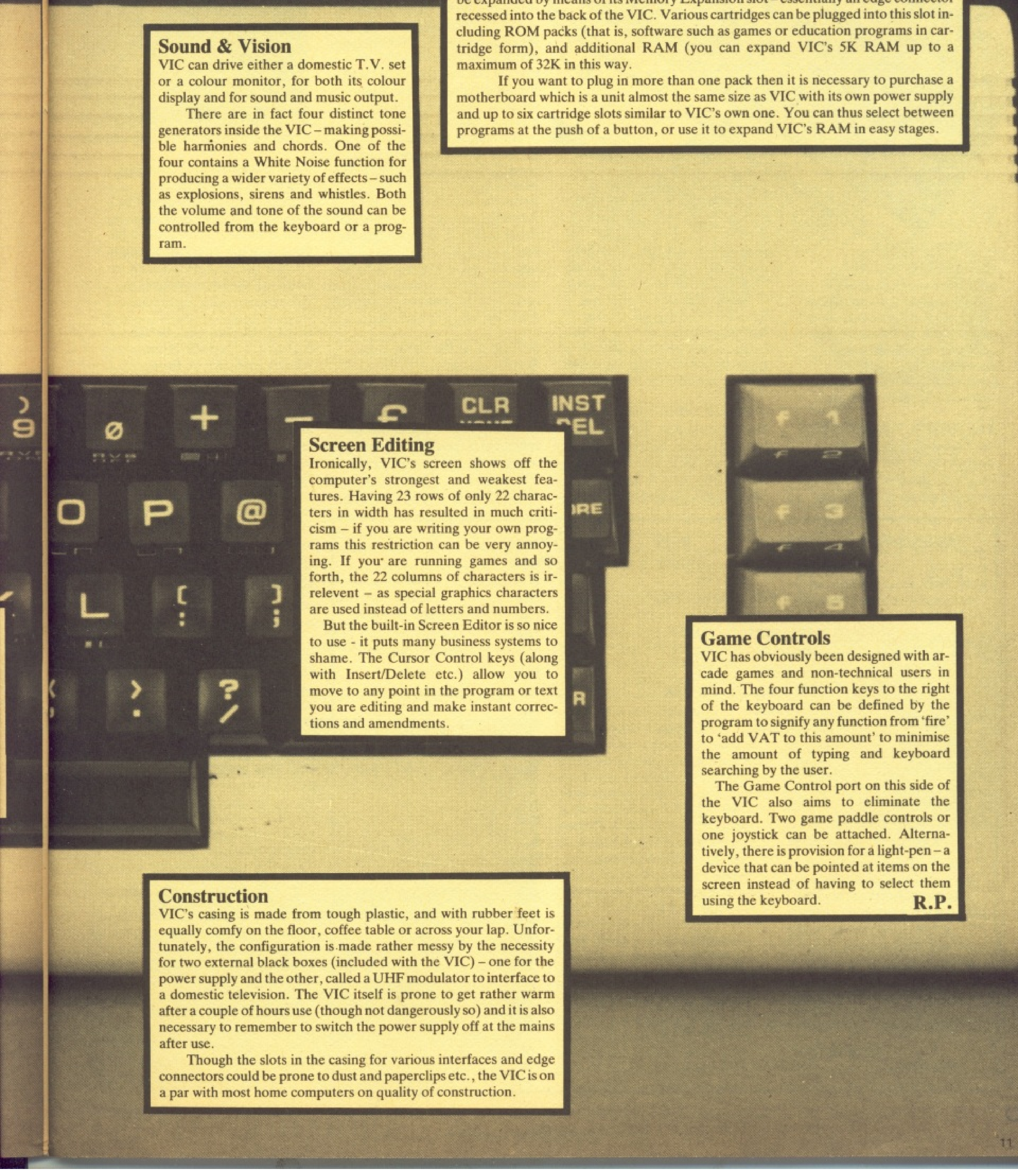
BASIC & Memory

The standard VIC comes with 5K of RAM, of which 3.5K is available to run programs, either typed in or LOADed from cassette. Additional memory can be plugged in (see Expansion) up to a maximum of 32K RAM.

In addition, 20K of ROM is included to house all the routines VIC needs to operate itself (called Operating System) and understand the programs you type in (the BASIC Interpreter). The ROM, too, can be expanded slightly with plug-in ROM packs which may be anything from extra BASIC commands to Space Invaders.

VIC's BASIC Interpreter has come in for much criticism because it lacks special commands to cope with the colour, graphics, sound and game controls. The BASIC used is in fact nearly identical to PET BASIC, and Commodore claim that compatibility between the two systems was the motive. A more likely reason is that insufficient time and resources were allocated to the software development department.

THE VIC



Sound & Vision

VIC can drive either a domestic T.V. set or a colour monitor, for both its colour display and for sound and music output.

There are in fact four distinct tone generators inside the VIC – making possible harmonies and chords. One of the four contains a White Noise function for producing a wider variety of effects – such as explosions, sirens and whistles. Both the volume and tone of the sound can be controlled from the keyboard or a program.

Expansion

Apart from the various peripheral interfaces and the game control port, the VIC can be expanded by means of its Memory Expansion slot – essentially an edge connector recessed into the back of the VIC. Various cartridges can be plugged into this slot including ROM packs (that is, software such as games or education programs in cartridge form), and additional RAM (you can expand VIC's 5K RAM up to a maximum of 32K in this way.

If you want to plug in more than one pack then it is necessary to purchase a motherboard which is a unit almost the same size as VIC with its own power supply and up to six cartridge slots similar to VIC's own one. You can thus select between programs at the push of a button, or use it to expand VIC's RAM in easy stages.

Screen Editing

Ironically, VIC's screen shows off the computer's strongest and weakest features. Having 23 rows of only 22 characters in width has resulted in much criticism – if you are writing your own programs this restriction can be very annoying. If you are running games and so forth, the 22 columns of characters is irrelevent – as special graphics characters are used instead of letters and numbers.

But the built-in Screen Editor is so nice to use - it puts many business systems to shame. The Cursor Control keys (along with Insert/Delete etc.) allow you to move to any point in the program or text you are editing and make instant corrections and amendments.

Game Controls

VIC has obviously been designed with arcade games and non-technical users in mind. The four function keys to the right of the keyboard can be defined by the program to signify any function from 'fire' to 'add VAT to this amount' to minimise the amount of typing and keyboard searching by the user.

The Game Control port on this side of the VIC also aims to eliminate the keyboard. Two game paddle controls or one joystick can be attached. Alternatively, there is provision for a light-pen – a device that can be pointed at items on the screen instead of having to select them using the keyboard. **R.P.**

Construction

VIC's casing is made from tough plastic, and with rubber feet is equally comfy on the floor, coffee table or across your lap. Unfortunately, the configuration is made rather messy by the necessity for two external black boxes (included with the VIC) – one for the power supply and the other, called a UHF modulator to interface to a domestic television. The VIC itself is prone to get rather warm after a couple of hours use (though not dangerously so) and it is also necessary to remember to switch the power supply off at the mains after use.

Though the slots in the casing for various interfaces and edge connectors could be prone to dust and paperclips etc., the VIC is on a par with most home computers on quality of construction.

ADD—ONS & PLUG—INS

One of the VIC's greatest assets is the vast range of add-ons and plug-ins with which the computer can be expanded. Mike Todd takes a look at what's available from Commodore and independent suppliers.

With the market for VIC-compatible peripherals and programs growing so rapidly, no review of products could claim to be complete. What follows below is an overview of add-ons and plug-ins, divided into four categories: memory expansion, add-ons, software and books.

Memory expansion

Extra memory allows longer programs to be written and also permits the use of VIC's high resolution graphics capabilities.

The internal memory layout is rather odd, and as a result, there are several ways of adding extra memory.

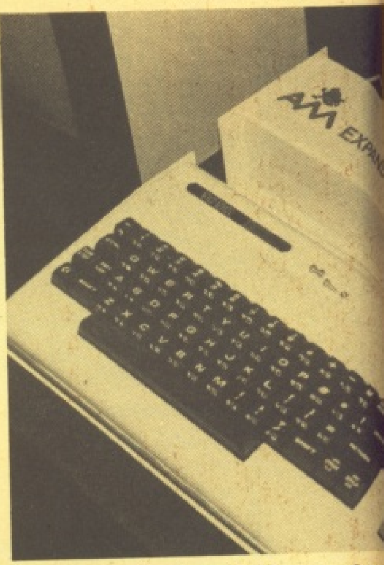
A maximum of 32K of RAM can be used, divided into 4 blocks of 8K each. The first block (block 0) already contains 1K of RAM, followed by a 3K gap, 3.5K for BASIC programs and a final .5K for the screen memory. The 3K gap is filled when using any RAM expansion with a specified 3K section.

Blocks 1 to 3 are filled using RAM in multiples of 8K and must be filled in ascending order. For instance, if 8K RAM is placed in block 3 with none in blocks 1 or 2, the VIC will just ignore it! Small switches or soldered connectors on the RAM pack usually determine which block each 8K of RAM will occupy.

ROM packs, such as games and other plug-in programs normally occupy block 5 which is not available for BASIC programs. However, there are now cartridge simulators available which fill this 8K block with RAM to allow the simulation of cartridge programs. For maximum benefit, these must be battery backed up so that they do not lose their contents when power is removed. These are useful for developing software prior to putting it into a ROM or just for copying software from other ROM packs. *(Ahem, not pirating software, surely! – Ed)*

The table lists most of the memory expansion boards and cartridges currently available. The column headed CAPACITY shows the maximum amount of RAM the unit can take, while the RAM SUPPLIED column shows how much RAM is actually installed and an asterisk indicates that the RAM is battery backed up so that the contents are not lost when the VIC is turned off.

STACK (290-298 Derby Road, Bootle, Liverpool. 051-933 5511) must be one of the most prolific manufacturers of VIC goodies. The bottom of the range is their simple 3K RAM pack and at the other end is their 19K expansion in which the 16K is battery backed. The main range is based on a single board with space for 3K



Arfon expansion board with seven slots

RAM and twelve 2K RAM chips. This allows a wide variety of configurations to be bought. The table shows two prices for most of the boards. The larger figure is for the special low power RAM chips. There is also a ROM socket on board and the expansion port is repeated.

BEELINES (Freepost, Bolton BL3 6YZ. 0204-384599) and ADDA (154 Victoria Road, Acton, London W4. 01-992 9904) both sell a 32K memory expansion unit which also brings the VIC up to 40 characters per line. Gone are the normal VIC graphics and these are replaced by the TELETEXT/VIEWDATA graphics characters. ADDA also sell the 40 column unit separately at about £115. I would argue against buying one of these units unless you want to do something clever with PRESTEL or TELETEXT – if you really want 40 characters per line, wait for the 40 column VIC!

ARFON (Cibyn Industrial Estate, Caernarfon, Gwynedd, N. Wales) and Commodore (675 Ajax Avenue, Trading Estate, Slough, Berks. 0753-74111) both have very similar products available. They both do 3K, 8K and 16K expansion cartridges at the same prices, so there's nothing to choose between them. However, their two expansion chassis are significantly different. The Commodore unit has the memory expansion port repeated six times, and simply plugs into the VIC without any mechanical support. The ARFON unit is well supported and even allows a shelf to be fitted for putting a small TV on. The ARFON board is also significantly cheaper!

AUDIO COMPUTERS (87, Bournemouth Park Road, Southend-on-Sea. 0707-618144) produce a low power 20K cartridge (VCR-20) which is also available

Manufacturer	Capacity	RAM Supplied	Number of Slots	Power Supply	Cost
Stack	3K	3K	1	No	29.89
	3K+16K	3K+16K*	1	No	227.70
	3K+24K	8K	1	No	94.30/ 79.35
	3K+24K	16K	1	No	142.60/113.85
	3K+24K	24K	1	No	192.05/148.35
	3K+24K	3K	1	No	56.35
	3K+24K	3K+8K	1	No	103.00/ 97.75
	3K+24K	3K+16K	1	No	167.90/132.25
	3K+24K	3K+24K	1	No	211.60/166.75
Beeline	32K	32K	1	Yes	253.00
Commodore	3K	3K	0	No	29.95
	8K	8K	0	No	44.95
	16K	16K	0	No	74.95
	–	–	6	Yes	125.95
Arfon	3K	3K	0	No	29.95
	8K	8K	0	No	44.95
	16K	16K	0	No	74.95
	–	–	7	Yes	97.75
Audio Computers	20K	3K	0	No	24.00
	20K	20K	0	No	64.00
	0K+0K+8K	0K+0K+8K*	2	No	44.00
Greenwich	3K+24K+8K	none	1	No	51.75

with only 4K. Extra HM6116 chips are £5.00 each. Their VCS cartridge simulator has 8K of battery backed CMOS RAM.

GREENWICH INSTRUMENTS (22, Bardsley Lane, Greenwich, London SE10 9RF. 01-853 0868) produce a single board with a duplicate memory expansion slot on it, and 5 sockets to take up to 35K of RAM. It is designed to be equipped with their INSTANT ROMS, available in 4K and 8K versions, but which cost over £60 each! A useful development tool, but expensive.

I have my own ideas about the perfect expansion unit, but no-one manufactures anything quite like it (yet!) I would like to see something like the ARFON chassis, complete with power supply and space for the modulator and the shelf for the TV. However, I would only have 4 memory expansion ports instead of seven and in the space left I would have sockets for the full 27K (i.e. 3K+24K) of RAM expansion together with 8K of battery backed up RAM as a cartridge simulator with each of these three sections individually switchable out of circuit. There would be no RAM included so that only the bare minimum would be bought to start with. And the cost? It would have to be less than £100.

Add-ons

Probably the most popular add-on for the VIC is the cassette recorder. Because of the unusual (but reliable) recording method adopted by Commodore it is best to buy the Commodore cassette machine for £44.95.

If you would rather use your existing domestic cassette recorder, a special interface is available for £19.55 from Customised Electronics Ltd. (Winker Green Mills, Stanningley Road, Armley, Leeds. 0532-792332).

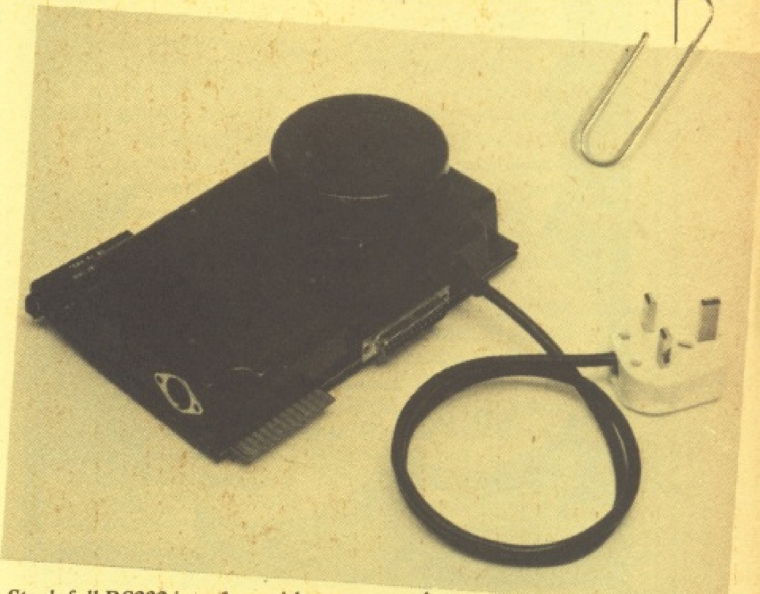
The VIC 1515 printer costs £230, and plugs straight into the back of the VIC. It prints up to 80 characters across the page (a relief from the 22 on the screen) at 30 characters per second on tractor feed paper (that is paper with holes up each side) and will print the VIC graphics character set.

The VIC 1540 floppy disk unit is the final major item of hardware in the VIC range and costs £396. It allows very much faster storage and access of programs and data than the cassette. Data recorded on disk by the VIC can be read by the PET disk drives 2020/3030/4040, and vice versa which means that data can be exchanged between the two systems. Unfortunately, the VIC disk drive is much slower than the PET drives but this won't significantly affect most users.

If you've already got a PET disk or printer, maybe you would like to use it on the VIC. Commodore make a VIC-IEEE interface cartridge for £54.50 which makes this possible.

If, instead, you have an RS232 printer then there are a variety of RS232 interface cartridges available. The VIC itself already has the necessary software to drive an RS232 device, it just needs the interfacing hardware to be attached to the user port. The Commodore RS232 interface (VIC 1011A) costs £34.95.

Commodore VIC-1540 single floppy disk



Stack full RS232 interface with power supply

Stack produce two RS232 interfaces. For £19.84 there is a low cost, bi-directional RS232 interface with a minimum of frills. The fully implemented interface costs £56.35 and contains its own built-in power supply with facilities to get at some of the power rails for other peripheral devices if required.

3D also produce an RS232 interface for about £25. They also have an interface available which will allow the VIC to drive any Centronics type printer for around £50. This could be very useful in view of the number of Centronics-compatible devices around.

Stack make a light pen for £28.75 which will work in normal and hi-res modes. This is attached to a length of curly cable and plugs straight into the games port at the side of the VIC, and the position of the light pen is easily detectable from within a program.

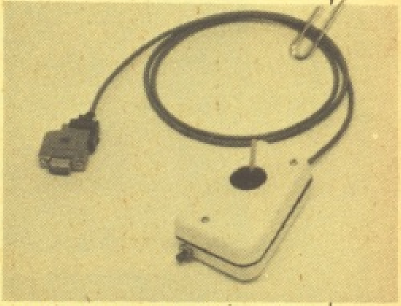
Also plugging into the games port, Commodore have a simple switch type joystick complete with "fire" button for £7.50 which can be used with many of Commodore's cartridge games. The style of the joystick is very like the Atari version, but is reported to be a bit more robust.

Le Stick is supposed to be the ultimate joystick and is available from ADDA at £30.75. This is a one handed joystick which uses tilt switches to detect its position.

Commodore also make games paddles at £13.50 for a pair. These can be used with a couple of the Commodore games and are merely rotary controls whose position can be detected by the software.

It is important to realise that there are two types of joystick available – the switch type and the analogue type – and they are both totally different. So if you are buying one then make sure you know which sort it is. STACK produce a joystick at £14.95 and they don't say what type it is.

If you want to connect a light pen and a joystick to the VIC at the same time, the STACK VIC games-port-adaptor cable reproduces the games port twice and costs £19.84. In fact STACK do a wide range of bits and pieces for the VIC including leads, plugs and sockets, dust covers and so on.



Stack analogue joystick

(Ed – As we went to press, news came in that ADDA have signed up the UK distribution rights to a number of exciting VIC add-ons from Datatronic in Sweden. These include a low-cost modem, a cartridge of relays for the home experimenter and a large number of cartridge games and utilities – including the programming language FORTH).

Software

Commodore produces a variety of plug-in cartridges for £19.85. ▶

ADD-ONS & PLUG-INS

One of the VIC's greatest assets is the vast range of add-ons and plug-ins with which the computer can be expanded. Mike Todd takes a look at what's available from Commodore and independent suppliers.

AVENGER is the Commodore version of "Space Invaders", JELLY MONSTERS is "Packman", ALIEN is "Space Panic", and STAR BATTLE is "Galaxians". In addition there is RAT RACE in which you guide a mouse through a maze, picking up a much cheese as you can on your way. You are chased by rats, with strategically placed cats scattered around. It doesn't help that you can't see all the maze at any one time, although a small "radar" display does show roughly where everything is. Without doubt, one of the most additive of the Commodore range!

Variety of goodies including VIC printer, cassette deck and modem.

Other games from Commodore include SUPER LANDER (a moon landing game), SUPER SLOT (a very boring slot machine simulation), ROAD RACE and PINBALL (a superb and addictive cross between a pinball machine and "Breakout"). On cassette for £4.99 is BLITZ in which you bomb a skyscraper skyline from a plane travelling across the screen. The plane gets lower and lower and you must destroy the skyscrapers before you crash into them.

All Commodore games use the keyboard but many can take advantage of joysticks – for convenience.

Future Commodore games include SARGON II, an impressive chess program and several different ADVENTURE games, ADVENTURE is not an arcade game, but a dialogue between you and the computer in which you must achieve a specific goal by exploring, overcoming obstacles and collecting the necessary artefacts. A complete game can take days or even weeks, and the game has become highly popular amongst more "intellectual" computer users.

AUDIOGENIC (P.O. Box 88, Reading, Berks. 0734-586334) have a variety of VIC programs including VICALC (£8.99) which is not a game but a programmable calculator. They also have SPIDERS OF MARS on cartridge (£24.99) and a range of other cassette based software all around £6.99 to £8.99.

HI-TECH (7 Queensway, Hemel Hempstead, Herts. 0442-50450) include PACKMAN, SPACE INVADERS, 3D MAZE, MISSILE COMMAND and INVADER FALL in their catalogue. Because of the memory limitations, many games lack the refinements expected, although MISSILE COMMAND (which requires 3K expansion) is a good example of getting the best from the VIC. Many are a bit clumsy to use but are not too expensive at £8.75 or below.

BUG BYTE (100 The Albany, Old Hall Street, Liverpool, 051-227 2642) produce a superb imitation of "Packman" called VICMEN (£8.95) and a version of "Breakout" called ANOTHER VIC IN THE WALL.

For only £6.95, dk'TRONICS (23 Sussex Road, Great Yarmouth, Norfolk. 0493-602453) sell a cassette of 10 VIC programs including a simple tank battle, BREAKOUT, MASTERMIND and a couple of sound and graphics demonstrations. They also have a couple of games such as ROX and DEFLEX for £4.95 and an 8K version of ROX plus 3D LABYRINTH for £5.95.

Of course, it's not only games that people buy (is it?).

Commodore produce three useful utility cartridges. The PROGRAMMERS AID allows single stepping through a BASIC program, automatic line numbering and renumbering, merging, search and replace and much more. The MACHINE CODE MONITOR is essential if you want to write machine code and allows simple assembly, disassembly, and has a variety of debugging aids. The SUPER EXPANDER allows access to the high resolution capabilities of the VIC through POINT, DRAW, CIRCLE and PAINT commands. It allows the function keys to be assigned character strings, simple music to be generated and easy access to games paddles, joystick and light pen values. With a built-in 3K expansion it is extremely good value. All three utility cartridges cost £34.95.

STACK produce the VICKIT for £28.75 which provides the same basic facilities as the PROGRAMMERS AID and there is a VICKIT II at £33.35 which is the same as VICKIT but also provides similar high resolution graphics commands to the SUPER EXPANDER. These are sold as bare chips and so require a ROM socket to be available – which of course STACK can supply.

Future developments of VIC software will include SIMPLICALC (a sophisticated aid to decision making along the lines of "VisiCalc"), a STOCK CONTROL program, VIC FILE (a data filing system) and VIC WRITER (a simple word processor). All of these are to be produced by Commodore who also have a wide range of educational packages in the pipeline. There is a junior education pack with number, spelling and grammar programs. At a more advanced level there are GCE 'O' level and CSE revision programs for many subjects, and a series of home education programs.

Books

"The VIC needs the VIC REVEALED", or so say the ads. I would certainly take issue with that statement on the grounds that the book is riddled with errors of fact (I counted nearly a hundred!), typing errors and badly designed layouts. At £10.00 I rate it a very poor buy. Fortunately, there is to be a new edition very soon and that could be a useful addition to the library. It is published by Nick Hampshire Publications, (P.O. Box 13, Lysander Road, Yeovil, Somerset).

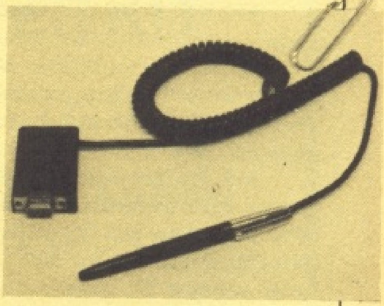
Commodore have their own PROGRAMMERS REFERENCE GUIDE which was originally £14.95, and has been reduced to £9.95. It too has many errors (but nowhere near as many as VIC REVEALED), but is better presented and covers much more – including a summary of all BASIC commands, machine code and the innards of the VIC.

GETTING ACQUAINTED WITH YOUR VIC-20 by Tim Hartnell costs £5.95, and Commodore also produce a paperback, LEARN COMPUTER PROGRAMMING WITH THE COMMODORE VIC by Carter and Huzan. At £1.95 it must be reasonable value!

The Independent Commodore Product User Group have a VIC section and there should be machine code course for the VIC, available soon to members at a cost £1.00 (yes, one pound!). ICPUG also provides six newsletters a year covering the entire range of Commodore products, including the VIC, as well as a free software library and an opportunity to tap the corporate expertise of its membership. The annual subscription is £7.50 and details are available from Jack Cohen (30 Branchester Road, Newbury Park, Ilford, Essex. 01-597 1229)

Finally, if you want to learn BASIC, there are many books around. My two favourites are the BBC/NEC 30 HOUR BASIC book at £5.50. This covers BASIC in general, with notes on the BBC Microcomputer, but is well presented with lots of exercises and examples. Most of the book is applicable to VIC BASIC with the exception of the file handling section.

The other book is the Commodore INTRODUCTION TO BASIC (part 1) which costs £14.95 and consists of a 150 page book, two cassettes and a flowchart stencil. The course is arranged in 15 lessons, each covering an important aspect of programming. The course is well thought out, but the book is over elaborate and rather difficult to read. The programs on cassette are quizzes testing your understanding of the units and example programs. Both text and software are unusually bug free, although there are bugs in the cassette software – some of them deliberate to test your debugging skills!

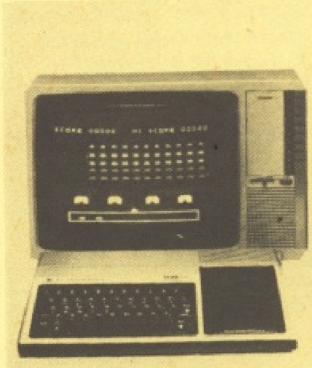


Light pen – connects to the game port

R.P.

THE COMPETITION

What future does VIC-20 have?



Atari & Texas: "stiff competition in home entertainment"

BBC & Spectrum "user friendly"

Commodore MAX: gunning for Uncle Clive.

Though the VIC has come in for a fair amount of criticism in the computer trade, and a variety of rival machines have been tipped as winners by different magazines, the VIC-20 continues to sell very well indeed.

With competition hotting up, a price war in the offing, and Commodore themselves announcing a new range of products, the moment seems ripe to try and forecast VIC's future.

The VIC is not without its weaknesses – particularly in the areas of BASIC and Operating Systems, the screen size, and the number of game paddles/joysticks which can be attached. Strangely enough though, VIC's main strengths stem not from its specification, but from its marketing, distribution and availability. Quite simply, the more computers of a particular model are sold, the more compatible programs and attachments are offered by independent suppliers – and in VIC's case, this range of support programs is already very large. In any case the amount of support you can expect from a manufacturing company already actively marketing a large range of computers is going to be more than from a company involved primarily in technical research and indirect mail order sales.

None of VIC's main competitors (specifically the Atari 400, Texas TI99/4A, BBCModel A and Sinclair Spectrum) can match this support to the same degree, though all offer better specifications in certain areas. Atari, for example, has the best colour graphics. That's true both in terms of resolution – the size of the dots and hence the smoothness of curves you can draw – and sophisticated features for designing games. Atari call these Player-Missile graphics. The TI comes close to Atari, particularly with the optional plug-in cartridge *TI Enhanced BASIC*, which provides 'sprite' graphics – colourful graphic objects which you can design and then move about the screen at will.

Both systems score higher than VIC on the range of high quality cartridge games available, though in both cases the software is more expensive and comes from a small number of suppliers. The TI is supported by a range of peripherals which similarly reflect a high standard of design and construction, and display a proportionally higher price tag.

With the latest reductions bringing both Texas and Atari prices down to the £200 mark, these two machines look set to offer VIC some stiff competition in the home entertainment/education market. The BBC A and Sinclair Spectrum, however, will hurt VIC more in the home enthusiast/programmer market – though the manufacturers seem more concerned with competing against each other rather than anyone else. The reason that both score well in this department is due to their superb BASICs, which are user-friendly and contain a number of high level commands to cope with the graphics, colour and sound. Both interface to domestic cassette recorders with good recording speeds – ideal for those who want to write and save a lot of their own programs.

But competition to the VIC-20 is coming from within as well as without. The VIC-10, now known as the Commodore *MAX*, will be Commodore's entry into the low end of the market. With high-resolution colour graphics (with 'sprite' capability) and a built-in music synthesizer that puts most microcomputers sound facilities to shame, the heavy emphasis is clearly on home entertainment. Rather smaller in size than the VIC-20, the MAX can take plug-in cartridges (including one for running BASIC) and has a kind of solid-state keyboard with diaphragm keys which move. The price has yet to be announced; our guess is that it should be between £100 and £125 to give the Spectrum a run for Uncle Clive's money (of which he has more than his fair share). Jumping in above the VIC-20 comes the Commodore 64 or VIC-40, depending on who you talk to at Commodore. Details are scarce, though it is known that this machine will resemble the VIC, offer 40 columns on its screen, up to 64K of RAM, and the same colour graphics and sound features as the MAX. Both machines are likely to be available this autumn.

Where does all this leave the VIC-20? Our guess is that Commodore will keep manufacturing the machine at least until spring of next year, or until sales start to suffer from competition (of which there is no sign yet). Thereafter, the rapidly expanding VIC range should ensure that software and peripherals will be available for a long time to come.

READ/WRITE

In touch with aliens

On page 67 of your February issue, in an article entitled "In Touch with Aliens", statements are made regarding myself and Prince George King as follows:-

"Sadly, the credibility of the Society is somewhat tarnished by their other antics, which have included the spurious use of titles – to wit Sir Richard Lawrence, who is no kind of Sir at all according to the Royal College of Heralds – a Doctor of Divinity who, in conversation with 'The Observer' revealed the startling fact that he'd never heard of The Magnificat, and, best of all, Prince George King who caused a major row when he was crowned Prince in a Church of England establishment without reference to anyone at all, especially not Her Majesty or very many Archbishops and stuff, who are generally in charge of this sort of thing."

I have personally phoned Mr. Cheshire, Chester Herald of the Royal College of Heralds, who confirmed to me that no statement of the nature attributed to the College would ever be made. The College is only concerned with titles of the British Realm, which are either hereditary or bestowed by Her Majesty Queen Elizabeth II. They would confirm that I do not possess a Knighthood of the British Realm and I have never claimed otherwise. They would not state that I am "no kind of Sir at all" because they do not register Knighthoods from other parts of the world, including the Orders of Chivalry from which I received my Knighthood.

More serious even than this is the allegation that I have never heard of The Magnificat. I presume this is taken from an article written in the Observer colour supplement by Sue Arnold of 8th March 1981, when she interviewed myself and Dr. John Holder, whose doctorate is in biochemistry. During this article, Sue Arnold attributed the following question to Dr. Holder: "What's the Magnificat?"

I myself was brought up as an Anglican and attended King's School, Canterbury, where, as a King's scholar, I was required to sing the Magnificat in Canterbury Cathedral every week. I was later confirmed into the faith by the Archbishop of Canterbury himself. It is very damaging indeed to state that I, as a Doctor of Divinity, whose entire life is devoted to religious teaching and conduct, have never heard of The Magnificat.

The Ceremony you referred to when Prince George King was crowned in St. George's Church, Hanover Square did not cause "a major row". This is a completely erroneous statement. Moreover it is wrong to say that the Coronation took place "without reference to anyone at all, especially not Her Majesty or very many Archbishops and stuff". The Ceremony itself was based on strict Anglican liturgy and was presided over by Canon Mathias, an Anglican Minister. At the conclusion of the Ceremony, all present rose to join in the National Anthem to Her Majesty the Queen.

There is no doubt that on all these four points, the writer of this article has made erroneous and damaging statements against myself or Prince George King to which we strongly object.

I must point out that at no time did the writer of this article seek any information from myself to confirm these factually incorrect and damaging allegations. Had he done so, I would have been able to put him right and it would have avoided this very serious situation arising.

Dr. Richard H. Lawrence, B.A.
European Headquarters Secretary,
Aetherius Society.
An International Brotherhood
Founded in 1955.
Registered as a Church
757 Fulham Road, London S.W.6.

We are happy to accept Dr. Lawrence's assurances that he is indeed familiar with The Magnificat. It appears that in quoting from the Observer *interview the names of the two worthy doctors were accidentally transposed. We apologise for any error. The Society tell us that their founder should be addressed as His Eminence Sir George King Kt.C.G.C.J., Ph.D., D.D, Hu.SA,D. Archbishop Metropolitan of The Aetherius Church.*

Cheap hi-res graphics

Could you please answer a few questions of mine? They are as follows:-

1. Can a portable TV's bandwidth be altered (electronically) to become a monitor for the Crofton ZX81 ADAPTAKIT? The make of TV is a Ferguson Model No. 3848, and is made by Thorn Consumer Electronics Ltd.
2. With the new ZX Spectrum now on the market at £125, will high res. boards become cheaper for the ZX81, i.e. QS High Res Board?

For question 1 could you send details of the transformation if possible.

S. MacKenzie,
Arnold, Notts.

We're afraid that the short answer to your first question is: no. Though a monitor and TV do have many components in common, converting one to the other is not really on unless you are an electronics designer! Sorry.

The answer to your second question is really up to the suppliers concerned. However, our guess is that prices for things like hi-resolution boards will fall quite dramatically – as have memory expansions for the '81 since the announcement of the Spectrum.

READ/WRITE

The Editor welcomes your letters, but if you require a personal reply please enclose an S.A.E.

Ancient Manuscript

A shady character sidled up to me at a recent PET Show which shall be nameless and dangled a mess of dirty listings in front of my face. "Filthy printouths?" he hiththed, and so they were, as they seemed to be covered with coffee stains and cigarette burns. Purchasing them thight untheen and paging thurreptitiouthly through them in the prepaid privacy of the privy, I rejected all but one and emerged, flushed, with what I am bound to believe is an early version of a well-known work by one of our home-grown experts on Boolean algebra. It is headed "W & C v.1.5" and is, unfortunately, apparently only a fragment. I have transcribed it here for your delectation.

"The time has come", the Walrus said, "to talk of many things:
Of choosing chips and ceiling VATs and Babbages and kings:
Of why the case is boiling hot and whether files have strings."
"But wait a bit", the hucksters cried, "before you press RETURN,
For all of us are out of cash and few of us can learn!"
"No hurry!", said the Commodore: they hoped that he would burn.

Perhaps some student of Lewis Carroll will read this and be able to supply us with the rest of the manuscript.

Lindsay Doyle,
Princeton, NJ, USA

Programmable calculator

Some years ago I purchased a Commodore PR100 programmable scientific calculator. In October 1981 I purchased a Commodore VIC-20 with the intention of replacing my calculator. I have since found out that the VIC-20 is mathematically inferior to the calculator.

My question is, is there a micro computer on the market which is mathematically equal to or better than a scientific calculator?

N. C. Clemons,
Coventry

Many people who purchase a microcomputer, having used programmable calculators, are surprised to find that they offer only 8 digits accuracy, compared with the 10, 12 or 14 of the latter. This is determined by the BASIC interpreter – and some professional machines have special functions built into the language to give double precision. The more accurate your calculations, the more RAM storage space you use up for each number – so you have to draw the line somewhere.

The question really is: why do you need such accuracy anyway? The pocket calculator has done quite a lot of damage in schools by creating an obsession for accuracy. Most scientific or engineering calculations require only four digits at most. Surely the far greater flexibility of a computer should outweigh the loss in accuracy?

The only home micro we know of with greater than 8 digit accuracy is the Texas TI99/4A – which reflects much of TI's experience in calculator design. In processing speed, however, it is considerably slower than most of its competitors.

Language tapes

We have recently purchased a Sharp MZ-80K home computer. Although we are very pleased with the machine, there is one problem.

We are concerned about the possible deterioration or damage of the language tapes when they are subjected to considerable wear and tear – as they must be re-loaded every time the machine is turned on.

As the language tapes cost approx. £40 to replace, we are anxious to duplicate them as a safeguard against the original being damaged.

We have tried duplicating the language tapes on the tape recorder, but as there is such a high density of information on the tape this was not successful.

We have loaded the language onto the computer and then tried to 'save' the language onto a clean tape – but with no success.

Could you please let us know if there is anyway we can use the computer to duplicate the language onto a clean tape for our own domestic use.

Mrs A Fletcher,
Colchester, Essex

Our first reaction to this letter was that it was another example of the old story: you know – where the manufacturer won't tell you have to make a back up copy because they think you're going to pirate the software. Well not so in this case – when we rang Sharp in Manchester (061-205 2333) the software department was very helpful.

If it's the BASIC tape you want to copy (your letter didn't specify which) then all you need to do is load in the software and type two commands:

USR (33) and
USR (36)

to write the tape header and program respectively. If this doesn't seem to work – or if it's another language you need to copy – then give Sharp's software experts a call on the number above.

Watts the matter!

The other day I bought myself a lovely new multimeter circuit tester. Yawn. Yes, well the point is when I got home, besides measuring the electrical resistance of the cat, my brother's lunch and how flat my car battery was, I measured the output of my Sinclair ZX power supply (anything for kicks). Hoo boy. 12 volts. 12 volts?!? Aha!

The man at W.H. Smith's agreed that this was a trifle odd and promptly exchanged the whole caboosh (power pack computer and RAM pack) for new ones in case they had been damaged. Well, it had to be the cause of all the mysterius crashes (*without* RAM pack) and Load/Save problems, dinnit?

So. Get home. Plug transformer into voltmeter.

12 volts. AARGH! I can't take any more! What is going on here? Can I use the computer or will this one go quietly potty too?

A. Mills,
Woking, Surrey

Sounds to us as though your cat and/or brother's lunch are causing the mysterious crashes, though the 12 volts does sound a trifle strange. We immediately phoned Uncle Clive who assured us that the output from ZX transformers can vary from 7-13 volts and that 9V is only a typical figure. The regulators inside the '81 take care of these variations.

He also said that the RAMpack problems were usually caused by dust or loose connections on the edge connector (which has now been changed) and that the cassette problems are mainly due to the difficulty of adjusting the volume and tone controls. If this advice sounds rather less than helpful, try the advice given in Mr. Griffiths' letter.

How it works

I thoroughly enjoy reading "How It Works" by Chris Preston, published in your May issue. I am pretty sure many of your readers would welcome this short series of articles as they all know the need for understanding their PETs if they want to make the best use of their computers.

My only complaint about this article is that it is really very short. I wonder if you would consider doubling the size of this article in the subsequent issues.

I feel sure many of your subscribers would also like to know how do their floppy disk drives and line printers work. Undoubtedly, they will welcome jargon free explanation for complete beginners appearing in your magazines.

Lastly, Chris states at the end of his article that 12 address lines go to each chip, A0 to A12. There are 13 lines from A0 to A12. Is one of these a ground line?

M. P. Wong BFPO 1, Hong Kong

Thanks for the kind words, Mr Wong. By now of course you will have seen all three parts of the series on how hardware works inside. By popular request Chris has now been commissioned to explain in jargon-free detail how disk drives work and how the DOS knows where everything is kept.

As you point out, there was an error in the May article in that the twelve lines should have been numbered A0 to A11. Each chip in a microcomputer has one or more ground lines which are connected together, but have no connection with the address bus.

▶88

C.O.R.P.™ makes Apples more tempting

Apple, the most popular micro-computer, now has a Software accessory which enables the system to be programmed by beginners!

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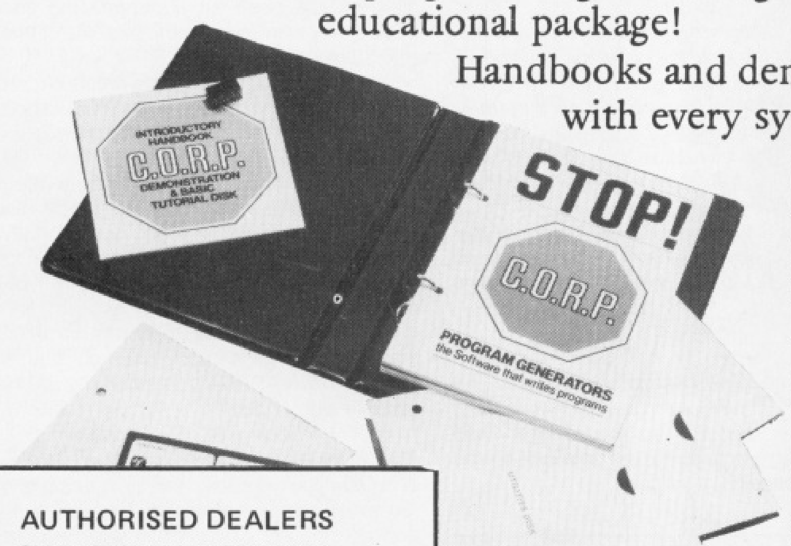
C.O.R.P. II is the most advanced and comprehensive collection of program generators which writes Applesoft programs. It enables a beginner to program quickly, simply, and error free by himself in everyday language with no programming knowledge. It's the first usable, educational package!



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48K Apple II, DOS 3.3 & 2 disk drives required.

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AMPAL (COMPUTER SERVICES) LTD.,
31 Woodbridge Road, Darby Green,
Blackwater, Camberley, Surrey.
Tel. (0252) 876677

Who *is* No. 1?

At the last count, no less than four micro manufacturers were claiming the title of Britain's Best Selling Micro Computer. We thought it might be interesting to clear the matter up once and for all. And so it proved.

We asked/begged/threatened/ cajoled the leading micro firms into giving us their May sales volume figures, and the total number of machines sold in the UK to date. We then checked this information with trade sources, and in a number of cases, with our own unofficial sources within the companies concerned. In several instances the claimed sales figures appeared to have been exaggerated to a greater or lesser degree.

The figures in the table therefore represent an informed estimate of net hardware UK sales for May; that is to say, computer and peripheral sales by the manufacture or distributor to dealers. The figures for Sinclair and the BBC micro reflect sales to British end-users. Export sales and those of software not included with the system, were excluded. The sterling value of these sales has been estimated by us.

Market Share

Not unexpectedly Sinclair delivered more systems than anyone else; some 20,000 ZX-81's in May, compared to Commodore's 6,700 *PETs* and *VICs*. It is rumoured – unofficially – that *ZX-81* sales have declined sharply since the announcement of the *Spectrum*, however.

Sinclair also wins handsomely on installed user base, with some 300,000 ZX80s, and ZX81s out there. Sinclair claim to export twice as many as they sell here.

The BBC Micro earned third place with 3,500 units a month being shipped; still not enough to satisfy the long waiting list for the 'B' model.

Apple made fourth place with 1,100 units sold against Tandy's 950 computers a month.

Sales by value

The other way of looking at the market is by comparing hardware sales by value. Here the picture altered radically.

Sinclair's £1.6m monthly turnover is trumped by Commodore with £2.6m. The surprise contender for third place was ACT with £1.2m sales of their Sirius 1. This narrowly beat the £1.1m worth of BBC machines sold, and £1m barrel load of Apples. Tandy made sixth position at £750,000 and Osborne seventh with £420,000.

Two caveats apply: the micro computer market alters very rapidly, and can be influenced by seasonal factors. Secondly, the figures for monthly hardware sales value are estimates – although we believe them to be accurate. A special section of next issue's Read/Write column is being reserved for angry letters from manufacturers disputing our figures. Those accompanied by auditors certificates will be given priority!

Manufacturer /Distributor	Units per month	UK installed base	Net monthly hardware sales £
ACT Sirius	500	1,500	1,220,000
Apple	1100	30,000	1,000,000
Atari	475	5,000	130,000
BBC	3500	18,000	1,150,000
Commodore	6700	95,000	2,600,000
Osborne	450	1,000	420,000
Sharp	1400	13,500	304,000
Sinclair	20,000	300,000	1,600,000
Tandy	950	24,000	760,000
Texas Instruments	200	3,000	35,000

ACORNGRAM

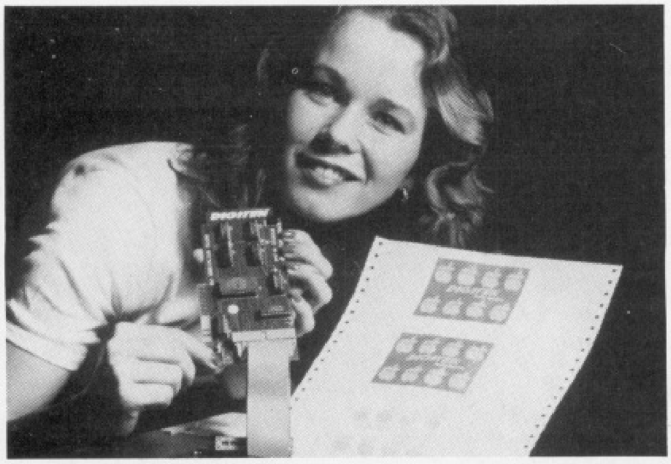
MESSAGE BEGINS ACORN USER OFFICIAL MAGAZINE FOR ATOM + BBC + ECONET USERS COMMENCES PUBLICATION THIS MONTH STOP SUBS £15 PER ANNUM FROM 53 BEDFORD SQUARE LONDON WC1B 3DZ STOP MESSAGE ENDS

APPLEGRAM

MESSAGE BEGINS APPLE PRICES DOWN 20% STOP APPLE II 48K RAM + DISK + 12 INCH MONITOR + VISICALC = £1200 + VAT BEFORE JULY 31ST STOP MESSAGE ENDS

SIRIUSGRAM

SMALL SYSTEMS ENGINEERING HAVE A Z-80 BOARD THAT LETS SIRIUS RUN ALL STANDARD CP/M SOFTWARE STOP CORVUS HARD DISK INTERFACE + 64K OF RAM BUILT IN STOP £299 FROM SSE AT 2-4 CANFIELD PLACE LONDON NW6 OR DEALERS STOP MESSAGE ENDS



This charming lady is called Doreen.

Doreen is modelling the Printmaster *parallel interface from Digitek.*

Note the discreet Apple motif on the printout.

Hi-res graphics dumping are not a problem for Doreen. She simply slots the card into her Apple and before you can say Clive's your uncle, Doreen is producing inverse printing, double density and double picture size.

Doreen can also undertake 90 degree picture rotation (honest), justify her text and control her margins.

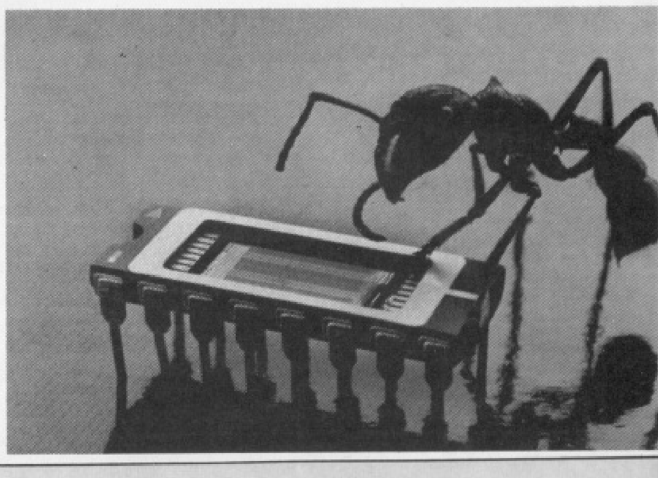
I have just gone right off Doreen.

Well, how can you resist a calendar that contains such essential data as that contained in the Great Computer Calendar 1983? *I mean take March. For the 1st it reminds us that Frankenstein was published on this day 1818; that the Sinclair ZX81 was introduced on March 5th 1981, and that on the 15th of March 1963 absolutely nothing happened at all.*

Nothing? Well, anyway I thought you would probably want to know that it costs $7.95 from Reston Publishing Company, 11480 Sunset Hills Road, Reston, Virginia 22090, USA.

Memoires concerning March 15th 1963 should be sent to them, not me.

March's illustration: Argentine Fire Ant gets to grips with Western Electrics 64K RAM chip.



by Julian Allason

D.I.Y. ZX 82

A few months ago we asked readers to pre-empt speculation about Sinclair's new computer with a ZX-82 design of their own. We have had a marvellous time sorting through your entries.

None of you managed to come up with anything that quite matched what Uncle Clive has now launched as the *Spectrum*. You clearly had a lot of fun trying through.

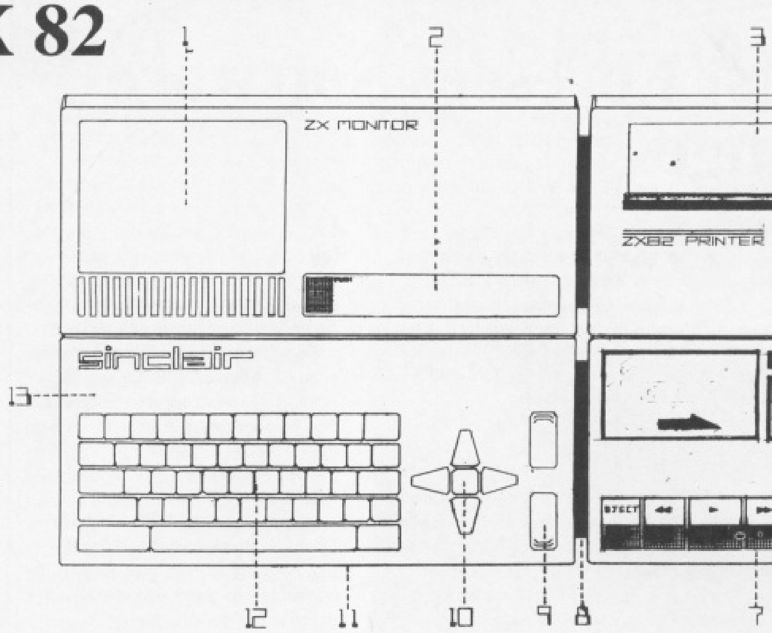
Joseph Taylor of Leith, Edinburgh, proposed a single chip computer with only one pin "to simplify kit building". His ZX-82 design also featured a new 100MHz clock "so the screen doesn't have *time* to flicker", and a novel not-very-floppy disk device using 2p coins.

Complimentary subscriptions are on their way to Joseph, and also to Stephen Smith of Chippenham and Christopher Lewis of Ynstawe, Swansea, whose description of a ZX-81 with calculator keys, sound and colour capabilities, and on-board loud speaker wasn't far off the mark.

The winner, however, was 18-year old Alex Blok, of Burclere, Newbury whose design was in some respects *better* than the Spectrum, the judges felt.

A real Spectrum will be on its way to Alex shortly, kindly donates by Clive Sinclair.

Here is the winning entry:



ZX-82 WITH PLUG-IN LCD MONITOR

1. FLAT SCREEN TV MONITOR (£50) with built-in rechargeable battery pack. Can easily be detached and mounted elsewhere using a cable. Or can be replaced by a dot matrix LCD monitor which would help reduce power consumption and weight.
2. PERSPEX COVER protecting volume, brightness controls etc.
3. ZX82 PRINTER (£60) with wider printout than ZX-81 printer. Can be mounted elsewhere or plugged directly into the computer.
4. MANUAL PAPER FEED.
5. OPTIONAL MICRO CASSETTE RECORDER (£35) for program storage with LED indicators for loading, saving and power.
6. PERSPEX COVER protecting speed select, vólume controls etc.
7. PIANO TYPE TAPE TRANSPORT CONTROLS, with software control over program location when in play mode. Can be disconnected and mounted elsewhere like rest of system.
8. PRINTED CIRCUIT BOARD CONNECTORS which allow the units to be held together rigidly. They can be replaced with the long flexible connectors as described above.
9. THE ZX-82 itself (Basic unit £70; with 16K RAM £100-£115)

The unit would come as standard with low resolution colour graphifacility, when used in conjunction with an external colour monitor, and about 8K of user RAM.

The ROM will be similar to the ZX-81 ROM in that the keyboard will still have the one touch keyword entry system.

The keys arrowed by the number 9 are for scrolling when using the LCD monitor.

10. CURSOR CONTROL KEYS which are duplicated on the joystick output on the front of the unit (number 11). The centre key is the HOME key and returns the cursor to the top of the screen.
11. JOYSTICK INPUTS.
12. CONVENTIONAL QWERTY KEYBOARD with modern short throw keys for high speed programming.
13. THE CABINET will house up to 16K of user RAM, a built-in battery to protect programs in the event of a momentary power failure, and space for future developments, (like a disk drive control ciruit) and music, using the built-in miniature speaker.

My congratulations to Alex. Now perhaps someone would like to build the thing. Are you listening, Uncle Clive?

16 bits good: 32 bits better

Just as I was getting to grips with 16-bit technology, Acorn have gone and spoilt it by announcing a 32-bit microcomputer.

Based on National SemiConductor's 16032 processor, it will appear first as an add-on board for the BBC computer, connected via their mysterious Tube.

With half the industry arguing that eight bits are just as good as sixteen, you may be forgiven for wondering why anyone should need a 32 bit device at all. The short answer is that most of us don't. Yet. And won't until there is enough software to make it work.

Acorn are not exactly unversed in such matters, and have used their special relationship with National SemiConductor, to make sure that the software really will be ready by year's end.

"Having missed the 16-bit boat, Nat. Semi realised they would have to be very supportive of us," Acorn's co-founder, Herman Hauser told me. The support will apparently take the form of a variety of commercial grade compilers. FORTRAN, Pascal and PL1 are due in December, with COBOL to follow in mid '83.

Once the software tools are available the software houses can get cracking on applications programs for the likes of you and me. Quite a few of them may simply be ported across from much larger mainframe computers. After all, something like 90% of the world's scientific and engineering programs are said to be written in FORTRAN.

"It all started when we designed the Tube," says Hauser. "We set out to create an efficient interface that would enable the BBC machine to address more memory."

The microprocessor inside the BBC machine was the trusty 6502, which only addressed 32K bytes of RAM. Putting a second 6502 microprocessor in seemed a more elegant way of increasing addressable RAM than paging. And so the Tube was born.

"We got the Tube design so right that we discovered it didn't matter what was on the other end of it," says Hauser.

The next step was obvious: a Z-80 card to let the BBC machine run CP/M programs.

Now Acorn have set their sights on becoming the first microcomputer manufacturer to offer 32-bit capability. So far they have got most of BBC BASIC written in 16032 assembly code. Hauser says the floating point arithmetic runs 22 times faster than the original 8-bit version, and uses 30% less code.

A full 32-bit computer is planned, but initially the 16032 should appear at the end of this year as an add-on board with 128K or 256K of RAM. It will rejoice in the name of the Acorn Glueon. (Glueons are the things that hold quarks together). "It will be a glue-on for the BBC micro," adds Hauser helpfully.

Columnist Foresees Software Sex Change

This column is frequently consulted by the curiously clad denizens of the marketing profession – if profession it be – as to "the future of microcomputers". Perhaps they think we are some kind of oracle, albeit an overweight one.

Alas, nothing could be further from the truth. The fact is that we are usually as baffled by the latest turn of events as you are. If not more so.

Occasionally, however, the prophetic muse descends on Upper Basildon, zaps us with her wand – or being Berkshire, it might be a hunting crop – and vanishes leaving us with a pleasant tingling sensation and a clear vision of the future.

For the benefit of the pin-striped marketeers, we will share our latest vision with you. It is simply this.

A new standard (cries of "Cobblers" and "We've heard that one before") is unfolding itself. Any microcomputer manufacturer who ignores it – and to date most are doing just that – will be dead. Or severely disadvantaged at the very least.

This new standard can be summed up in the equation 8088 +MSDOS = ££££.

Allow me to explain.

There are, as we know (and if we don't, we should direct our attention to the last four issues) three 16-bit micro processors that count. These are Intel's 8088, Zilog's Z8000 and Motorola's 68000.

Consult Tommy, or any boffin worth his white coat, and he will tell you that the 68000 is the best. And from a technical point of view, he will be entirely correct. About the Z8000 I make no comment beyond recalling that my colleague Inside Trader recently published its obituary, and Olivetti have selected it for their microcomputer. (The latter is held in the trade to be the more telling of the two).

Intel's 8088 isn't even a full blown 16-bit chip at all, at least not in the sense a minicomputer manufacturer would understand. Nonetheless, the mighty IBM, whose annual legal budget would comfortably refit the Argentine Air Force, saw fit to choose it for their *Personal Computer*. Such being the way things are, everyone else has smartly stepped into line.

Indeed, Chuck Peddle of PET fame, actually managed to queue barge IBM in the UK, and as I write (late June) his *ACT Sirius 1* is the only one of the new 16-bit machines to have reached the market place in any quantity.

Next in line are Digital Equipment Corporation, whose very handsome *Rainbow* goes on sale this autumn, smartly followed by Wang, and a host of other less well known Americans, and some fairly famous Japanese, notably Hitachi.

Since most of these supermicros are as yet no more than a few marks on the manufacturers marketing plan, you may justifiably wonder whether this column is not indulging its taste for red herrings.

Not so, this time. Because the threat – and that's exactly how the Apples and Commodores currently see it – of the 16-bit machines, has already damped down sales of 8-bit microcomputers quite dramatically.

The manufacturers aren't admitting to any of this, of course, but one finds dealers like the Bristol-based Datalink openly musing about "the market slow-down" in their latest newsletter.

So what has MSDOS got to do with it? Answer: quite a lot, since it was IBM who commissioned it and Microsoft who they commissioned it from.

IBM apparently share my view that the world's most popular operating system, CP/M is awful. *(But see supplement this issue – Ed.)* At any rate Microsoft was instructed to write something a bit more user friendly. Being Microsoft, they have exceeded their brief by all accounts, and although MSDOS was only released here in the second half of June, the majority of software houses seem set to quietly drop the 16-bit version of CP/M (also awful) and switch their efforts to developing software that will run under MSDOS.

The upshot of all this is that by wintertime there is likely to be an overwhelming amount of software for the 8088-based machines, most of it running under MSDOS.

Sure, Keen and Tandy and the lesser fry who have backed the 68000 will have some excellent software on offer, but it will be as nothing to what will be available for the IBM/Sirius/DEC/Wang Personal Computers.

Of course, I *could* be wrong about all this, (and I am biased as hell about Sirius) but I don't think so. If I am, blame the muse and buy an Olivetti.

[We apologise for the headline on this article which was due to circumstances within the Editor's control, but unfortunately he was out to lunch at the time. Readers are invited to submit misleading headlines of their own for use in future editorial lunch time situations.]

Debugger Off

"SM Debug Spray kills all known bugs. Simply apply to your program and errors will instantly be eliminated ..." said the instructions.

"Does it work?" I asked SM Software's Ken Godden.

"Not yet" he grinned. "But have a good look at this; it's almost as good."

It proved to be SM's *Integrated Business System*, an ingenious set of CBM programs that slot together like Leggo. You might start with a few basic functions like Stock Control and Invoicing, adding Sales and Purchase Ledger, Payroll and word processing programs at your own convenience.

SM is the merciful abbreviation for Softwareverbund MicroComputer GmbH, one of West Germany's better known micro software houses.

The British branch at Raglan House, Dursley, Gloucestershire (telephone 0453-46065) will be happy to send you details of their business system, but will probably change the subject if you ask about Debug Spray.

Greatest Show on Earth

There are reputed to be no less than thirty two entrances to the Barbican Centre. Unfortunately, the organisers of the *PCW Show* know about twenty nine of them and will be posting members of their Hells Angels-style security squad with instructions to "discourage" gate crashers.

Nonetheless it should be well worth the possible risk to life and limb to gain entrance to what has become arguably the most interesting of the micro computer shows. In emergency it may even be necessary to pay the £2.50 entrance fee on 9th-12th September.

Last year's effort at the Cunard International Hotel led to queues that twice encircled the block. This time business visitors – i.e. anyone who books ahead on business stationery – will be able to use a special 'no waiting' entrance manned by nubile young girls with the minimum of clothes. Send your money to Ms Timmi Collins at Montbuild Ltd., 11 Manchester Square, London W.1.

Ms Collins tells me the show will be at least as twice as large as last year, and will incorporate special ZX and BBC/Acorn fairs within it.

If you are planning to travel to the Show from any distance a number of package deals are available. These include Show ticket, 2nd class return rail travel and (hopefull first class) hotel accommodation. Typical prices: £25.50 from Manchester; £19.50 from Southampton. For details ring 01-995 8995 and ask for Big Frank.

See you there.

by Julian Allason

Hi-res Hotstuff

When I first started poking about in personal computers, just about all that was on offer in the way of affordable hard copy devices were a few clapped out old teletypes.

Don't laugh; that was as recently as 1977.

Thanks to the generosity of a succession of various printer manufacturers (the cynical may put it down to an entirely reasonable desire for publicity) I haven't had to pay for one since. That's if you exclude a positively antique IBM golfball I was conned into parting with £700 quid for the following year. The first and last time it was a source of pleasure to me was when we dropped it from a great height into the Solent, where it now constitutes a hazard to mariners.

Back to the point. If only for a moment. If I can remember what it was.

Ah yes. Printers.

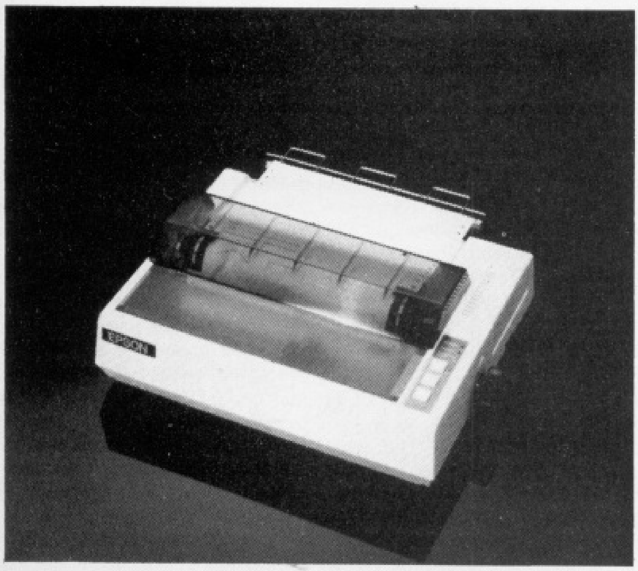
Well, they get better all the time, don't they? Take these new high resolution graphics models from *Epson*.

Bloody marvellous they are. Reliable, cheap and all the doings. That means superscript, subscript, deletion and italics as standard features. Centronics-type 8-bit parallel interfaces, natch. RS232C – and IEEE488 for the asking.

This one is the MX100 Type III, which pelts along at 100 characters per second in any of eight software selectable international character sets (well, you *might* need cyrillic one day). Those characters, which incidentally have true descenders, can be expanded, condensed or enlarged at your command.

But the magical bit is the high resolution graphics capability. All it needs is a short BASIC subroutine and we should be able to dump all those lovingly constructed hi-res graphics directly on to the printer.

Winston Churchill, Einstein, Snoopy, Linda Lovelace *(who? – Ed)*, here I come!



Net Stockings

I can't think of a single good reason why anyone buying a new computer system should be remotely interested in multi-tasking systems.

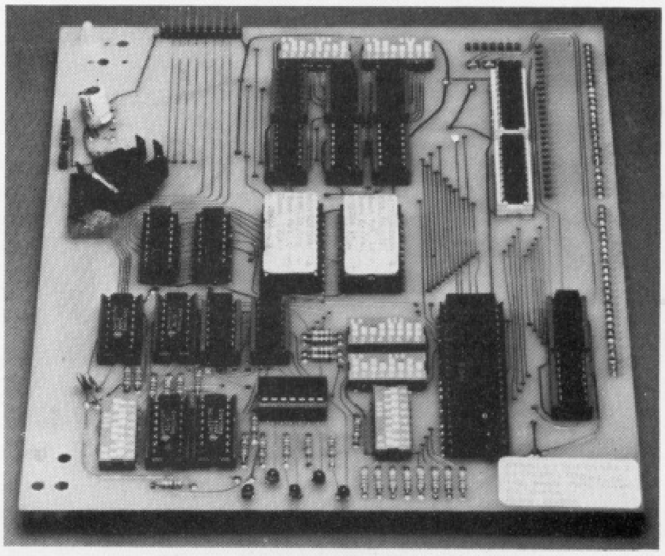
The idea of individual terminals taking it in turns to share a central processor had quite a bit of relevance when the processor and random access memory were the most expensive parts of the system.

These days, that is no longer the case and whilst you might conceivably want to share a disk drive or printer, or maintain a common data base on hard disk, local intelligence and RAM must be considered essential.

The sensible way of linking computers together is with a local area network. Such networks are now getting very cheap indeed.

One of the least expensive is *Keynet* for the VIC. Up to 200 VICs, spaced as far apart as 1.8km, can be linked into the system at a cost of about £200 a station.

A *Keynet* system might work something like this: I hack out this column on a VIC using the splendid new *Wordcraft-20* word processing program (£125 from Audiogenic) loaded from a disk drive downstairs. The finished articles are saved onto disk for libel (and spelling) checking by the Editor on his PET. The finished product would be sent to a daisywheel printer to make a permanent copy for our files. A further copy might be sent to our composer for typesetting once that were interfaced to the same network.



The Keynet board which links PETs and VICs in a local network.

One VIC – or PET – in the system is designated a master; the rest are slaves. To become a master or slave, a small *Keynet* board is plugged into the memory expansion port of the computer. The connection between the computers is ordinary four-pair telephone cable. After that it is – more or less – plain sailing.

U-Net is a new system developed by Apple dealer Dr. Bill Unsworth of U-microcomputers, with schools in mind. Here, up to eight Apples, Atoms, VICs or BBC micros can share the resources of a host Apple computer.

£400 buys the *U-Net* board plus the system software on disk. Thereafter the cost per station is £110 for Apple-to-Apple or £50 for smaller micros.

For chapter and verse on local area networks I warmly commend to you our January issue, (available price £1.25 post free from P.O. Box 2, Goring, Reading).

I Speak Your Wait

The telephones have hardly stopped since I mentioned the Mitsui document reader that Zenithplan (01-636 5364) linked to a Sirius at the Hanover Fair. Text fed into it is scanned, converted into ASCII code and displayed on the computer screen. The system costs £9,800 complete.

Why not hitch it to a speech synthesiser like Votrax's Type'n'Talk unit and have it 'speak' the words? Ideal for the blind, I mused.

Someone else in the rotund shape of Ray Kurzweill seems to have had much the same idea in 1974. The result is the Kurzweil Reading Machine that has just gone on display at the 'This Is Information Technology' exhibition at the Science Museum in London.

Kurzweil has installed over three hundred of his machines in the United States, mostly in libraries, at about £20,000 a throw.

A spin-off from the project is something called the Kurzweil Data Entry Machine. This 'reads' virtually any typeface (but not handwriting – it is too variable) ten to fifteen times faster than the time it would take to rekey it manually.

More information can be had from Omnifont International at 12 High Street, Chalfont St. Giles, Bucks. Tel. 02407-5995. Or visit the Science Museum before September 5th.

I shall be trying out some of my own reading matter on these machines shortly. We will let you know how they get on with Playboy.

PET Show Report

Poor old Commodore. Three years after they started sticking CBM labels on their computers, and everyone still calls them PETs. And so it was with the PET Show despite valiant efforts to publicise "The Third International Commodore Computer Exhibition".

Bigger it certainly was; and if a little of the early excitement of the original Cafe Royal do was missing, the kit on show was a great deal better.

The old timers were to be found in the Captains Bar tearfully recalling the bad old days (circa 1979) when an absence of accurate technical information and decent software brought users together in a kind of war time camaraderie.

Take the book 'Programming the PET/CBM', for example, being sold by its author Raeto West at the show. £14.90 buys you 504 pages of just about everything you could possibly want to know (and more) about ROM routines, how BASIC works, disk operation, graphics and so on. To those of us who fought for scraps of information, drooled over the simplest of new tricks and stayed up into the wee small hours trying to find ROM locations in the early days of PET, it somehow seems too easy for newcomers – like learning how to do Rubik's cube out of a book.

Much of the Commodore show, it must be said, was very similar to last year – particularly in the area of business software. Though the number of integrated accounting systems had increased dramatically and several of the more popular titles had reached second or third editions, new applications programs were hard to find.

An exception was a package called CALC-RESULT from the Swedish company Datatronic. Really a kind of 3-dimensional 'VisiCalc' this program allowed you to perform spreadsheet type calculations on several pages, accumulate results from different pages and even view one page through a window in another. The 3-dimensional connection arises from the ability to perform calculations into or out of the screen, as well as in rows and columns. The whole package had apparently been written in the language FORTH and then compiled – and Datatronic were also displaying a VIC cartridge of FORTH along with a number of other goodies such as a cartridge of relays for the home experimenter, and a cheap modem.

Datatronic were looking for UK distributors for all their products and by the end of the Show had signed up a deal with Adda Computers for the VIC products.

Adda themselves used the show to launch a new idea in computer training for businessmen. £690 plus VAT is the cost of a training package that includes a full day course in computers, word processing and financial planning, plus a complete VIC system (including cassette, printer, 16K RAM and a whole lot of accessories) to keep and continue the training at home.

Rabbit software (a reference to their software reproductive capabilities?) showed a number of exciting cassettes and disks for VIC including RABBIT WRITER (not as some supposed, a biography of Richard Adams, but a 16K word processor), RABBIT BASE (a small database system) and FROGGER – a version of that revolting pub game that requires navigation of a frog across a busy road without accident. You can reach RABBIT on 01-863 0833; ask for Big Ears.

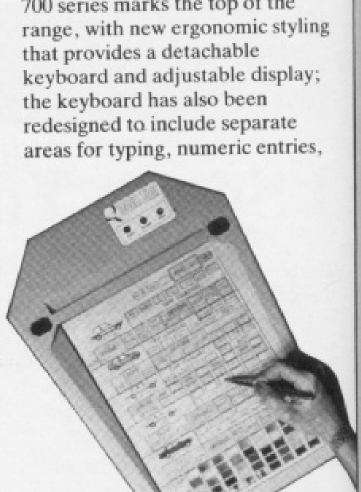
Meanwhile, for all those PET owners getting jealous of baby brother's colour display, IO Systems Ltd. (01-959 0106) showed a superb colour board for the PET which costs around £400 and drives a colour monitor. The board fits inside a PET, comes complete with 192K RAM and its own 16-bit processor and gives a resolution of up to 640 x 576 pixels in colour – which makes the VIC look positively clumsy! Machine code subroutines can be called to draw lines, boxes and graphs etc.

The Datatab (see photo) is another interesting add-on for the PET and comes from Quality Computer Systems Ltd. (02514-23833). It is a pressure sensitive pad which can be used for selecting options – rather like the cash registers used in MacDonald's hamburger joints. You can design your own overlays or have laminated sheets made up professionally. Up to 16 Datatabs can be daisy-chained to one PET at a cost of around £400 each.

If hard disk is what your business system requires, there were two bits of good news at the Show. First, Commodore was showing off its new 9060 5¼" mini-Winchester hard disk, which is available in 5MB and 10MB versions and looks to the PET much the same as a Commodore floppy disk. The alternative to Commodore's unit is the Mator Shark which is based on an 8" Winchester with options of between 10 and 45 Megabytes. The Shark was being marketed by Commodore but has now (surprise, surprise!) been relegated to the status of Approved Product. The new development at the Show was the Sharkive – a quarter inch tape cartridge unit which solves the perennial problem of backing Winchester disks.

Perhaps the most surprising aspect of the Show was Commodore's own prescence. Unlike many companies who become more and more remote from the marketplace as the dealer structure develops, Commodore used the opportunity to make themselves known to the end user. A large education stand was run in conjunction with several schools and teachers; a technical clinic was available for users requiring advice direct from the boffins – even the Service Department had their own stand, with a bunch of heavies ready to deal with anyone unwise enough to register a complaint.

Two central stands were used to show off the shortly-to-be-released new products, these were carefully roped off from prying fingers. The 700 series marks the top of the range, with new ergonomic styling that provides a detachable keyboard and adjustable display; the keyboard has also been redesigned to include separate areas for typing, numeric entries,



screen editing and 10 user definable function keys. The 700 ▶

by Julian Allason

◀uses an 8-bit 6509 microprocessor which is compatible with Commodore's popular 6502 but can address up to 1 megabyte of RAM (256K inside the casing). Microsoft BASIC is standard as are twin 5¼" disks. There is also a facility for a second processor such as a Z80 or 8088 to give access to CP/M, CP/M 86 and MSDOS based packages.

The 500 series is a cross between a home and business computer – having a 40 column high resolution colour display when plugged into a domestic TV set. Processor, memory possibilities and keyboard are the same as on the 700, though there are no built-in disk drives so you will need to purchase one of the standard external units.

Coming down into the personal field, the Commodore 64 (also known as the VIC-40 or VIC-64) looks externally much like a VIC-20 but features 64K RAM, a 40 column hi-res colour display, and the new 'Sprite' graphics offered by the VIC2 chip. Also included is the new full sound synthesiser chip known as SID (which is built into the 700 and 500 for no apparent reason).

These two chips also form the basis of Commodore's entry into the low-cost market, called the MAX. This has a semi-solid keyboard and superb graphics and sound capabilities. Plug-in cartridges give access to a large range of games, educational aids or the language BASIC. The price could be as low as £100.

None of these machines is expected to be available in UK before the autumn.

R.P.

The Short of It

There now follows a very *brief* announcement.

RC Computer Services, who hail from that *least large* county in our United Kingdom have developed *Petite Pascal* for the PET.

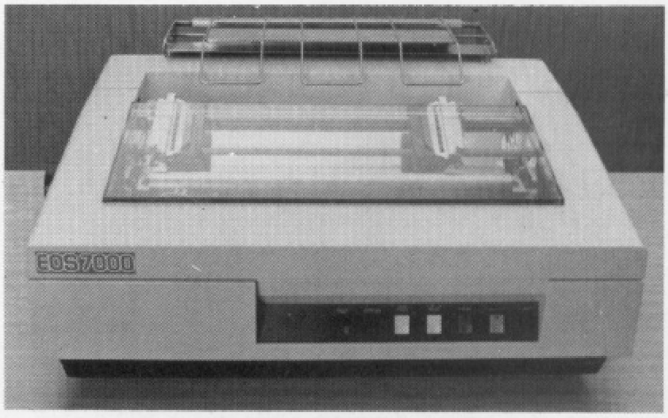
It is what you might call a *tiny* Pascal compiler, written in 6502 machine code, so it is *compact* and fast. You will still need 16K of RAM memory though, *not much* by present standards.

Once loaded, the compiler co-resides in RAM to provide what its author (who is of *less than average* stature) disarmingly describes as "a fast user-friendly environment, ideal for learning how to program in Pascal."

Versions are available on 4040 or 8050 disk dormat, and tape for a *modest* £35 inclusive from RC Computer Services, Gilfach Meredydd, Brechfa, Dyfed SA32 7QS.

Blaise Pascal was *small* too.

3-in-1 Fun



More than one microcomputer owner has resolved the perennial 'quality-or-speed' quandry by buying *two* printers: a dot matrix device for high speed work and a daisywheel for correspondence.

Electronic Office Services have addressed this very problem with their new model 7000, which they describe as a "3-in-1 printer suitable for all makes of computer."

All makes? I am not sure that too many ZX81 owners will be forking out the £2200 + VAT it costs, but it is worth a careful look nonetheless.

In what they call high quality letter mode, it prints at a speedy 90 characters per second, double the rate of any daisywheel I have used.

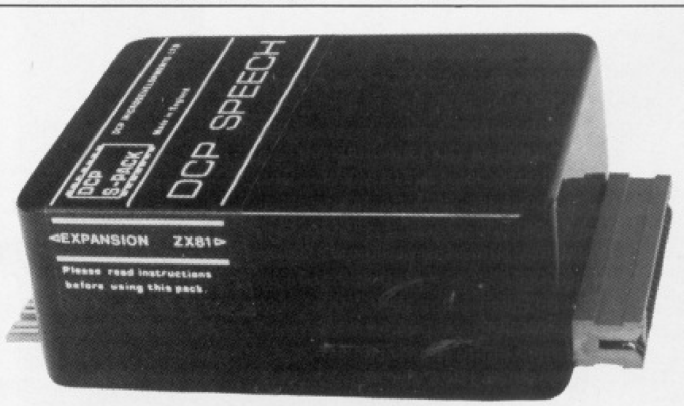
In draft mode it positively belts along at 180 characters per second, giving a typical dot matrix effect, which may be fine for figures, but can be tiring on the eyes.

The third alternative is graph mode, wherein it becomes possible to reproduce things like letterheads and trademarks. With a resolution of 120 dots to the inch, fast screen dumps from high resolution monitors are clearly no problem.

All this quality (feel the width. 336 columns across the page which should satisfy even *VisiCalc* users) is courtesy of a new dot matrix head. Instead of the usual seven or nine needle heads, this one has 16.

More about the EOS7000 from Electronic Office Services at 29/31 Fleet Street, London E.C.4. Tel: 01-248 6971.

Sinclair Speech



"Within a few hours you'll be talking to it like an old friend" – remember the slogan from the Sinclair ZX-81 advertisements?

22 year-old Daniel Palmer has neatly turned it on its head: "Within a few minutes it will be talking to you like an old friend". He is describing his DCP Speech Pack, a new £50 device that plugs into the back of the *Sinclair ZX-81* or, with an adaptor, *the Spectrum*.

The unit comes with Word Pack ROM number 1. Plug this 8K chip into the synthesiser and the computer instantly acquires the gift of speech, albeit in somewhat restricted fashion.

Word Pack ROM 1 has programmed into it instructions which tell the synthesiser how to pronounce all the letters of the alphabet, the numbers zero to over a million, and a few other useful words like "and" & "the"

ROM packs 2, 3 and 4 add to this rather limited vocabulary; they cost £14.95 each from Palmer at DCP Microdevelopments Ltd., 2 Station Close, Lingwood, Norwich. Be warned, however, coding your own EPROM chips is *not* for beginners.

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3D

We are specialist suppliers of CBM PET and HP 85 compatible interfaces.

We also supply complete systems for industrial and laboratory monitoring and control.

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IEEE-488 compatible systems . . . .

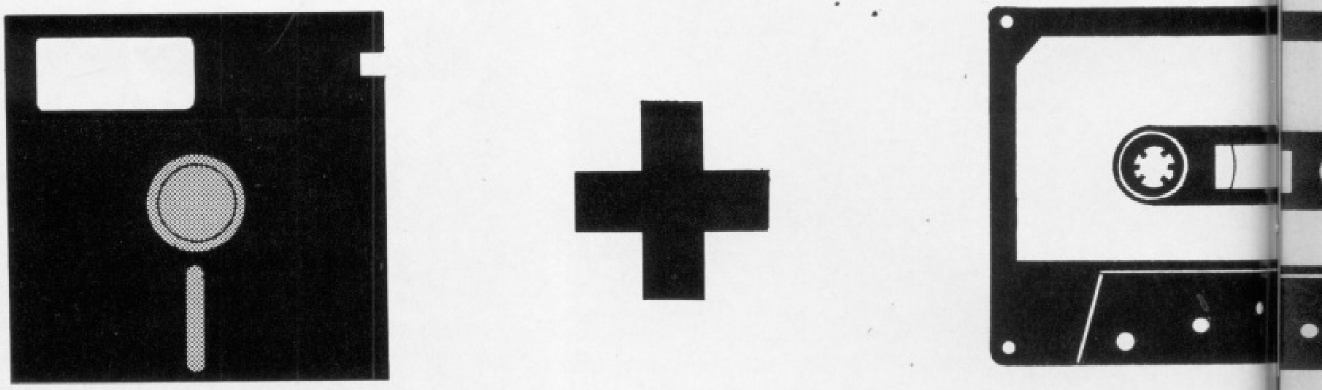
• 8 channel 12-bit A/D convertor	£600
• 8 channel 12 bit D/A convertor	£695
• 16 channel 12-bit A/D convertor with software programmable amplifier.	£850
• 16 channel 8-bit A/D convertor	£300
• 8 channel 8-bit D/A convertor	£350
• X-Y analog plotter interface	£200
• digital data input unit, 64 bits	£400
• digital data output unit, 64 bits	£350
• 16 channel relay control unit	£350

All the above units are boxed complete with IEEE-488 address internally selectable, integral power supply, switch, fuse, indicators etc. Illustrative BASIC software supplied.

• user port convertor A/D plus D/A	£200
• fast data acquisiton system 40,000 readings per sec. 4 A/D + 4 D/A	£950

All prices EX-VAT.

MONEY FOR



Making money from selling programs isn't quite as eas

The most important single thing to remember when preparing a piece of software for sale is the fact that the salesman is your enemy.

You may take your brand-new brain child to any of the new "outlets" for software – to the manufacturers (Apple, Commodore, IBM, Osborne) or independent software publishers like Microsoft, Digital Research, Visicorp, Microtrend, Caxton, or Harding, or even to product brokers like David Ferris, or Brian Mills. All can help you get into the money – and all are your enemy.

To prove my point, let us talk about holidays, bikinis, sun-tan oil, and sand. And aeroplanes.

When I was an airline advertising man, the company regularly used to spend hundreds of thousands of pounds advertising the fact that it had aeroplanes flying to Spain.

Any rational observer would have noticed that this was daft – or at least, apparently daft.

After all, nobody going to Spain cares a toss what aeroplane they're flying in. If anything, they'd like to forget about the whole subject of aeroplanes, and routes, and airports, and hotels. All they want is a beach covered with attractive people of the opposite sex, nd enough cheap alcohol to make the job of getting acquainted less embarrassing.

On the other hand, they are scared stiff of getting killed in a crash.

People buy their holidays, not from an airline, but from a travel agent.

Travel agents

Travel agents, like anybody else, have a limited amount of time to spend on any one customer, especially when they see a frustrated queue of would-be customers walking out of the shop because they got tired of waiting for service. And conversations like "Dynamic Airlines? Oh, very reputable carrier, sir and madam, with bigsuper 5432 jet baskers. Baskers? Oh, very reliable aircraft, sirandmadam, with enormous Rotund engines. Rotund? Oh, the best engineered turbines in the business, sirandmadam, with feathered blades. Turbines? ...." can get very wearing on an anxious retailer.

Actually, very few people would ask questions like that, but the retailer is afraid that they would. So, in order to set his own mind at rest, he likes to choose holidays where his customers are flying with an airline that he knows they've heard about.

And the way he judges whether they've heard about it is: has he seen the airline adverts on television? If he has, the customers have, and so the airline can send round the tours salesman.

"Hello Mr Travel Agent, we can offer you three flights a week to Palma, and just look at the advertising schedule we've organised to back you up."

Selling micro software, mostly, is exactly the same business.

Write a word processing package, and the retailer can think of a hundred reasons why he should refer any customer, not to your package, but to *Wordstar* or *Spellbinder*, or *Select*, or any well-known, much advertised and popular package.

The same applies to someone who is trying to get an Editor to print a detailed listing of his latest blob-chaser game program for the little-known D Minor Concerto micro from Bach Technology.

As a start-up operation, you and your accountant friend are simply not in a position to produce software with that sort of advertising and publicity backup. The question then arises: what can you do instead?

The answer is: make the program *look* good.

This doesn't just mean "sell it in a pretty box" though it does mean that, too. It means "wrap the code up in pretty code" because nobody will type RUN if they can't work out how to LOAD first.

There are some truly fundamental packaging principles, which astonishingly few programmers seem to have heard of. Even the clever ones.

For instance: something like 80% of a good program has nothing to do with its actual function, but is entirely devoted to making life easy for the user – displaying prompts such as "Command ? (possible commands are E(dit), S(core), H(unt) or I(nsert) or ? for more information") at the appropriate times.

Yet something like half of the software I see (and this is stuff which is supposedly ready for release on an eager world) expects you to have read, understood, and memorised the manual first.

This is quite all right if we are talking about something as well known as *VisiCalc* or *Wordstar*, because the customer probably knows nothing about computers except that *VisiCalc* (or *Wordstar*) is what is needed.

Established product

With an established product, the customer is prepared to devote time to working out what it is good for, and how to use it. With something he has never seen before, he is probably going to make some judgements about how good it is long before he has a chance to use it.

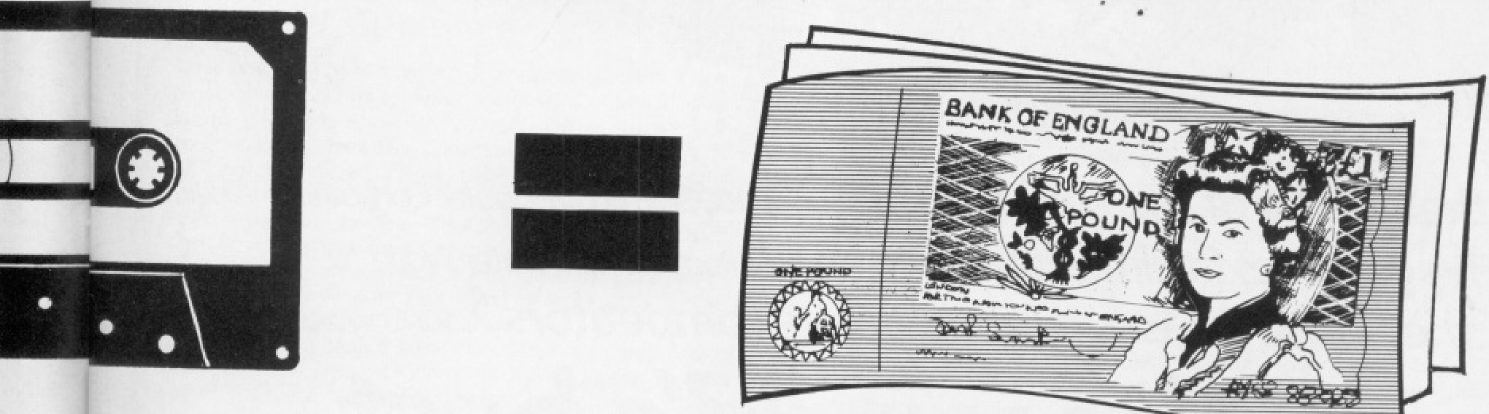
That much is obvious, perhaps. Less obvious, is the second stage "travel agent" fear, and it is at this stage that the really practical difficulties start appearing.

Let's give a real live example. Geof Reis is a project manager, based in Bradford. After years of working out project networks on large computers, Geof sat down in front of an Apple, and wrote a program which did all he ever needed to co-ordinate men, materials, services, deliveries, and any possible accidents, into a properly managed project – usually in building.

This program worked. Geof was approached by Apple, who had heard of it, and offered to publish it – indeed paid good money for the rights. The product was called Apple Project Manager, or APM, and you can find it in the catalogues today as a successful product, with users now into four figures.

Once the product had been sold to Apple,

R OLD ROPE ?



asy as it seems. Guy Kewney looks at software publishing.

Reis and his partner sat down to produce a version of the program for CP/M users. A British agent signed a deal giving them UK marketing rights in exchange for a healthy royalty. This UK agent then recommended that American sales should be sought, and that San Francisco software consultant David Ferris should be given the job of finding a publisher.

Ferris took one look at the product, and declared it unmarketable.

Actually, the product was a lot more marketable than many successes – as its record showed. But it was not market proof.

Anybody who has ever got involved in publishing can tell you that success is unpredictable. Most products offered for publication fail – the articles don't get read, the books don't get bought, the programs don't get distributed, the record isn't given air time, and nobody can understand the poetry.

All the money spent getting it ready for market is wasted.

Eager publisher

In the mind of the most eager publisher, then, there is always more doubt than enthusiasm when faced by a product which he didn't commission – and a hundred and one questions, objections, drawbacks, obstacles and whims rise up before him, shouting: "Do Not Publish This Turkey's Stuff!"

When your agent appears in front of you, and you demonstrate a program, any slight doubts he may feel about the product can be easily overcome by almost indetectable prompting from his elbow.

"Hit 'RETURN'," you say as if it was obvious that he must hit RETURN to start some computational process. "D stands for Dump," you explain as if you were merely pointing out what he can already see on the screen. "You can cancel any command by typing Control C just like that," you explain proudly, quietly distracting his attention from the fact that the point at which he did it was in fact the only one where he was offered the option on the screen, and he'd never have guessed before.

When he is in front of the head software acquisitions man inside Apple, things are very different.

First, Apple takes on a lot more programs than it can possibly publish. So do other publishers, but Apple is probably the biggest publisher of software in the world, almost twice the size of Visicorp, so it has more than twice as many "dead" products.

My opinion of why publishers do this is simple: they like the product, and would like to publish it and make money – but even if they aren't altogether sure that it will make money for them, they definitely don't want to make money for a rival. I dare say you will find that the publishers don't agree with me on this.

Whatever the explanation, it certainly happens, and it worries your agent.

Remember, you aren't the only client on the list. He has to go back to that same acquisition executive again next week and next year with another product. If your product gets taken on as an official Visicorp program and sells no copies, then your agent is going to have a hard time selling the next thing in his portfolio.

Overselling

So he's a bit wary of overselling.

The next problem is: you aren't there. Imagine the demonstration: your agent, a bright lad but busy, types in "ESCAPE" the way he thought he should, and the screen flashes busily, and ignores him the way you hoped it would. Actually, you went to a lot of trouble to make sure that Control C was the *only* way to cancel a command, and that ESCAPE wouldn't crash the program. But you aren't there to remind him, are you?

In his mind's eye, your agent can see the whole scene – his briefcase having to be retrieved from under the desk so that he can find the 300-page photostat of the draft manual, still without index, after which there is that dreadful, fruitless search for the right command ("I'm sure it was under General Utilities, but maybe it was Error Recovery – oh no, silly of me, it's right here under Library – it's under Library, you see, because ... well, actually, I can't remember why it's under Library, but they did explain it to me..." and at that point, inevitably, the first cup of coffee, the one which he didn't drink because he has four fingers in four pages of another stapled manual, demonstrating the problems of a rival product, anyway, that coffee was put to one side when fresh coffee came in, and now it goes over, getting into his left shoe. "Good thing it didn't go on the diskette!" he quips, wishing to heck that it had, and he would now be able to make his excuses and leave.

No, your agent isn't going to make a fool of himself in front of the publishers, and he'll fight you hard to ensure that it doesn't happen.

For him, too, the author has to make sure that the program not only *is* easy to use, but *looks* easy to use. The information displays must be neat, even if they are really pretty rudimentary. They must give the impression that anybody could just start pressing buttons and get results, even if you really need a day or two's intensive training in the basic concepts of the package.

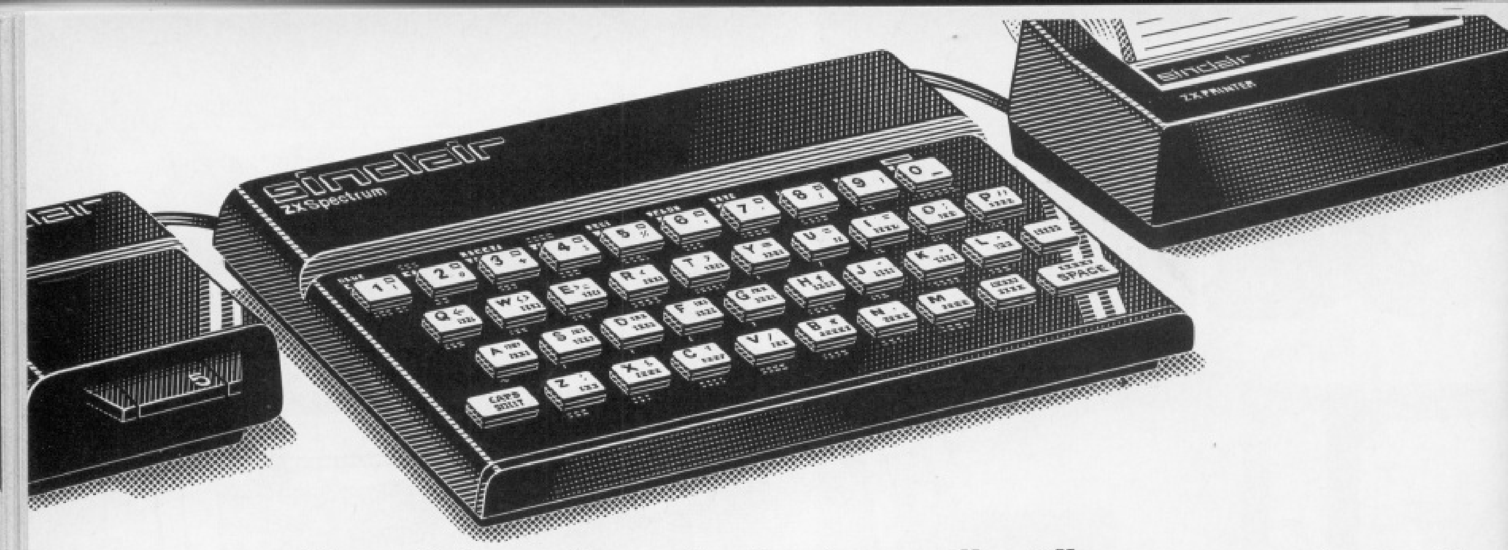
Let us now sit down for scene Three. Scene One was where you wrote the package and got an agent. Scene Two was where you rewrote the package, and got a new agent.

Scene Three is where you know your product will work, will sell, and want to make money from it.

Exaggerated glamour

Money is not something you will get from computer magazines. Believe me, when Adam Osborne described publishing as "the armpit of the computer business" he exaggerated the glamour and rewards to an irresponsible degree.

A computer magazine will record in its news pages that it costs £30,000 to thoroughly prepare a software product for



"...the quality of the colour display is excellent". Popular Computing Weekly.
"The graphics facilities are great fun". Personal Computer World.
"...the Spectrum is way ahead of its competitors". Your Computer.

"The world's best personal computer for under £500."

Clive Sinclair

Sinclair ZX Spectrum
16K RAM £125, 48K RAM £175.

This is the astonishing new ZX Spectrum – a powerful professional's computer in everything but price!

There are two versions – 16K or a really powerful 48K. Both have a full 8 colours, sound generation, a full-size moving-key keyboard and high-resolution graphics. Plus established Sinclair features such as 'one-touch' keyword entry, syntax check and report codes!

Key features of the Sinclair ZX Spectrum

Full colour – 8 colours 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.

High speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY and MERGE for programs and separate data files.

The ZX Printer – available now

The printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

ZX Microdrive – coming soon

Each Microdrive will hold up to 100K bytes on a single interchangeable microfloppy – with a transfer rate of 16K bytes per second. And you'll be able to connect up to 8 ZX Microdrives to your ZX Spectrum – they're 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 coupon below. You can pay by cheque, postal order, Access, Barclaycard 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.

sinclair ZX Spectrum

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

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

Qty	Item	Code	Item price £	Total £
	Sinclair ZX Spectrum – 16K RAM version	100	125.00	
	Sinclair ZX Spectrum – 48K RAM version	101	175.00	
	Sinclair ZX Printer	27	59.95	
	Printer paper (pack of 5 rolls)	16	11.95	
	Postage and packing: orders under £100	28	2.95	
	orders over £100	29	4.95	
			TOTAL £	

Please tick if you require a VAT receipt ☐

*I enclose a cheque/postal order payable to Sinclair Research Ltd for £____

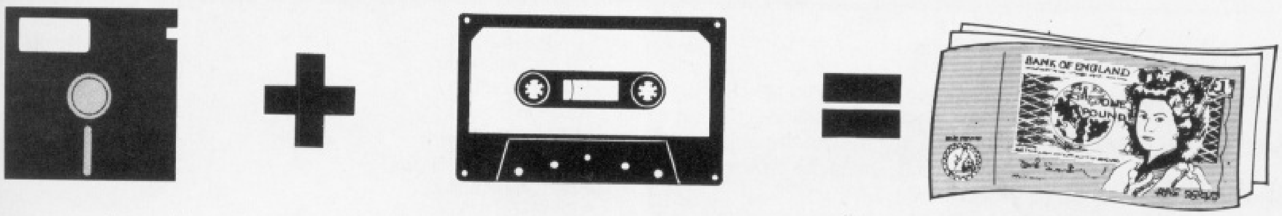
*Please charge to my Access/Barclaycard/Trustcard account no. Please print.

*Please delete/complete as applicable.

Mr/Mrs/Miss

Address

FREEPOST – no stamp needed. Prices apply to UK only. Export prices on application. **MPP 807**



the mass market, and in its feature pages will print a BASIC listing for which it re-imbursed the programmer to the tune of a year's subscription.

Anybody who has tried typing one of these listings into their computer will understand all too clearly why this is so. RUN, you tell it. OK, it responds. Why does it say OK when it isn't?

Putting a small ad in the back of the magazine will get you a few sales from people who know that they want something which does what you say yours does. One of these people may be a good agent. Otherwise, that is no way to get rich with anything that is less than exceptionally excellent.

Publishing in a book is great if you are the book publisher. The arithmetic of supplying one program out of fifty or more in a book which sells for £10, and may achieve sales of 5,000 copies if it does moderately well, is something you can work out on your own Casio. Don't forget that author's royalties are usually well under 15% – total. If there are 50 authors, you get 2% of 15%, which might pay for the cost of the diskette you wore out writing the thing.

Try, if you are dynamic and determined, setting up your own software publishing outfit. They say there is lots of venture capital about for software, but that won't get you shelf space in the dealers' shops.

Go to W.H. Smith, for example, and see how easy it is to talk to a buyer who sees Commodore once a month, Sinclair twice a month, is fighting Acorn off, and doesn't want to see another Visicorp salesman for at least ten years. "Why isn't your product in the Commodore catalogue?" asks the buyer. "Because I refuse to pay their rip-off royalty," you say indignantly. Does he believe you?

Pirates!

You persist, and finally get the operation off the ground, with sales of a few hundred through a couple of dozen enthusiastic dealers. Then one day, one of them shows you an American product. It is half the price, in a prettier box, and strangely enough, has exactly the same bugs as your own product. You realise you should have hit the American market simultaneously, to crowd out the pirates.

One small hint: if this does happen to you, don't bother sueing in the US. "When did you launch this product?" the judge asks the pirate. He names the date. "And when did you launch it?" he asks you. You are forced to admit that the US launch was last week. Don't laugh, but unless you can afford a good enough lawyer to chase up all the evidence, you may even find that the pirate can sue you for breach of copyright.

Get the right agent, or get the right publisher, and a great deal of money can be made from producing the right software. A useful program should sell more than a thousand copies, and it should sell for over £100 in these days, and even if you sign away half your royalties to the agent, that still adds up to a useful sum. It could easily be a lot more.

Games are a gamble. What is called "educational" software, or games that look like lessons to parents, is more promising, but less easy to break into unless you get it published free in Educational Computing – and free isn't what you're after, is it?

My advice is: give it a go. You may be lucky, and you may even find a good, honest agent, who makes you right, or find an untapped market which turns you into an agent or a publisher yourself.

And if it all flops, what the heck. You can always turn the experience to profit by writing your memoirs and selling them to some publishing house.... or maybe cutting a pop single called *Software Blues*?

MICRO COMPUTER PRINTOUT

'User friendly' is a phrase much beloved by advertising agencies, but one which few programmers understand. Chris Preston exposes some of the most common mistakes made in business packages, and shows how careful design can lead to higher productivity and happier operators.

User-friendliness is a 'buzzword' (buzzword is, of course, itself a buzzword – a good example of a recursive definition!) which crept into the computer language a few years ago, aided by those who had not heard of, or could not spell, ergonomics. It replaced the buzzphrase (how's that for a new buzzword?) which was current during my own apprenticeship: 'The man-machine interface', which formed the title of many an extramural seminar or lecture. This was in the pre-women's lib day's of course; I suppose we would now have to put up with 'The person-machine interface'.

Sex discrimination

Now that sex discrimination has reared its head, can I apologise in advance for the rest of this article? I was brought up in a world where programs where typed up by punch girls, and the same punch girls also entered all the data into the programs when they were running. The whole of the business was therefore at the mercy of a couple of dozen girls down in the bowels of the computer department.

Since microcomputers began to be used in business, I have been all over the country to various installations, small and large, and the vast majority of those who actually sit in front of the machine and key in data are female. Owing to the preoccupation of women between, say, 20 and 40, with producing and training children, these female operators tend to fall into two groups.

The first are the 16 to 20 year olds, probably straight from school, who would rather discuss their latest boyfriend (or each other's) then concentrate on keying in the company's sales figures for September. The other group consists of slightly dotty old matrons, from 40 up to 60+, who are much the same, except that the subject is each other's grandchildren.

If the tone of this article is a little bit depreciatory, it is because I have found it best, when designing programs, to keep these two types in mind. I realise that your secretary is the salt of the earth, highly intelligent, etc., but if your program is going to be used by anyone else, you must assume that they are as thick as the proverbial two short planks. Believe me, it is safer that way.

A large amount of manure is talked about user-friendliness (how I hate the phrase – from now on no more U-F in this article, only ergonomics), by people who think it means two things only:

1. Incredibly ornate screen displays like the worst of the roccoco period giving every piece of information which can possibly be crammed onto the screen. These kind of programmers revel in 80-column screens because far more can be crammed into them.
2. Constant repetition of requests for confirmation before any action takes place. "Are you sure?" "Please confirm." "Press 'C' to confirm". And so on. Not everyone is as hesitant as some systems designers seem to be.

It goes without saying that systems should be properly designed to make them as easy to use as possible and to cut down the possibility of operator errors. It is also true that the best way of doing this is very much a matter of personal taste on the part of the system designer. All this article can do is to point out some common faults, often playing the devil's advocate to bring the point home.

Screen layouts

The thing to bear in mind is that the operator wants to think as little as possible, at least about what he/she is doing. *We* do not want the operator to think either, because otherwise errors will be made. If the screen is crammed full of redundant information, so that the operator has to wade through a vast amount of garbage to find the one piece of information needed, you will be faced with a tired, irritable operator at the end of eight hours work. All the screens and operations within a system must be consistent as well. If you sometimes put error messages at the top

USER FRIENDLINESS

How to recognise the symptoms!

of the screen, sometimes in the middle and sometimes at the bottom, you are making a mistake, and sooner or later so will the operator. However, do not stint on prompts to the operator if it will help her decide what to do next. If she has to press one of a number of keys to make a selection, tell her "PRESS A, D OR I", rather than just put a list of options on the screen without any indication of what she is to do with them.

Some computers have a screen which display black characters on a white or green background, some which display white or green characters on a black background. Whichever is the default, there is usually an option to display in 'reverse video', that is the opposite to normal. It is, in my opinion, infinitely better to have 'lit' characters on an 'unlit' background. A screen which is a solid mass of colour, with dim characters scattered about it, may look nice on your computer in your office, but you must consider a typical user's environment. When the computer is several years old, probably never having been serviced, the screen definition will suffer, so that the edges of the letters become blurred, which tends to 'fill in' the letters, making them harder to read. If in addition the computer is placed in a location where bright light is shining on the screen, and the operator is a fifty-year-old woman working part time, whose eyesight has been declining since her late twenties, the poor girl has no chance whatsoever!

Please do not accuse me of being sexist, I can assure you that you will find such an operator in a majority of sites. If your program uses a light-on-dark display, the characters will tend to fill out as the display hardware ages, which does not have such an adverse effect on readability.

To continue the same argument, the time is not so very far away when there will be legal limits on the amount of X-ray radiation emitted by VDU's, and a screen which is filled with light emits a vast amount more X-rays than one which is nearly dark. I was recently involved with negotiations with the C.C.T.A., who are responsible for recommending a range of computers for use by Government and Civil Service, so I do have first-hand knowledge of the way policies are moving.

Upper & lower case

Still on the subject of screen displays, there is a trend towards the use of lower case characters in screen displays. Yes alright, I suppose it does look very pretty, but aesthetics are not the name of the game. Heaven help us, we will be having joined-up writing next! The fact is that the character "a" is half the size of the character "A", which given our old, clapped out computer and our old, clapped out operator results in more problems for the old dear. It is a different matter when we are talking about characters entered by the user. Here we must give the option of either upper or lower case. After all, this article would not look very impressive if it was printed in capitals!

Coming now to screen prompts, the rules we have discussed above apply. They should be in upper case, in a fixed part of the screen, e.g. the bottom line, possibly heralded by a beep. Most important, they should disappear when no longer needed. For example, if the program needs a new disk in drive A, then it should prompt something like "LOAD NEW DISK IN DRIVE A." When a new disk has been loaded, this prompt should be removed. Imagine the situation where our operator has been prompted for the new disk and has loaded it successfully. She then starts to count sheep, gossip to the girl at the next terminal, powder her nose or even (if the program is a long-winded one such as a sort), goes to have lunch. She comes back, and sees a prompt "LOAD NEW DISK IN DRIVE A" on the screen. "Have I already done that?" she thinks. "Oh well, I'll put another one in. It can't do any harm". Now most microcomputer disk drives are not lockable (why not, Messrs. Commodore, Apple, etc? Don't try to tell me you can't find a small enough solenoid or you are worried about price. I tell you what. *MicroComputer Printout* will donate *free of charge* not one but two Space Invader badges to the first microcomputer with a sensible 5" floppy disk drive which can be locked when the disks are in use), so she whips out the disk (with half a file on it) and stuffs in another.

Disk security

Now another serious fault on many microcomputers, with the notable exception of those running CP/M, is that the operating system does not know that a disk has been changed (and these people are trying to tell me their machine is an ideal business machine. No wonder they all use comdians in their advertising compaigns!) Now before you all write to me to tell me, I do know that Commodore disks have a security ID on each disk, but if you have a large installation with several hundred disks lying around I will bet a S.S.I. badge that at least two of them have the same ID, and we all know about Sod's Law. In fact, if somebody has written a program which automatically formats the disks, it is quite possible that each of the several hundred disks has the same ID. But enough of this meandering, let's get back to the subject of this article.

There is another fault which is very common, the very opposite of the 'cluttered screen' syndrome, and that is the 'blank screen' syndrome. The computer screen should never, ever go blank. You could at least put a message saying "I AM THINKING. PLEASE TALK QUIETLY". Similarly, if the computer is ever going to go dead, during a long calculation, or while loading another program, you should display a holding message "CALCULATING DISCOUNT", or "LOADING PROGRAM".

Data entry

The basis of a typical data entry system is a "form" consisting of a series of fields where data is entered by the operator. It should be possible not only to move the cursor around inside the field, inserting and deleting characters at will, but also move up and down from field to field. When the operator leaves a field, all the data displayed in the field should be accepted, no matter where the cursor is. If I go back to a field to correct the first character in the field, I do not want to be bothered by having to move the cursor to the end of the field to avoid losing all the data I have entered.

When we come to the subject of data entry, it is important to realise that sooner or later, your operator is going to make a mistake, possibly a typing error, possibly entering the wrong data. After all, if operators were perfect, they would be programmers! When you detect a mistake, such as the operator pressing a letter key in the middle of a field which should only contain numeric characters, you should not just ignore the character. You

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should at least give some sort of audible warning (if your computer has such a thing!) and possibly even lock the keyboard, ignoring all input until the operator has indicated that the error has been noticed. If the constant beeping annoys the operator, so much the better; it will encourage tidy typing! Also, please remember that a proficient typist (not all operators are sour-faced old biddies!) will be "touch-typing", not looking at the screen. She will have a pile of documents, say invoices, and will be running down each one with her beady eyes glued to the paper. If you just display "CUSTOMER NOT ON FILE" on the screen, she may be half way through entering the data before she realises her mistake. The point of computers is to improve efficiency; typing everything twice is somewhat counterproductive.

Error checking

Error checking should be extended to field length. Many systems use a convention whereby when the end of a field is reached, the cursor automatically moves on to the next. This is A Bad Thing. Think of our touch-typist. She has to key in a 6-character reference, but half way through she fumbles and presses an extra key by mistake. Now the last character of the reference is going to appear in the first character position of the next field, and she is going to be one character out of step from then on. If the computer had given her a buzz (not a buzzword!) when she tried to enter 7 characters into a field which only holds 6, she would discover her mistake that much sooner.

Errors should be reported to the operator as soon as possible, while she still has her eye on that part of the source document. For example, if the operator is keying in an invoice for $2000, she should be told as soon as she has keyed in the value that the customer only has a credit limit of $1000, not when she has keyed in the rest of the invoice. If it is not possible to detect an error immediately, at least when you do spot it you should put the cursor back in the field which is in error.

Nearly every system eventually comes to a point where the operator has to make a decision. It is unfortunate but there it is, it cannot be avoided. It may be a menu where she has to press a digit, 0 to 9, or a letter, A to F. It may be a little bit more complicated where she has to choose between amending, deleting and inserting, and has to press A, D or I. It is in fact a good idea to make the selection based on a key which is significant, such as an initial letter. Many programmers just use 0 to 9 for all selections, because they know very well what each one stands for, and anyway, if they have to look for the letter G each time, they will be there all day! This again is A Bad Thing. The system is not being designed for the convenience of the programmer, it is being designed for a typist who cannot remember that 0 is insert and 1 is delete, but can hit G ten times out of ten blindfolded.

So now we are making a selection based on A, D or I. What happens if the shift lock button has been pressed? Does the program allow both "a" and "A" in the selection? An awful lot of systems don't, and I have been fooled like that myself before now. I have also had my ear bent by irate customers on the phone, "That system's gone down again. I keep pressing A for Amend and it keeps saying 'WRONG KEY'". A shift lock button can do a lot of damage to the old customer relations!

Reports

When it comes to reports, the question the system designer must ask himself is, "For whom is this report intended?" An accountant who is trying to assess stock levels does not want to have to search through a mass of detail on each stock item to find the current quantity. A stores assistant is not interested in how long G. T. Engineering take to deliver his washers. Both want to know how many washers there are, but one also wants to know the tolerance on the inside diameter,

► 88

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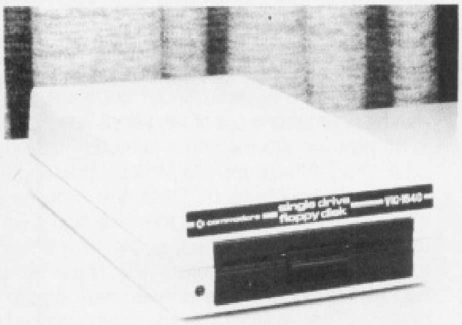

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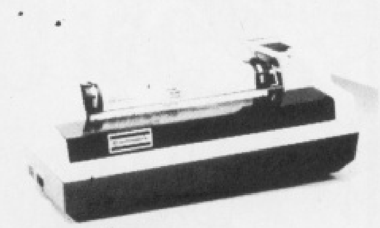

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DOES YOUR MICRO NEED VIDEO DISK?

Computer industry boffins are getting wildly excited about a new storage medium that promises multi-megabyte capacity at low cost. But as **John Gowans** discovered – there is rather more to video disks than meets the eye.

Video, videre: v., 2nd conjugation: to see

Discus: n., 2nd declension: a disk. – dimly-remembered 2nd form Latin.

"Dum volvo, video disco." – carefully-manufactured dog-Latin tag. ("While I turn I see and learn".)

If it's not one next-year's-big-thing it's another, and one gets awfully blase about the whole business. As Philips frisbees rainbow-coloured objects across our TV screens in adverts of stupefying mediocrity, one naturally turns to Lawrence Durrell on BBC-2, where these video disk things and other such fripperies are properly relegated to the Scottish League Division Two.

After all, video cassette recorders were last-year's-next-year's-big-thing and are now part of the SDP member's scenery (hence the Volvo in the totally spurious quote above – and the dum (sic) come to that). Even the computer industry is using video cassettes for businesslike things such as backing-up Winchester disks, with the Corvus Mirror interface and the Alpha Micro add-in video board doing just this job.

Nothing more exciting? I'm afraid not.

But disks are different, as they usually are, and video disks open up a whole new spectrum of computer applications in entertainment, education, and plain ordinary data storage.

At first sight this is by no means obvious; video disks actually look worse than the cassettes, since the user cannot record stuff on the disk but only play it through the TV. And believe me, even 'Game for a Laugh' loses its appeal after a few showings – or one showing in my case. However, video disks have the same advantage over video cassettes as floppies do over audio cassettes; viz. and to whit, you can jump quicky to any small bit of stored information you need rather than grind through the whole tape looking for it.

And as you will immediately recognise, this opens up a whole new spectrum etc. etc... which we'll go into once we've seen how these disk things work.

The first thing is that TV, like cinema films, works by putting different pictures on the screen one after another, but fast enough for the poor human eye to run them together into a continuous moving picture. Carrying the film analogy further, each of the separate TV pictures is called a frame – even though the TV frame has no physical reality at all, and is just the picture painted on the screen by an electron beam flying across it 625 times (525 if you are unfortunate enough to be watching TV in the USA).

The amount of information needed to build up a single TV frame is enormous, since in each line (or raster scan, to be technical) there are – for some reason – 416 picture elements that can be varied in brightness to produce 1/625th of the frame. So if we assume that each picture element, or pixel, has only two brightness levels each line has 416 bits of information in it. Then each frame has something like 600 lines, since a number of the lines are not used – it is these last lines that are used for broadcast Teletex services like Oracle and Ceefax, by the way – so a TV frame has something like 25,000 bits of information.

Now TV pictures are shown at a rate of 30 per second rather than the 24 of the cinema, so one second of TV pictures needs 750,000 bits of information. That's just over 92K bytes, or an entire Osborne-floppy-disk-full to put it into perspective.

Even worse, remember that we only allowed each pixel to have two brightness levels and in real TV that would produce really boring pictures made up only of black and white spots. (Don't ask about colour, that only complicates matters.) So each second of stored video actually represents maybe six or eight of our Osborne disks.

DiscoVision – shown here with interface to a microcomputer.

At first sight ... video disks actually look worse than the cassettes, since the user cannot record stuff on the disk but only play it through the TV.

Video tape back up

What this is leading up to is that any method of storing video information has to have very high capacities indeed. For instance, before leaving video cassettes aside, it is worth noting that the Alpha Micro Winchester back-up system lets the user store up to 100 megabytes on a one-hour VHS cassette; and of course, if your Winchester is only 10 megabytes there still might be room for 'It's a Knockout' in the leftover space.

We may therefore take it as read that video disks can store a lot of information. But it is important to distinguish between the two types of video disk we are talking about, since there are two methods of storing this mass of information. One is digital and one is not, but surprisingly both can be used with computers to open up a whole new spectrum....(cont.p94), and the one used in commercial video disk players such as the Philips LaserVision system is in fact the non-digital one. Let's look at these real disks.

A video disk is about the same size as an LP, 12in. in diameter, and can store up to an hour of video frames on each side; that 'up to' is because, as in so many other areas we are familiar with, there are two conflicting video disk standards. But with video disks the standards are fundamentally different, concerning the way the information is physically stored and retrieved from the disks.

Simplest, and cheapest, is the capacitance-encoded disk (CED) method used by RCA in its commercial players. This is closest to the LP, since the video frames are stored in a spiral groove and read by a stylus in physical contact with the surface of the disk. In this system the disk itself conducts electricity, and the coated metal stylus acts as the second plate of a capacitor. The video information is coded into the groove in the form of pits, and when the stylus goes over a pit the capacitance change is sensed by the stylus and used to rebuild the video image coded in the disk.

If the CED method is like LPs, the Philips/MCA method, optical-encoded disks, is more like floppies and Winchesters. Here the video information is stored in concentric tracks, again in the form of pits, and there is no physical contact between the read head and the disk surface. Inside the read head is a tiny semidconductor laser, which bounces ▶

VIDEO DISK

a beam off the recording surface; the pits interfere with the reflection of the beam, and the variation in reflected light intensity is used to rebuild the images.

In both these methods it is worth repeating that the stored information is not digital, is not a succession of pits representing a '1' and non-pits representing '0'. The technique used in both is frequency modulation, and it is the length of the pits rather than their sheer existence that conveys the information.

Emmanuelle gets the hump

So what, the computer user yawns. So you can buy 'Green Emmanuelle Goes to Mars with Abbott and Costello' and watch it n times on an expensive video disk machine until

Philips LaserVision – first to be mass marketed in this country.

your hair falls out. What does this do for my ZX81? There is a simple answer to this carping creep apart from the obvious deleted expletives – and the simple answer is interactive video.

You see, unlike video cassettes, video disks are random access devices and can be controlled by microcomputer programs if you have the right interface. And this means you can write a program that can quickly call up different visual images from the disk, insert ordinary computer displays into the picture, and use the operators response to that display to call up the next sequence of pictures from the disk. And if that does not open your spectrum (not Spectrum, Sinclair; sit down boy) I don't know what will. Just think of that adventure game with every scene and piece of action in moving TV pictures on the screen, where entering your command will call up the next appropriate scene or action...

Sounds good, at least in theory. In practice I have a feeling that adventure games on video disks will suffer from the 'Listen With Mother' vs. 'Play School' syndrome – you know, the argument that imagination is often better than blatant display when it comes to children or computer fans. I for one don't think that involvement in a fantasy adventure will be helped by tacky video pictures of cardboard caverns with Dr. Who extras dressed up in their green slime overalls making Home Counties grunting sounds. Too much like a Young Conservatives dinner for me. But if it's done properly, it's an exciting prospect. And of course, in education it would be great; showing some video, asking questions on the screen, moving onto a new sequence if you get it right and repeating the sequence or showing a more detailed one on the same subject if you get it wrong.

... each second of stored video actually represents maybe six or eight of our Osborne disks.

I hope that your imagination is now stirring from its customary torpor, and that you have, to coin a phrase, got the picture.

Whether you have or not, if you want to get into interactive video there are a few things you need besides a microcomputer and some ideas. For a start you need an optical-encoded video disk player like the LaserVision from Philips or Pioneer's VP-1000 which uses the same system. The reason for this is simple; the capacitance type of disk just can't handle it.

The problem with the CED is that LP-like spiral track that the stylus follows, chosen as the simple and cheap way of achieving video disks with reasonable playing times. Obviously, for interactive video this is no better than a video cassette since the stylus cannot be jumped from one part of the groove to another. And the groove also means that slow-motion and freeze-frame pictures are out, since once a set of frames has been played, the stylus cannot be jumped back to play them again.

But in optical disks interactive video is pretty simple. Each concentric track on the disk stores one video frame, and the laser reading head, not limited to a rut, can jump to any track at will. Each side of the disk has 54,000 such tracks, numbered logically if unimaginatively from 1 to 54,000; and with one track per frame and 30 frames per second, each side of a disk can hold half an hour of video. Well, that's when the player is in the mode we're interested in. To compete with the longer playing times of the capacitance disks another operating mode has been added that stores four frames per track at the edge of the disk and one frame per track near the centre, and the disk rotation speed is varied to make this work properly.

The reason we are not interested in the extended mode is that it inhibits freeze frame and slow motion. With one frame per track and a constant disk speed, freeze frame is easily done by making the read head scan the same track the whole time, and slow motion is equally easily done by scanning one track a few times, the next track the next number of times, and so on.

Interfacing to a computer

OK, let's assume that you have a microcomputer, a suitable display screen, and an optical-encoded disk player operating in standard one frame per track mode. What you still need is an interface to hook all these things together, and once again the entrepreneurs have leapt in to supply such a thing. Of course, they all come from the US so far since the video disk hasn't been widely available here until recently.

The interfaces come in different types, to suit either a particular video disk player (and there are now five of them: Philips LaserVision, Pioneer VP-1000, Sony LDP-1000, Magnavox 8000, and IBM partner Discovision Associates with the PR-7820 in three models – all optical disk players with potential for interactive use), a particular computer, or combinations of different computers and players. They also vary in what they can do, from simply using the computer as a remote control unit, through switching the display from video pictures to computer display as required, up to the top-line models that let you insert computer graphics and text into the video picture as it is displayed, either by overlaying it or by cutting a hole in the video picture and sticking it in there.

All this explains why there is a variety of interfaces on the market, and here are some of them.

At the simpler end is the Omniscan package from Aurora Systems of Madison, Wisconsin, which connects an Apple II to the Pioneer player. The kit includes a board that fits in an Apple expansion slot, a floppy disk full of software, and cables and connectors. What this basically does is let the Apple take over the job of the player's control panel, and this interface is one of the 'flippers' that lets you have the computer display or the video display, but not both.

A set of very similar products comes from Symtec of Farmington, Michigan, to connect an Apple II to the Pioneer, Discovision, and Sony players; the company had to come up with three products because the Pioneer is controlled through a remote control jack socket, the Discovision has an 8-bit parallel port built in, and the Sony has an RS232 port. These interfaces are all flippers too.

Then there is the VMI interface from Allen Communication of Boulder, Colorado, which hooks up the Apple to any player apart from the Magnavox and does much the same thing as the ones above.

For the Atari 400 there is the Discmaster 1000, made by New Media Graphics of Cambridge, Massachusetts to go with the Pioneer machine and do, once again, pretty much the same kinds of things.

The mighty Texas Instruments has a link between the 99/4A home computer and the Pioneer player; Adwar Video has an Apple interface, as has Coloney Productions; and that just about wraps up the low end.

When it comes to mixing computer text and graphics with a video display, the interfacing starts to get a bit tricky, and the interfaces themselves start to get more 'intelligence'. There are two of these wonderful devices for the Apple II, from Sanders Associates of Nashua, New Hampshire (where the copiers from from) and Video Associates Labs of Austin, Texas. And there is one for the Tandy Models I and III from the Nebraska Videodisk Design/Production Group of Lincoln in its eponymous state (Nebraska that is).

Polygamy

And finally we come to an odd one from an odd company, Wicat Systems of Orem, Utah, and now also in the UK. Now, according to the story I've been told, Wicat, which stands for the World Institute for Computer Assisted Training, was set up with US Government money to do its computer-assisted stuff in the Mormon schools that dot the Salt Lake City region of Utah. And in the process of doing this the company has come up with a range of hefty microcomputers and graphics systems built around the Zilog Z8000 and Motorola 68000 16-bit microprocessors, which are now on general release to the business world as well.

Obviously, Wicat is heavily into (man) the use of interactive video disks for education, and has developed the Random Access Video Controller to go with its 68000-based micro. Just to prove the company's versatility, the RAVC has yet another 16-bit micro, the Texas Instruments 9900, for its intelligence and also includes 16K bytes of video RAM and even a TI 9981 video chip a la 99/4A. The RAVC works with any video disk player, and since it is pretty much the same spec as TI's home computer, it can also display its own colour graphics to stick in between video sequences.

A Wicat man in the UK assures me that not everyone in the company is a Mormon, citing a recent trip to Utah where he and some Wicat executives apparently lived it up to no small degree in the fleshpots of Orem. But look at the Wicat ads in the US magazines, gaze on the clean-cut visage of the company president, and it will be easy to imagine him turning up on your doorstep one Sunday

Pioneer LaserDisc – also makes use of the optical encoding system.

you ... can quickly call up different visual images from the disk insert ordinary computer displays into the picture, and use the operators response ... to call up the next sequence of pictures ...

morning.

So there is at least one interactive video disk firm in the UK, although I understand that Wicat here is concentrating on selling its micros to business users rather than this new esoteric area. But it is a name to watch.

Of course, for the computer user getting a video disk system together the main problem has not even been mentioned yet – getting suitable disks with appropriate video sequences on. You can use commerically available disks of feature films, Lionel Bart on Ice, and so on to cannibalise sequences for your programs. But we have yet to see the first games video disks, and the main market is in the educational area so far.

One company who got off to an early start in the UK is city-based Apple dealer, Personal Computers (01-626 8121), who for around £3,000 can equip you with a Discovision and interface to their favourite micro, or any other for that matter. Personal Computers are aiming to sell to large companies such as city investors for archival storage and interactive video training programmes. They are official dealers for the Discovision and so can act as agents/advisors in getting your disks cut.

According to Nigel Stewart: "The cost varies considerably with the type of information you want stored: freeze frames, video clips and pure data." Ballpark figures are £1500-£2500 per disk, so your application has to be a pretty intensive or cost effective one. "One of the major advantages," says Stewart, "is that unlike magnetic media storage, the contents don't degrade with heavy use."

Any look at video disks would not be complete without a brief section on their prospective use as data storage devices – the digital recording bit I mentioned briefly many paragraphs back. I well remember visiting Eindhoven in 1978 to see the video data disk that the Philips Labs in Apeldoorn had cobbled to- ▶

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Sirius 80 Card

- Allows all standard CP/M 80 2.2 software to run without modification.
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gether using the laser technology developed for the newly-emerged LaserVision product. This small, simple-looking unit could store 10,000 megabits (over a gigabyte, for the non-numerate) on *one side* of a 12in. disk. To put it another way, one side of a video disk can store the equivalent of about 100 10M byte Winchester drives.

With these storage capacities in mind, the big computer firms – the gigabyte gang – started to examine the posiibilities of using the technology for data.

There are two ways of doing the job; the first is to code the digital data into video data and produce the video disks in the normal way (sorry, no space to go into how the disks are physically made), and the other is to write the digital stuff straight on to the disk. This second method is simply done by burning holes in the recording surface of the disk by boosting the power of the laser reading head when you want to write some data – a hole means a 1 and no hole means a 0.

In 1978 the US Government asked Magnavox, then getting in to video disk players, to develop a video data disk system, and it did so in a bulky kind of way. This spawned similar work in other big-name research labs like RCA, Thomson-CSF in France, and oil giant Exxon. Exxon appears to be having second thoughts, having recently sold off its video disk operation to IBM-compatible peripheral maker Storage Technology, but the work still goes on elsewhere. Even in Japan, where Toshiba has put together the Laserfile system developed initially by SRI International in the US. And tight-lipped Hitachi is also up to something in the area.

Microfilm and microfiche could start to feel the breeze soon, since video disk storage allows the storer to store pictures, diagrams, and so on as well as more normal types of data.

You can't erase it

But all the systems being developed are so far up in the stratosphere of the computer business, with prices in the tens or hundreds of thousands of any currency you care to name. And they all have a fundamental problem; data written on a video data disk cannot be over-written or erased once its on there. Logical really, since once you've burnt a series of pits into something, it is hard to pretend it never happened.

The argument to get round this is that with the capacities we are talking about this doesn't really matter. There is so much room on the disk that updating a file can be done simply by writing the new version somewhere new on the disk and forgetting the old version completely. Still, it is not the computer disk's normal way of working, and the applications of data disks are most likely to be in archival storage of information that will never change, like bank records or encyclopaedia contents.

Microfilm and microfiche could start to feel the breeze soon, since video disk storage allows the storer to store pictures, diagrams and so on as well as more normal types of data.

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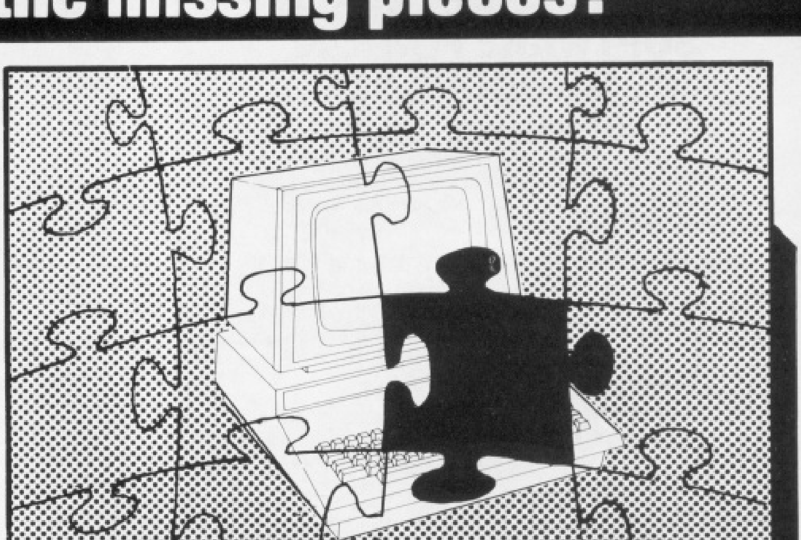

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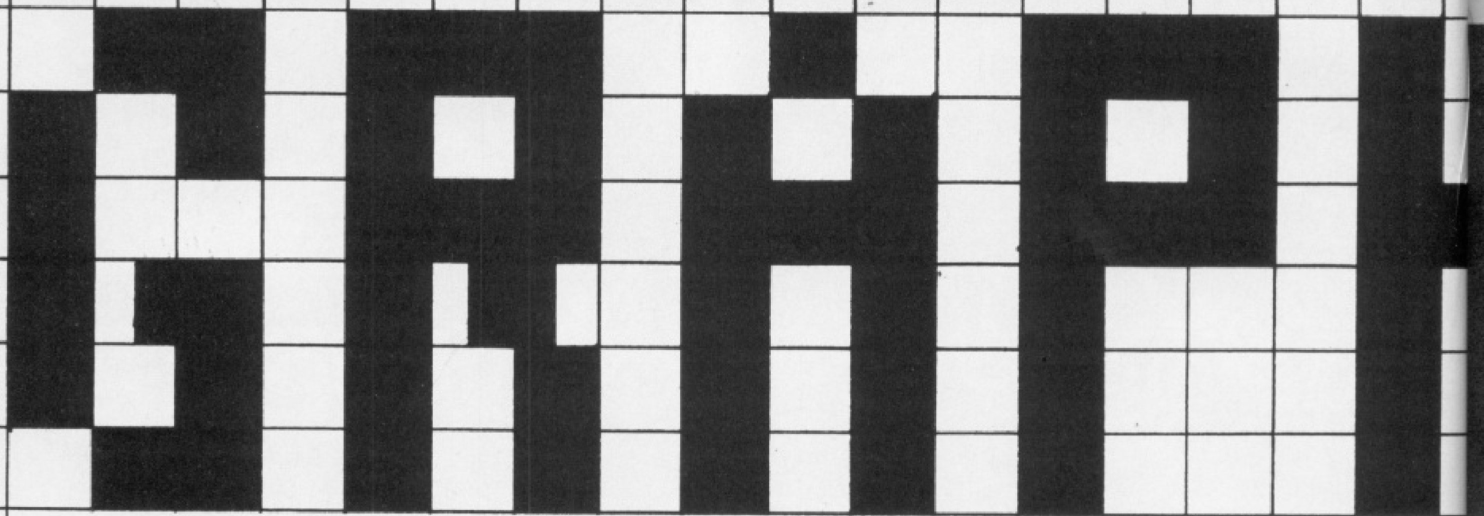


MicroComputer Printout recently carried a **Terry Hope** article entitled "What Atari Didn't Tell You". Since then, mail has been continuous and the theme "more". That's why Terry begins here a series which should roll the Atari veils a little further back....

I didn't guess what I was starting when I wrote "What Atari Didn't Tell You". The only thing in my mind was a sort of evangelistic fervour; a desire to let Atari-owners know what a great box of tricks they had, and maybe also spread the word to those who simply saw it as an up-market games machine.

A great games machine it may be, but that's like saying Concorde's quite a sleek-looking aeroplane – it overlooks the major advantages. The point is this: Atari's capabilities make it good for games, but it's a fatal error to ignore one key fact: those same capabilities make it good for a lot of other things too.

So, over the next two or three issues, we'll look at those facilities, and do it in a way that hopefully will wise the rest of you up and let any Atari owner start using them. To leave them lying undisturbed is wasteful!

Let's recap to start: Atari doesn't have one microprocessor chip under its covers. It has four. First, there's a computing chip, the 6502. PET and Apple use the same chip. In addition, and this is what makes Atari so different, it has three *more* microprocessors: ANTIC, GTIA and POKEY. It's the first of these – ANTIC – with which we'll spend most time.

Start at the beginning

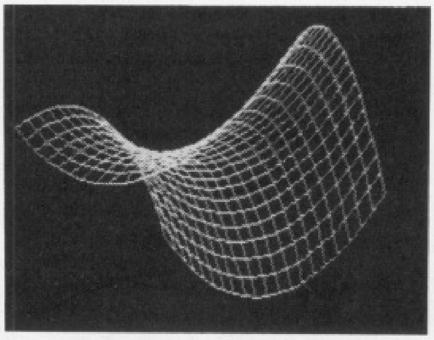
To begin, we all know that computers use TV screens to show you what's going on. Microcomputers, personal computers, home computers – call them what you like – usually work with a TV screen which is exactly like your home TV. In fact, in most cases, it *is* your home TV.

Now this raises a problem which isn't obvious until you think about it. A TV picture is made up of lines, or so it seems. Actually, the lines are drawn by a dot which whips across the screen a few hundred times until it reaches the bottom. Then it disappears for an instant while it goes back, and then reappears to do it all over again. A screenful of lines drawn by the dot is called a *raster*.

The dot can either be on, off, or in between. If it's on, it's drawing a bright part of the picture; off, a dark part; in between, a mid-tone part (we're ignoring the complication of colour, but the principles are more or less the same).

Thus the picture's made up of lines, and every time the dot races across the screen, tracing the lines, it's redrawing the picture.

If we're using a domestic TV (or a domestic TV-like circuit) for the computer display, the problem is this: the TV doesn't remember



what's been drawn on the screen, and every time the dot starts tracing the raster at the top left-hand corner, something has to tell it again what to do as it works its way down to the bottom.

This problem doesn't arise with broadcast television pictures because the TV set gets a constant signal from the transmitter which gives the instructions. If we use a TV with a computer, it's the computer which has to give the instructions to the dot.

Screen memory

Now that means the computer has to reserve a chunk of memory to store these instructions. This chunk (and I promise you I'll try to keep the technical jargon to a minimum!) is called the "screen RAM" – RAM, of course, is Random Access Memory, which simply means memory *you* can manipulate.

What happens is this: the computer uses *your* instructions to decide what's going to appear on the screen, and sticks those instructions in screen RAM. Then when the picture-drawing process is under way, screen RAM issues a stream of orders to the flying dot. The dot faithfully obeys them, turning itself on or off as instructed. (With most computers, there's no 'partially-on' order, which mercifully simplifies things a bit!)

OK so far? Fine! Now here comes the next semi-technical bit. We've already established the fact that computers have a screen memory. This is made up of "bytes", which are nothing more than computer-style instructions.

The first byte tells the display what to do in the first screen position at the top left corner. The last byte tells the display what to do in the last screen position at the bottom right corner.

How good is the display?

Just how good the screen display will be is fixed by two things: how good the TV is, and how much memory (that's the screen RAM) is reserved in the computer for the instructions.

Both the standard PET and TRS-80 computers have one of the simplest arrangements (simple not meaning bad!). They reserve an effective 1,000 bytes of screen RAM, which means the TV screen is divided into 1,000 positions, each of which can hold a single character.

The Apple computer is a lot more sophisticated. I won't get into the complications of how it's done, but Apple can work in either "text mode", "low-resolution mode" or "high-resolution mode".

In the last of these, Apple can give instructions to nearly 54,000 different points on the screen, which is a lot more than PET and, come to think of it, VIC too. In VIC's best display mode (it only has two!) there are around 31,000 points on the screen.

So PET and TRS-80 operate in one single mode; VIC in two; Apple in three. What about Atari? Well, the plain truth is that the Atari 400 and 800 offer no less than 14 display modes and unlike the other machines, any or all of these modes *can be mixed on the same screen.*

In other words, you're not restricted to any *one* of 14 choices, ample though 14 seems. The display prescription mixture is entirely up to you, and you can use all 14 display modes at once if that's what takes your fancy (or more professionally, fits your program design!)

Putting the picture together

At this stage we'll get back to the way the TV screen is made up because there are certain facts we'll need in coming articles. We've seen it's a whole lot of lines, and most people know British TV is a 625 line system.

But here's an interesting fact: we never actually see all 625 lines at once. That's because a television set only draws every other line during one of the dot's passes down the screen. Then, on the next pass, the dot draws the other lines, neatly interlacing them with the first set.

The two sets which make up the full screen are drawn every twenty-fifth of a second, which means each half-set is drawn every fiftieth of a second. Don't forget that at the end of each drawing process, the dot is blanked out for an instant while it returns to the top again. We'll be coming back to this in a later article. From here on, however, to make explanation easier, we'll ignore the way in which the lines are alternated, and concentrate on just one set.

Using a computer with a TV set raises one rather nasty problem. The TV picture on a normally adjusted set is off the screen at the top, bottom and both sides. This is great for TV viewing, but bad news for computer displays because some information won't be in view.

Atari's resolution

Taking Atari as our example, this is why the 400 and 800 only use 192 lines for their displays, starting down from the top of the screen, and a little in from the left-hand side, with each line finishing short of the right-hand side and the whole set ending before the screen bottom.

The figure of 192 may already have run a bell, for this is the greatest horizontal resolution Atari provides. The figure of 192 lines is also absolutely vital to everything that follows, and you should keep it very much in mind.

We only need to know one more general thing before we start looking at ways and means of putting this information to work. There's a standard horizontal measurement along each line which is important to us, and it's known as the "colour clock".

Atari has 228 colour clocks in one line, with a top limit of 176 of them actually in view. And if that figure rang another bell, so it should! Yes, Atari's maximum horizontal resolution is indeed 176.

I'm sorry about the length of this run-up, but I hope you've been patient and stayed with me so far!

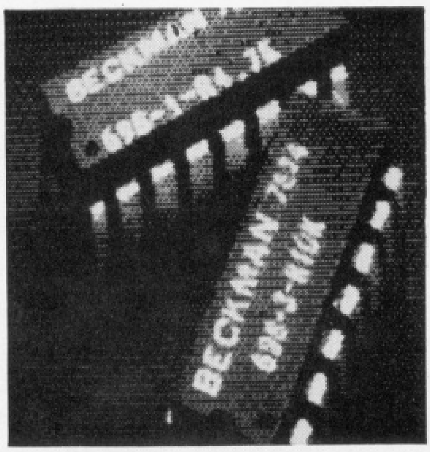
The preamble reasons are simple: we've got to be sure we're all up to speed on some straightforward basics. Now we can go ahead and chat about 192 line displays, colour clocks, and things like that, without worrying about leaving anyone behind!

Now for ANTIC!

The whole lot becomes useful because of ANTIC, Atari's dedicated screen display chip, a little marvel that let's us do some pretty clever things with what we put on the screen.

ANTIC's a computer in its own right, the most important thing being that it has its own program.

The program's called the "display list" and it checks and uses three things: where in Atari's memory the screen information is living; what display modes to use when the information is being handled; and whether any display options need to be mixed in.



And at this stage, we come to something pretty important: stop thinking about a TV screen display as being a set of horizontal scan lines. Think of it instead as being a stack of "mode lines", with each mode line consisting of a certain number of scan lines, according to your choice of graphics mode.

In Graphics 0, for instance, there are 8 horizontal scan lines to a mode line; in Graphics 2, 16 lines; in Graphics 8, one scan line; and so on. For a table covering all the standard graphics modes, have a look at Figure 1.

How much screen RAM?

You'll see some other things in Figure 1 which we're going to need soon. One is the amount of screen RAM used for each mode line (don't forget – a mode line is a set of scan lines). Another thing in the table is a special mode byte code number for each mode line – we'll see how they're used in a few moments.

The key point is this: you can mix as many different graphics modes as you want on one screen, *providing* the total number of scan lines used in each mode line comes to no more than 192 when they're all added up. Thus you can have 24 mode lines in a full screen of Graphics 0, because each Graphics 0 mode line has 8 scan lines and 24 times 8 is 192.

You'd be unlikely to do this because Atari does it for you when you work in Graphics 0. In other words, it automatically stacks up 24 mode lines of 8 scan lines each in Graphics 0. It's nevetheless an easy demonstration of how the principle works.

Making a display list

Now let's actually try something practical. Let's construct a display list for the screen, mixing a bit of Graphics 0, a slice of Graphics 1, a dash of Graphics 2 and a wodge of – well, what do you fancy? Graphics 7? OK, Graphics 7 it is.

The first thing we need is a sketch of the screen we plan to build, because we *must* keep an eye on the number of scan lines we're using. Remember, the number of scan lines *mustn't* exceed 192. If it does as we plan, we'll have to modify our plan until we hit the magic figure. I've suggested a possible arrangement in Figure 2. If you don't like it, feel free to do your own thing!

If you look at the number of mode lines in each graphics mode in Figure 2, and also check Figure 1 for the number of scan lines each mode line needs, you'll see we've got the required total of 192 scan lines. In case you're having problems, take a quick look at Figure 3, where the figures are actually worked out.

So far, so good. Now we actually build the screen we've sketched on paper. And, as you'll see, it's very easy.

Since we're going to construct our display list in BASIC (it's even easier in machine code but the bad news is you have to understand machine code!), this is the stage where we note down the special mode byte code numbers for the modes we're going to use. They're in Figure 1 for all the graphics modes.

If you note them down, your note should look like Figure 4. Keep this handy for reference.

Load memory scan byte

There's just one more thing to do before we actually write our display list program, and that's calculating (if "calculating" is the right ►

word for something as simple) the load memory scan byte.

Don't get worried by the phrase – in fact you can practice dropping it into conversation from time to time. It'll impress your friends no end. The load memory scan byte is a little something we need right at the start of our display list program and working it out is a snip.

All you do is simply add 64 to the mode byte code for the graphics mode at the *top* of your screen. In the example we're using, we've got Graphics 0 at the top of the screen, and the mode byte code for Graphics 0 is 2. So, 2 plus 64 equals 66 and voila! we have our load memory scan byte – it's 66. Told you it was simple.

The display list program

Now there's nothing more to do before we write the program, which you'll actually find listed in Figure 5. We'll go through its component parts now.

The first thing is to check which graphics mode will use most memory, and issue a BASIC graphics command to take us into that mode. Take another look at Figure 1 and you'll see each graphics mode has different memory requirements.

In our screen, we've 20 mode lines of Graphics 7, and because Graphics 7 needs 40 bytes for 1 mode line it's obviously the one that needs the most memory: an actual total of 20 mode lines at 40 bytes each, which is 800 bytes.

The others use less, so our first program line deals with this. The +16, by the way, is to give us a full screen without the text window at the bottom.

The next BASIC line calculates the display list pointer. That's a little something which ANTIC needs so it knows where everything is. It's simple enough: memory locations 560 and 561 are the low and high bytes of the display list starting address, and Line 20 calculates the "signpost" ANTIC needs.

The next step is to poke the load memory scan byte into memory just before the start of the display list. That's what Line 30 achieves: it pokes the figure we worked out into memory just before the display list pointer.

Tackling the modes

Now we come to a series of steps, because we have to poke a mode byte code into successive locations after the display list pointer. We need to do this for *each* mode line as we move down the screen.

It sounds more complicated than it is, and the only thing to remember is that we don't need to do anything about the very first mode line on our screen. We already took care of that *en passant* when we poked the

GRAPHICS MODE NUMBER	SCAN LINES FOR EACH MODE LINE	MODE BYTE CODE NUMBER	RAM USED FOR EACH MODE LINE
0	8	2	40
1	8	6	20
2	16	7	20
3	8	8	10
4	4	9	10
5	4	10	20
6	2	11	20
7	2	13	40
8	1	15	40

Figure 1

```
------------------------------------------
GR.0:  3 MODE LINES (24 SCAN LINES)
------------------------------------------
GR.1:  3-MODE LINES (24 SCAN LINES)
------------------------------------------
GR.0:  2 MODE LINES (16 SCAN LINES)
------------------------------------------
GR.2:  3 MODE LINES (48 SCAN LINES)
------------------------------------------
GR.0:  2 MODE LINES (16 SCAN LINES)
------------------------------------------
GR.7: 20 MODE LINES (40 SCAN LINES)
------------------------------------------
GR.0:  3 MODE LINES (24 SCAN LINES)
------------------------------------------
```

Figure 2

```
GR.0: 10 MODE LINES/ 8 SCAN LINES EACH =  80 SCAN LINES
GR.1:  3 MODE LINES/ 8 SCAN LINES EACH =  24 SCAN LINES
GR.2:  3 MODE LINES/16 SCAN LINES EACH =  48 SCAN LINES
GR.7: 20 MODE LINES/ 2 SCAN LINES EACH =  40 SCAN LINES
           SCAN LINE TOTAL = 192 SCAN LINES
```

Figure 3

GRAPHICS MODE NUMBER	MODE BYTE CODE NUMBER
0	2
1	6
2	7
7	13

Figure 4

load memory scan byte.

If you look at the listed program, and check the Figures too, you'll quickly see how the process works.

Watch out for the graphics 7 mode lines. We looked after those with the very first program line, so when we get to them we don't have to do anything. We *do* need to calculate the space they use though, so that we carry on poking for the last two graphics 0 mode lines at the right point.

Gosh, it's machine code!

And that's just about it, apart from one tiny surprise: with all this poking, we've actually written a small machine code program without any sweat.

The only thing is that because it *is* machine code, we have to finish it off neatly with something called a JUMP instruction back to the beginning of the display list. That's what the last program lines do and you can use them as a standard in display lists *you* write.

So there we are for this instalment. You may want to enter the program in Figure 5, or get really inventive and go right ahead with your own different display list.

There's only one thing to watch out for. You'll almost certainly want to put something into your shiny new screen display. After all, a sectional screen with nothing on it is pretty boring!

If you do, don't get disheartened if it seems difficult. Certainly always make sure of one thing: do an early poke into location 87 for the graphics mode in which you plan to work. This stops anything nasty happening to your display list when you start writing to the screen. Thus if you plan to have a nice set of graphics 1 letters in the graphics 1 section of the screen, poke a 1 into location 87 as the first program line after the JUMP instruction.

You should then be able to use PRINT or PLOT to reach the graphics 1 sections of the screen, providing the cursor is in range.

If it isn't, you're going to have to poke the characters you want into screen RAM. And that's a whole new ball-park, as they say, for when we start sailing into waters labelled "player-missile graphics". Which is what we'll have a go at next month!

See you then!

```
10 GRAPHICS 7+16: REM FULL-SCREEN GRAPHICS 7
20 D=PEEK(560)+PEEK(561)*256+4:REM DISPLAY LIST POINTER
30 POKE D-1,66: REM POKE LOAD MEMORY SCAN BYTE
40 POKE D+2,2: REM SET MODE LINE 2
50 POKE D+3,2: REM SET MODE LINE 3
60 FOR P=4 TO 6:POKE D+P,6:NEXT P: REM SET MODE LINES 4, 5 & 6
70 POKE D+7,2: REM SET MODE LINE 7
80 POKE D+8,2: REM SET MODE LINE 8
90 FOR P=9 TO 11:POKE D+P,7:NEXT P: REM SET MODE LINES 9, 10 & 11
100 POKE D+12,2: REM SET MODE LINE 12
110 POKE D+13,2: REM SET MODE LINE 13
120 REM SKIP MODE LINES 14-33; DONE WITH GR.7 COMMAND, LINE 10
130 POKE D+34,2: REM SET MODE LINE 34
140 POKE D+35,2: REM SET MODE LINE 35
150 POKE D+59,65: REM JUMP INSTRUCTION ROUTINE
160 POKE D+60,PEEK(560)
170 POKE D+61,PEEK(561)
180 GOTO 180: REM ENDLESS LOOP; KEEPS NEW SCREEN IN VIEW
```

Figure 5

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The Worst Designed Machine

Most computers on the market have their Achilles heel – poorly designed features which make the machine a pain to use. But when we heard about a machine which combined all the worst features from all the micros in one – we alerted our most experienced ace-reviewer **Eddie Bootlace** immediately. His report follows.

(MicroComputer Printout will award a Silver Space Invader badge to the first reader who correctly lists all the various machines hinted at in Eddie's text).

It was obvious from the start that it was going to be one of those love-hate relationships. The review began in an elegant restaurant just off Hyde Park – "You will come and meet us for lunch first, won't you?" That sort of invitation should always be avoided in this business because it generally only means one thing; the system you're getting is just a little less than perfect!

The lunch was excellent and my hosts had the decency to refrain from mentioning the purposes of our meeting until the cheese had settled and the brandy and cigars were served – well, if you're out to influence someone you don't just buy him a hamburger, do you? (Actually, it might have been better if they had in the circumstances). We eventually agreed that the system should be delivered the next week, complete with its disks and printer, and I'd get to use it for around four weeks. Actually, they seemed reluctant to push for a return date; it almost seemed as if it wasn't wanted back!

The day of deliverance

The brute arrived in an enormous box; someone obviously has a sense of humour at their dispatch office. In fact, the box was so big the courier firm refused to cart it up the stairs and, as it wouldn't go in the lift, it all had to be unpacked in the entrance lobby.

The single box gave birth of four smaller ones and the first signs of impending doom were there for all to see. No-one had thought to mark the boxes as to which way up they should be opened. After a lengthy spell with a 5p piece, I ended up with an impressive score of 1 out of 4 – yes, I got the manuals out the right way up.

Fortunately nothing seemed any the worse for wear and I managed to get the system up and operating in a reasonably short time. Well, to be more exact the micro was doing something but the disks and the printer just weren't interested. A full half-hour with the manuals revealed the problem – the cables had to go from the micro to the disk before they were connected to the printer. One would have though that a large warning notice might have been appropriate.

Just what do you get for your money? Well, the main unit contains the processor, memory, display circuitry, interfaces and the keyboard. The disks are housed in a separate unit with its own power source and the printer is a standard Japanese unit in a fancy case. Ergonomically the main unit is a mess. The keyboard is set at almost exactly the wrong angle for fast typing, as if the QWERTY layout wasn't designed to slow you down enough already. The lid of the unit, where you'd expect to site your TV or monitor is specifically designed to be too small to accept any of the standard units. It would have been fine if someone hadn't decided to provide a nice little ledge for your pencils etc. and thus reduced the useable area by half! So much for the overall appearance of the machine: what about the hardware?

A hard bargain

Based on a standard 8-bit processor, the system should have been totally normal, in the event it proved to be far from this. When I tried to run a simple program, I found that I kept jumping back into the monitor program for no apparent reason. The machine is normally supposed to reside in BASIC and the monitor is called when you need it. Careful investigation inside the box – that's another warranty invalidated – revealed that the ROMs were all loose in their sockets, it was a miracle that the system was doing anything at all.

This problem was to recur time and again, and the reason for it was only solved by a chance conversation with a friend in the electronics business. The IC sockets that the company had chosen were of such low quality that as they warmed up when the machine was on, they tended to force the legs of the IC out of the socket. When the machine was turned off the sockets contracted and left the chips in their new positions. Obviously, as this went on the IC was eventually lifted completely out of its socket, hence the lack of BASIC.

I have already mentioned the nasty angle of the keyboard, but that is not its only fault. The Sirius Cybernetics Corporation must have been employed somewhere in its layout as there are three keys without any legend at all, and two of the stupidest key placements I've seen. Whilst the functions of the blank keys can be learned, the positioning of the Scratch (their name for Break) function right next to the Return key is somewhat less than sensible. The other horror waiting to trap the unwary is the positioning of the Reset key immediately above the second Shift key. The pressure needed to activate it is the same as any other key and if you've got long fingernails or, like me, are just plain clumsy, then you'll see a lot of your programs vanish. Needless to say, there is no 'Warm Start' facility built into the BASIC!

The interkey spacing is standard but the keys themselves are very large and chunky, you can almost slide your fingers over the top of one key onto the next. Perhaps it looks pretty but it means that if you ever drop anything between the keys, they'll jam up very nicely.

The final tragedy is that, while the keyboard can generate lower case characters and the system can understand them, the display circuitry cannot. They are shown on the screen as reverse video versions of the upper case letters and, when using a lot of text on the screen, the system tends to strain the eyes more than a little.

The screen display can be produced on a TV or monitor and is monochrome. There are two screen widths available, 40 and 64 characters, both are fitted into the 1K text screen by changing the lines shown from 25 to 16. However, the latter screen size, ideal as it is for use with text, only supports editing in the first 40 columns! Obviously the hardware and software development got somewhat separated along the development path!

The graphics screen is independent of the text screen and takes a substantial portion of the memory away from the user. In the highest resolution mode the user is left with a mere 2.5K for his program and variables. The screen is bit mapped, as tends to be the fashion these days, and follows a normal format of eight rows of eight dots to a character. Unfortunately, these rows are not sequentially arranged but laid out so that the top row of each character is followed by the top row of the next character until all the top rows are complete. The second rows are now built up and so on. Whilst this makes it very easy to draw lines across the screen, it makes it very difficult indeed to make use of the POKE and PEEK functions or to plot things vertically. The graphics command set does, fortunately, have a PLOT and DRAW function so this method can be used instead.

The Ins and Outs

As well as having the optional disks the system is equipped with a cassette interface as standard. The normal format of this interface is a 1200 baud version of the CUTS system and appears reliable but somewhat selective about the recorders you use. It is possible to select a slower speed, a true 300 baud CUTS, and this works much better. The manual does suggest that you unplug one of the EAR connections whilst saving a program on tape; apparently there is a hum loop problem. While the hum loop seems to degrade the reliability of the cassette interface, the continual unplugging and replugging of the lead certainly strains and loosens the socket on the back of the board. One possibility would be to make up a special cable with a switch built in to disconnect the EAR lead rather than to risk damaging your PCB.

Interconnection between the main unit and each of the attached peripherals is by a multicore cable loop. The problem I had at the beginning with the disk and printer is explained by the fact that the cable must connect to the devices in the order of their address. As the system allows for four disks, this means that should you expand from two to four, the second pair must be inserted before the printer in the sequence. As I had them connected, the micro was trying to find Track 0 on a piece of paper! The disk drives, being 5 1/4" units operating in single sided, single density should hold something like 170K but they can only manage some 150K. The rest seems to get lost in the provision for a second DOS, presumably CP/M, which has not been supplied as standard. Now, I like the idea of a second DOS, it certainly increases the number of software options, but I resent the loss of some 20K of space from an already inefficiently used disk unit; double density is called for at the very least.

The biggest horror of all is the fact that the DOS supplied with the system uses a live directory track. This means that if there is a power surge or noise on the data bus or anything else of this sort the directory may well be corrupted. They have already made life unpleasant enough by providing a disk formatting program which neglects to see if the disk has anything on it before wiping it clean, the live directory may well be the last straw.

The BASIC Option

The version of BASIC supplied with the system is a fairly standard implementation except for some quirks. The only really serious problem is in the provision of error handling, the disk units and the printer are both capable of reporting errors but there is no routine provided within the BASIC to vector these errors to a section of your program which can take care of them. The result is that if you wish to try to trap any I/O errors you have to do it at that point in your program: messy to say the least as much of the code will have to be duplicated.

There are three incredibly silly errors in the BASIC as well. The first is that the functions LOG and LN have been assigned to natural logs and normal logs respectively – the

The Worst Designed Machine

wrong way round from virtually every other machine. Our second problem is with the GET statement. While this performs as one would expect it does have a slight extra added, that's known as a 'feature' in this business. Every time you GET a characater from the keyboard, it is displayed on the screen; again, something that is totally alien to all other machines – no secret passwords with this system! Finally, the silliest of the lot. The system can generate the PI character but no-one thought to implement it as a BASIC function! So, each time you go to use it you have to remember to spell it out instead or else you get Syntax Errored!

A good read?

One of the most fundamental parts of any system is the manual, get this wrong and you'll stand a good chance of turning a reasonable system into a disaster. Strangely the manuals for the printer and disks are excellent; indeed the printer booklet is better than the one normally supplied by the original manufacturer! However, getting a manual with 'Provisional: Pre-draft edition' stamped across it tends to suggest that there might be the odd problem between the covers.

The first thing that hits you is that they have bound the manual like a book, hence it's impossible to get it to lie flat unless you break the spine...if you get a system with a wrecked manual that's probably the one I used! Whilst the information is generally correct, the spelling and punctuation leave some of the Japanese efforts looking like Shakespeare. It is sad to note also that a number of the programs are bug-ridden. If you are going to have mistakes, get them in the text and not the programs. In several cases the errors are not the sort that a first time user would spot so a great deal of frustration will occur.

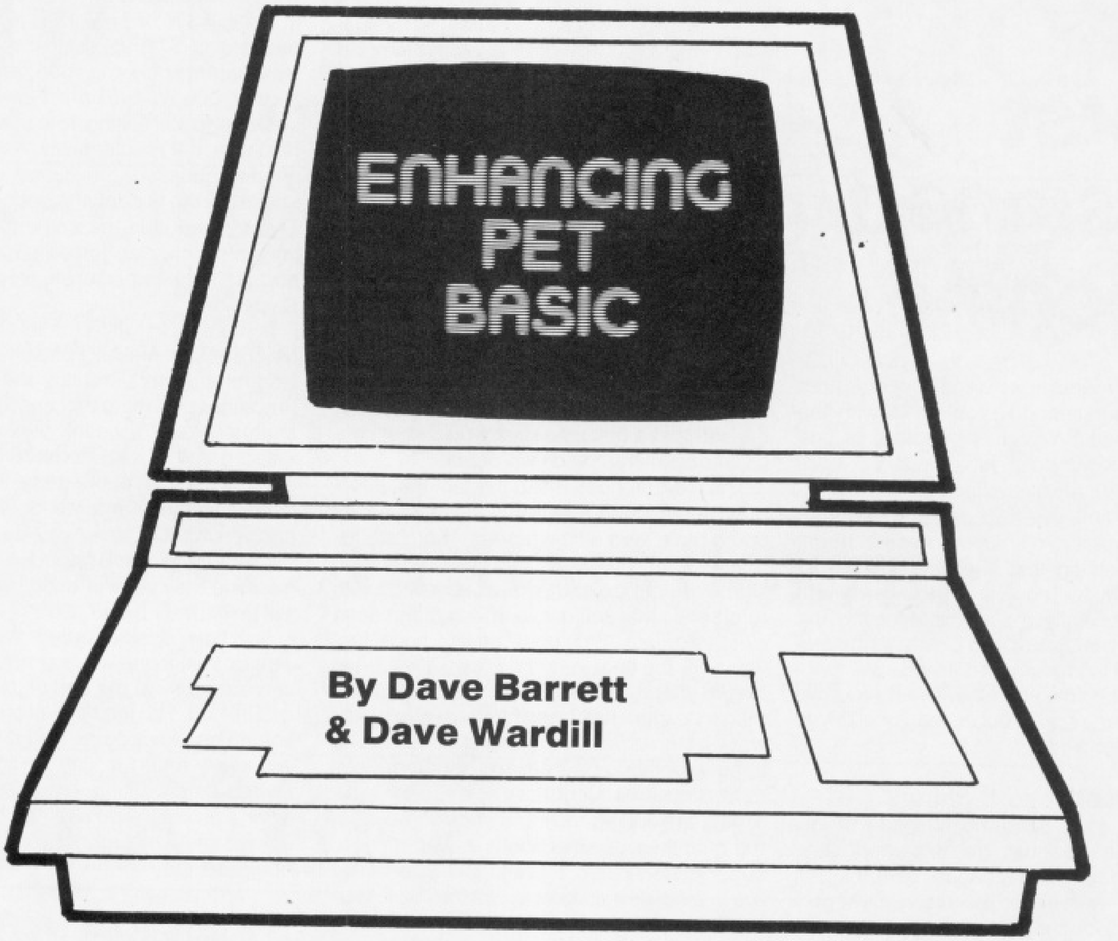
The manual does make the fact that it is a provisional document fairly clear but they could have tried a little harder. There are references to chapters and diagrams that simply do not exist, the index is riddled with references that you'd love to look at but don't exist, etc., etc. Still, one can but hope that when (if) the final version arrives it will be in better shape, although the indications are that an 'expert' has been hired to write it – always a sign of impending disaster as the one thing experts do badly is convey information to total novices. Doubtless all the book publishers are licking their lips in anticipation of the quantities of extra books they can sell to support the system, I gather that at least five are in the pipeline already. Not bad considering the system has only been out for a couple of weeks!

In conclusion

In many ways this machine reminds me of a beautiful girl I once met at a party. Terrific looks, great figure – in short, almost everyting a man could desire. However, no-one seemed to be talking to her so I asked the host what the problem was. As you may have already guessed, the illusion of beauty was shattered the instant she opened her mouth! This system is in the same league; it looks very nice, has an impressive specification and yet, once turned on, leaves an awful lot to be desired.

Is it, as I suggested in the title, the Worst Machine Ever Made? Possibly, but somehow I doubt it. In this industry the customer will buy almost anything that has the label 'micro' attached, be it a washing machine, toaster, video game or real computer system. Like the beautiful girl at the party, it serves a purpose and the owner will doubtless be very happy with it. Those who have used other systems may well regard it as the worst machine they've ever used, simply because it is unlike their own.

So, how does it rate? Well, I certainly wouldn't want one – they got the system back very promptly at the end of the review, I can assure you. You might want one, it does have some uses I suppose, and if you found that you really hated it, you could always get it stuffed and mounted in the trophy case alongside your slide rule and programmable calculator – the insignia of the dedicated computerist!



It has been estimated that the most time-consuming use of computers is sorting data into alphabetical order. Dave Barrett and Dave Wardill have developed a new command which you can add to PET's BASIC that will sort a whole computer-full of data in the twinkling of an eye.....

As we promised last month, here is one of the most useful routines which we have included in our 'New' BASIC.

It is based on the well-known Shell-Metzner sort routine, of which there must be a dozen versions available for the PET. What makes this one special, however, is the way in which we have made it user friendly.

For example, if it is incorporated into our extra-BASIC ROM, it can be put into action with a single statement in the middle of a program.

```
120 SORT A$(0)
```

or

```
120 SORT AB(0)
```

will do. The array A$ or AB will without further ado, become sorted into order.

If on the other hand, you only want to type in the HEX dump, then the command is just as easy, if slightly longer.

```
120 SYS 28672,A$(0)
```

or

```
120 SYS 28672,AB(0)
```

will do instead.

Extra features

First of all, any legal variable names can be used. It is not necessary to put the data into a special array, nor is it necessary to make any special arrangements to enter the array name. Just enter the command in the form shown above and the routine takes care of the rest.

Secondly, you don't have to sort the whole array. If you have some items you want to keep at the beginning of the array, then you can tell the routine where to start sorting with

```
120 SORT A$(12)
```

or

```
120 SORT AB(8)
```

This starts sorting at the 12th or 8th element respectively.

Thirdly, the routine will decide when it has sorted enough elements. In a numeric sort, all the elements get sorted; in a string array, the routine will stop when it hits a null (zero length) string. This is occasionally useful for protecting a 'tail' of data in an array which you want to keep at the end. It also avoids complications where you have dimensioned a large array, but haven't completely filled it. There are no snags involved in a partially filled array.

Capitals

Inbuilt into the routine is a short subroutine which will ensure that capital and lower case letters are treated equally. You don't need to worry that all the *smith's* will appear in a different part of the array from the *Smith's*. They are treated equally and the fact that some may be upper and others lower-case is ignored.

Speed

It is remarkably fast. An array of 400 string elements is sorted in less than a second. Larger arrays take longer, obviously, but as the time taken by a Shell-Metzner sort only increases logarithmically with the number of elements, it is very suitable for sorting large arrays. In fact, it is unlikely that sorting even a full 32K memory of strings will take an inconvenient, or even a noticeable, amount of time.

Hexdump

We have given an assembly listing and a Hex dump for users with a 32K BASIC 4 PET.

However, if any readers want to relocate this in a 16K or even an 8K PET this is extremely easy to do.

If you have a copy of the PET assembler, you can enter the source code and change the line which reads:

```
1540 *=$7000
```

This defines where the start of the routine is to be placed. Change it to the location of your choice and run the Assembler and loader in the usual way.

If you want to enter the hex dump only, and we agree that this is probably a lot quicker, then enter Monitor and type the Hex in as usual.

Then look at these lines.

```
7170 C5 68 90 03 4C 84 70 4C
7178 E7 70 etc.
```

If you want to relocate it for a 16K PET, change the 70 in each of these lines to 30.

```
71B8 A2 A0 02 4C 33 71 AA AA
```

Change the 71 to 31.

The routine can then be activated with SYS 12288,N$(1) as before.

For other PETs, or for different locations, it should be possible to calculate the changes which occur only at those three places.

Old PET BASIC

If any readers want to use this on an earlier version of PET BASIC, then the easiest way is probably to reassemble it using our listing, but changing these lines:

	BASIC 4	BASIC 2
1490	COMMA=$BEF5	COMMA=$CDF8
1500	SYNTAX=$BF00	SYNTAX=$CE03
1510	FINVAR=$C12B	FINVAR=$CF6D

If you have no Assembler, then the only resort remaining is to hack through the Hex dump looking for the addresses to change.

When you find 00 BF, change it to 03 CE, 2B C1 becomes 6D CF, and F5 BE becomes F8 CD.

Tedious but necessary. Fortunately, they only occur once each, near the beginning, so it shouldn't be too hard.

As usual, we will be glad to help anyone who doesn't quite know what to do to make use of this useful routine. You can get in touch through Durham 711380. If anyone has any new ideas they would like to swap, we would be glad to hear from you.

```
1000 ;*************************************************************
1010 ;*
1020 ;*
1030 ;*                    SORT
1040 ;*                    ++++
1050 ;*
1060 ;* WILL SORT ONE DIMENSIONED REAL OR ALPHA ARRAYS
1070 ;* (NOT INTEGER ARRAYS)
1080 ;*
1090 ;* FORMAT
1100 ;* ++++++
1110 ;* BASIC   SORT A$(X) OR SORT NA(X)
1120 ;* -----
1130 ;* NON BASIC SYS28672,A$(X) OR SYS28672,NA(X)
1140 ;* ---------
1150 ;*
1160 ;* ANY LEGAL VARIABLE NAMES ARE ALLOWED
1170 ;*
1180 ;* ANY START POINT MAY BE USED-
1190 ;* AS LONG AS THE ARRAY IS LARGE ENOUGH!
1200 ;*
1210 ;* IN A NUMERIC ARRAY ALL ELEMENTS FROM
1220 ;* THE START ELEMENT ARE SORTED
1230 ;*
1240 ;* IN A STRING SORT IT IS SORTED UNTIL A
1250 ;* ZERO LENGTH STRING IS FOUND
1260 ;*
1270 ;* IN A STRING SORT CAPITAL LETTERS MAKE NO DIFFERENCE
1280 ;*
1290 ;*************************************************************
1300                              ;
1310 FLAG1 =$07
1320 FLAG2 =$08
1330 TYPE  =$BF
1340 ARASIZ=$B1
1350 MAX   =$CE
1360 VAR1  =$6C
1370 VAR2  =$60
1380 CURRNT=$6A
1390 ELTNUM=$68
1400 STRCT =$11
1410 ELEMA =$62
1420 ELEMB =$66
1430 CVARAD=$44
1440 STRNG1=$18
1450 STRNG2=$16
1460 STRLEN=$1A
1470 CHARAC=$BC
1480                              ;
1490 COMMA =$BEF5
1500 SYNTAX=$BF00
1510 FINVAR=$C12B
1520                              ;
1530                              ;
1540 *=$7000
1550                              ;
1560                              ;*********************************
1570        JSR COMMA             ;NON BASIC ENTRY POINT
1580 SORT   JSR FINVAR            ;BASIC ENTRY POINT
1590        LDA FLAG2
1600        BEQ CONT              ;NOT AN INTEGER THEREFORE CARRY ON
1610 ERROR  JMP SYNTAX            ;PRODUCES SYNTAX ERROR MESSAGE
1620 CONT   LDA FLAG1             ;STRING OR REAL ARRAY ?
1630        BNE STRING            ;STRING !
1640        LDA £$05              ;INCREMENT FOR REAL ARRAY
1650        BNE REAL
1660 STRING LDA £$03              ;INCREMENT FOR STRING ARRAY
1670 REAL   STA TYPE
1680        LDY £$04
1690        LDA ($5C),Y
1700        CMP £$01              ;ONE DIMENSION ONLY
1710        BNE ERROR             ;NO? -THEN ERROR
1720        INY
1730                              ;
1740        LDA ($5C),Y           ;FIND HOW LARGE THE ARRAY IS
1750        TAX
1760        INY
1770        LDA ($5C),Y
1780        SEC                   ;MINUS THE START POINT
1790        SBC VAR2+1
1800        STA ARASIZ
1810        STA MAX
1820        TXA
1830        SBC ELEMA
1840                              ;*********************************
1850        STA ARASIZ+1          ;HOW MANY TO DO IF REAL?
1860        STA MAX+1
1870        LDA CVARAD
1880        STA VAR1
1890        LDA CVARAD+1
1900        STA VAR1+1
1910        LDA FLAG1
1920                              ;
1930        BEQ START             ;GO START
1940                              ;
1950        LDA £$00
1960        STA STRCT
1970        STA STRCT+1
1980        TAY
1990        CLC
2000                              ;*********************************
2010 LEN    LDA (CVARAD),Y        ;LENGTH OF CURRENT STRING
2020        BEQ ZEROLN            ;ZERO LENGTH SO END THIS ROUTINE
2030                              ;
2040        LDA CVARAD            ;GET THE NEXT STRING
2050        ADC TYPE              ;IN THE ARRAY
2060        STA CVARAD
2070        BCC COUNT
2080        INC CVARAD+1
2090        CLC
2100                              ;
2110 COUNT  INC STRCT             ;INCREMENT NUMBER TO BE SORTED
2120        BNE MORE
2130        INC STRCT+1
2140                              ;
2150 MORE   LDX STRCT             ;ANY MORE IN THE ARRAY?
2160        CPX ARASIZ
2170        BCC LEN
2180        LDX STRCT+1
2190        CPX ARASIZ+1
2200                              ;
2210        BCC LEN               ;YES SO GO AND DO IT
2220 ZEROLN LDA STRCT
2230        LDY STRCT+1
2240        CMP £$02
2250        BCS YES
2260        CPY £$00
2270                              ;*********************************
2280        BNE YES
2290        RTS                   ;NO!
2300 YES    LDA STRCT             ;YES!
```

```
2310          LDX STRCT+1
2320          STA ARASIZ
2330          STA MAX
2340          STX ARASIZ+1
2350          STX MAX+1
2360                              ;
2370 START    LSR MAX+1           ;HALF THE INDEX
2380          ROR MAX
2390          BNE ONGO            ;CARRY ON
2400          LDA MAX+1
2410          BNE ONGO            ;CARRY ON
2420          RTS                 ;ALL DONE !
2430                              ;********************************
2440 ONGO     LDA MAX+1           ;MULTIPLY BY 5 OR 3
2450          STA CURRNT+1
2460          LDA MAX
2470          STA CURRNT
2480          LDA FLAG1
2490          BNE SKIP
2500          ASL CURRNT
2510          ROL CURRNT+1
2520 SKIP     ASL CURRNT
2530          ROL CURRNT+1
2540          CLC                 ;DEPENDING ON THE TYPE OF SORT
2550          LDA MAX
2560          ADC CURRNT
2570          STA CURRNT
2580          LDA MAX+1
2590          ADC CURRNT+1
2600          STA CURRNT+1
2610                              ;
2620          LDA ARASIZ          ;SET UPPER LIMIT
2630          SEC
2640          SBC MAX
2650          STA ELTNUM
2660          TAX
2670          LDA ARASIZ+1
2680          SBC MAX+1
2690          STA ELTNUM+1
2700          TAY
2710                              ;********************************
2720          LDA FLAG1
2730          BNE SKIP2           ;MULTIPLY BY 5 OR 3
2740          ASL ELTNUM
2750          ROL ELTNUM+1
2760 SKIP2    ASL ELTNUM
2770          ROL ELTNUM+1
2780          TXA
2790          CLC                 ;DEPENDING ON THE TYPE OF
2800          ADC ELTNUM          ;SORT POINTERS
2810          STA ELTNUM          ;FOR THE ELEMENTS
2820          TYA
2830          ADC ELTNUM+1
2840          STA ELTNUM+1
2850                              ;
2860          LDA VAR1
2870          STA VAR2
2880          CLC
2890          ADC ELTNUM
2900          STA ELTNUM
2910          LDA VAR1+1
2920          STA VAR2+1
2930          ADC ELTNUM+1
2940          STA ELTNUM+1
2950                              ;
2960 FIRST    LDA VAR2            ;SET POINTERS FOR
2970          STA ELEMA           ;ELEMENT IN THE FIRST HALF
2980          LDA VAR2+1
2990          STA ELEMA+1
3000                              ;
3010 TWO      LDA ELEMA
3020          CLC
3030          ADC CURRNT
3040          STA ELEMB           ;SET POINTERS FOR
3050          LDA ELEMA+1         ;ELEMENT IN THE SECOND HALF
3060          ADC CURRNT+1
3070          STA ELEMB+1
3080                              ;********************************
3090          LDA FLAG1           ;IF IT IS A STRING
3100          BNE STRSRT          ;DO A STRINGSORT
3110                              ;********************************
3120          LDY £$01
3130          LDA (ELEMB),Y       ;NUMERIC SORT
3140          ROL A
3150          BCS MISS
3160          LDA (ELEMA),Y
3170          ROL A
3180          BCS NOSWAP
3190          DEY
3200 EXCH     LDA (ELEMB),Y
3210          CMP (ELEMA),Y
3220          BCC NUMSWP
3230          BNE NOSWAP
3240          INY
3250          CPY £$04            ;ANY MORE FOR THESE NUMBERS?
3260          BMI EXCH            ;YES
3270          BPL NOSWAP
3280 MISS     LDA (ELEMA),Y
3290          ROL A
3300          BCC NUMSWP
3310          DEY                 ;POSITIVE
3320 PLUS     LDA (ELEMA),Y
3330          CMP (ELEMB),Y
3340          BCC NUMSWP
3350          BNE NOSWAP
3360          INY
3370          CPY £$04            ;ANY MORE FOR THESE NUMBERS?
3380          BMI PLUS            ;YES
3390          BPL NOSWAP          ;- AND NEGATIVE
3400                              ;********************************
3410 NUMSWP   LDY £$04            ;SWAP POINTERS FOR NUMERIC ARRAY
3420 STRSWP   LDA (ELEMB),Y       ;SWAP POINTERS FOR STRING ARRAY
3430          TAX
3440          LDA (ELEMA),Y       ;SWAP ELEMENTS
3450          STA (ELEMB),Y
3460          TXA
3470          STA (ELEMA),Y
3480          DEY
3490          BPL STRSWP
3500                              ;********************************
3510          LDA ELEMA
3520          SEC                 ;SET POINTERS
3530          SBC CURRNT
3540          STA ELEMA
3550          LDA ELEMA+1
3560          SBC CURRNT+1
3570          STA ELEMA+1
3580                              ;
3590          BCC NOSWAP
3600          CMP VAR1+1          ;ANY MORE THIS TIME?
3610          BCC NOSWAP
3620          BNE TWO
3630          LDA ELEMA
3640          CMP VAR1
3650          BCS TWO
3660                              ;********************************
3670 NOSWAP   LDA VAR2
3680          CLC
3690          ADC TYPE            ;INCREMENT ADDRESSING INDEX
3700          STA VAR2
3710          LDA VAR2+1
3720          ADC £$00
3730          STA VAR2+1
3740          CMP ELTNUM+1
3750          BCC NEXCHK
3760          BNE NEXCUT
3770          LDA VAR2
3780          CMP ELTNUM
3790          BCC NEXCHK
3800 NEXCUT   JMP START           ;NEXT 'CUT
3810 NEXCHK   JMP FIRST           ;NEXT CHECK FOR THIS CUT
3820                              ;********************************
3830 STRSRT   LDY £$00            ;WHICH STRING IS THE SHORTEST?
3840          LDA (ELEMB),Y
3850          CMP (ELEMA),Y
3860          BCC LSHORT
3870          CLC
3880          LDA (ELEMA),Y
3890          BNE SHORT
3900 LSHORT   LDA (ELEMB),Y
3910 SHORT    STA STRLEN          ;SAVE THE LENGTH OF THE SHORTEST STRING
3920 FINDST   INY
3930          LDA (ELEMB),Y       ;FIND ACTUAL STRINGS AND
3940          STA $0015,Y         ;SET UP THEIR POINTERS
3950          LDA (ELEMA),Y
3960          STA $0017,Y
3970          CPY £$02
3980          BNE FINDST
3990                              ;********************************
4000          LDY £$00
4010 CAPS     LDA (STRNG1),Y
4020          AND £$7F            ;MAKES NO DIFFERENCE IF ITS UPPER CASE
4030          STA CHARAC
4040          LDA (STRNG2),Y
4050          AND £$7F            ;MAKES NO DIFFERENCE IF ITS UPPER CASE
4060          CMP CHARAC
4070          BCC SPOINT          ;SWAP
4080          BNE NOSWAP
4090          INY                 ;DO WE NEED TO
4100          CPY STRLEN          ;LOOK AT THE NEXT CHARACTERS?
4110          BMI CAPS            ;YES -SO GO AND DO IT
4120          LDY £$00            ;NO -THEN STRINGS MUST BE EQUAL TO
4130          LDA (ELEMB),Y       ;SHORTEST LENGTH,SO CHECK TO SEE
4140          CMP (ELEMA),Y       ;WHICH STRING IS THE LONGEST?
4150          BCS NOSWAP
4160 SPOINT   LDY £$02            ;SET UP FOR STRING POINTER SWAP
4170          JMP STRSWP
4180                              ;
4190                              ;
4200                              ;
4210                              ;
4220                              ;
4230 .END
READY.
```

```
?
.
.:    7000 20 F5 BE 20 2B C1 A5 08
.:    7008 F0 03 4C 00 BF A5 07 D0
.:    7010 04 A9 05 D0 02 A9 03 85
.:    7018 BF A0 04 B1 5C C9 01 D0
.:    7020 E9 C8 B1 5C AA C8 B1 5C
.:    7028 38 E5 61 85 B1 85 CE 8A
.:    7030 E5 62 85 B2 85 CF A5 44
.:    7038 85 6C A5 45 85 6D A5 07
.:    7040 F0 42 A9 00 85 11 85 12
.:    7048 A8 18 B1 44 F0 1D A5 44
.:    7050 65 BF 85 44 90 03 E6 45
.:    7058 18 E6 11 D0 02 E6 12 A6
.:    7060 11 E4 B1 90 E5 A6 12 E4
.:    7068 B2 90 DF A5 11 A4 12 C9
.:    7070 02 B0 05 C0 00 D0 01 60
.:    7078 A5 11 A6 12 85 B1 85 CE
.:    7080 86 B2 86 CF 46 CF 66 CE
.:    7088 D0 05 A5 CF D0 01 60 A5
.:    7090 CF 85 6B A5 CE 85 6A A5
.:    7098 07 D0 04 06 6A 26 6B 06
.:    70A0 6A 26 6B 18 A5 CE 65 6A
.:    70A8 85 6A A5 CF 65 6B 85 6B
.:    70B0 A5 B1 38 E5 CE 85 68 AA
.:    70B8 A5 B2 E5 CF 85 69 A8 A5
.:    70C0 07 D0 04 06 68 26 69 06
.:    70C8 68 26 69 8A 18 65 68 85
.:    70D0 68 98 65 69 85 69 A5 6C
.:    70D8 85 60 18 65 68 85 68 A5
.:    70E0 6D 85 61 65 69 85 69 A5
.:    70E8 60 85 62 A5 61 85 63 A5
.:    70F0 62 18 65 6A 85 66 A5 63
.:    70F8 65 6B 85 67 A5 07 D0 7A
.:    7100 A0 01 B1 66 2A B0 15 B1
.:    7108 62 2A B0 4F 88 B1 66 D1
.:    7110 62 90 1E D0 46 C8 C0 04
.:    7118 30 F3 10 3F B1 62 2A 90
.:    7120 10 88 B1 62 D1 66 90 09
.:    7128 D0 31 C8 C0 04 30 F3 10
.:    7130 2A A0 04 B1 66 AA B1 62
.:    7138 91 66 8A 91 62 88 10 F3
.:    7140 A5 62 38 E5 6A 85 62 A5
.:    7148 63 E5 6B 85 63 90 0C C5
.:    7150 6D 90 08 D0 9A A5 62 C5
.:    7158 6C B0 94 A5 60 18 65 BF
.:    7160 85 60 A5 61 69 00 85 61
.:    7168 C5 69 90 0B D0 06 A5 60
.:    7170 C5 68 90 03 4C 84 70 4C
.:    7178 E7 70 A0 00 B1 66 D1 62
.:    7180 90 05 18 B1 62 D0 02 B1
.:    7188 66 85 1A C8 B1 66 99 15
.:    7190 00 B1 62 99 17 00 C0 02
.:    7198 D0 F1 A0 00 B1 18 29 7F
.:    71A0 85 BC B1 16 29 7F C5 BC
.:    71A8 90 0F D0 AF C8 C4 1A 30
.:    71B0 EB A0 00 B1 66 D1 62 B0
.:    71B8 A2 A0 02 4C 33 71 AA AA
.:    71C0 AA AA AA AA AA AA AA AA
.
.?
.?
.?
```

EARLY CO

Microcomputers are now developing so rapidly that most books on the 'History of Computing' are out of date before they are printed. But how did it all start? Humphrey Walwyn delved into the archives and came up with some early computers that W. Heath Robinson would have been proud of.....

There's nothing new about computers and computing. Since the dawn of Early Man, some sort of mathematical language and computation was required if only to show to your fellow humans how many mammoths were about to descend onto your cave or how many sea shells would be required to 'buy' a new flint axehead. Indeed fingers on hands were the first digital computers, still widely in use today in an age of hand held calculators and binary notation! Incidentally, I've often thought that the 'fingers on hands' subroutine might be vastly improved if one counted in binary rather than decimal maths but then, with only ten fingers, you would only be able to reach 1024 so perhaps it's not such a good idea!

Abacus

Methods of addition and subtraction have always been sought by succeeding generations and it will be no surprise to you to realise that the main development of calculating machinery and computers through the ages owes its impetus to the world of finance. The more developed the mercantile trades became, the more figures and taxes there were for generations of accountants to figure out. The ancient Chinese civilisation was the first known to us to have a well-developed financial structure and so it is to them – along with so many other inventions – that we owe the abacus. The abacus was certainly the earliest digital device designed specifically to aid calculations and, if you've ever been to the Far East or parts of the Middle East where it is still widely used, you can see the speed with which a trained operator shuttles the beads back and forth. It is fascinating to see it still being used in the occasional Hong Kong shop where the abacus is sometimes preferred to the electric calculator. The idea is very simple and fundamental to basic digital logic. If you don't know how it works, here's a brief example.

Rows of beads on wires are divided into two partitions by a bar of wood. The counting is decimal based and each bead is either 'on' or 'off'. Being next to the wooden bar is 'on' and away from it is 'off'. The least significant digit is always to the right. Beads below the bar count as 1 unit and the bead above the bar = 5 units. See figure 1.

Addition and subtraction is very fast when you get the hang of it and multiplication is by a series of multiple additions. The other main advantage over the calculator is that the display is easily visible at a distance. No peering into dim LCDs!

Slide rule

If the abacus was the first digital device, then the slide rule was the first analogue calculating aid. Before the rule became well developed in the 19th century by Mannheim, there were numerous other analogue systems which were ingenious and practical including the astrolabe – principally used for the calculation of navigation mathematics – and the nomogram which was a simple linear slide rule. Other inventions were not so successful. These included a system of interconnecting levers and springs which got increasingly inaccurate as the springs stretched, and a water pressure calculator

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which consisted of a number of glass tubes with interconnecting capillaries to mark where the water levels reached in each tube. This latter device could only add and subtract and was subject to total disaster when the thing sprung a leak! Years of work would end up in pools on the scientist's floor...

None of these devices could really be termed 'machines' since they employed very little mechanical science. In the history of computing machinery, the prize of 'first' must go the French 17th century scientist and philosopher Blaise Pascal.

As I said earlier, it was the pressure of high finance that brought about nearly all computing inventions and, in Pascal's case, he designed and built the first working digital calculator purely to help with his father's business and tax calculations.

Pascal's machine – built in 1642 – was the ancestor of all those mechanical adding machines that one used to see in offices before the invention of the portable electric calculator. It consisted of a series of toothed wheels with numbers from 0-9 engraved on the edges. By peering through a glass window you could see the position of each wheel and turn the relevant dial wheel to 'input' the figure required. Addition and subtraction were possible by a train of gear wheels that automatically clicked over the neighbouring wheel as the number 9 was surpassed. Like the abacus, the least significant digit was to the right and up to 8 digits could be 'stored' in mechanical memory. Multiplication – again like the abacus – consisted of a number of addition steps.

Given the primitive state of metal working, it was a remarkable achievement to build accurately meshing gear wheels as long ago as the 1640's and the machine ws only made possible at all by the then new advances in clock making science.

Pascal's machine was, however, no more than a complex adding machine and therefore did not advance the science of computation much beyond the abacus. Pascal's own theories concerning numerology were considerably more interesting – but that's another story and another subject all together!

One of the major problems facing all early mathematical inventors was that the practical sciences such as metalwork, precision engineering and – later on – basic electricity were not sufficiently developed to put all their ideas into practice. It must have been very frustrating to think up all those remarkable schemes only to be thwarted by the impossibility of manufacture. This still happens now I suppose, but I can't help but feel that if Pascal, Leibniz, Napier, Leonardo da Vinci or Babbage were placed into the twentieth century by some magical time-lapse, they would still be capable of amazing the modern world with some of their inventing skills.

Ready reckoner

Gottfried Leibniz was one such 'thinker'. He took over Pascal's machine and completed a better version of it in 1671. The theory he put forward was that counting by decimal notation was too slow and cumbersome for clockwork machinery. Why not make all numbers part of a simple 'on-off' binary code which would be capable of much greater mathematical power and might ease the construction of a calculating machine. His plans showed how such a machine could multiply and divide with great ease as well as calculate square roots by a series of repeated additions – something that most modern computers do.

Once again, his ideas were before their time as the mechanical skills couldn't cope with his design. He gave it a name however .... 'the ready reckoner'. It was finally built as late as 1794, more than a century after his idea, and was shown to the Royal Society in London. However, it wasn't very reliable and proved to be inaccurate in long division. Nevertheless, a good try!

It required the increasing technical skills of the Industrial Revolution to produce the idea for the first real computer – a machine capable of storing and altering data and performing a series of mathematical steps. Charles Babbage came up with the 'Analytical Engine' in 1835 which owed its development to the intricate workings of the loom. Just as the loom shuttle weaved its way mechanically through threads of cloth, guided by an elementary 'punch card' system, so the 'Analytical Engine' used a number of 'feelers' to sort out the holes in a series of punched ▶

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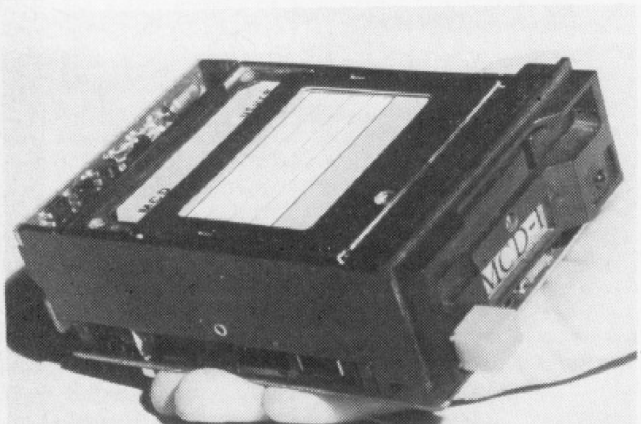

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cards. The real difference between Babbage's machine and previous calculating devices was that the machine was able to change its own data for use in further calculations.

There were two parts to the 'Analytical Engine'. Firstly a memory store of 50 block wheels with the capacity to hold fifty digits on each set of wheels, and secondly the central drive unit to perform the calculation and direct operations. It was the first device to store information in this way – 'mechanical RAM' and 'mechanical ROM' we should perhaps call it nowadays! The main drive unit could be 'programmed' by 'directive cards' which sorted out which set of wheels was going to be calculated on next and the data was transferred to the data wheel bank by 'number cards' – a remarkable operation for its day! The real advances that Babbage made were in the use of variables – a set of wheels could be 'programmed' to change its value as the calculation proceeded – and in the even more remarkable concept of conditional branching – by comparing the values of two different wheels, the machine could step and switch to a different slot on the central 'directive card'.

This meant that Babbage was the originator of the first true digital computer – a machine capable not only of performing calculations, but of altering its own programming codes according to how the data was being processed.

Acclaimed genius

However, he never received the recognition he undoubtedly deserved. His calculations and plans were never put into full effect because of the lack of really accurate mechanical transfer systems. Parts of it were built with money obtained from the government who took a great interest in Babbage's invention, but the whole machine was never completed. Indeed his plans, drawings and pieces of machinery were completely forgotten until 1938 when he was suddenly acclaimed a genius before his time.

So the next time you find a bug in a 'FOR...NEXT' loop or a line containing an 'IF...GOTO', you can blame Babbage for starting it all off. If Babbage had mechanical problems, some other less gifted but imaginative Victorian inventors faced impossible goals with an amazing selection of dream machines. The Victorian age spawned a flood of mechanical inventions, most of which never left the drawing board. They were real 'number crunchers' in more ways than one! One such 'Mathematical Marvel' sported a row of metal reeds being bent by the passage of a revolving cylinder with spikes. This was the same principle as the music box – only this device was supposed to play you music while it did your sums for you. You know the sort of thing .... D natural was number 4 and number 9 was represented by E flat. By poking about with the 'programme wheel' you could get the 1812 overture to play when the right numbers were typed into the machine. Quite awful!

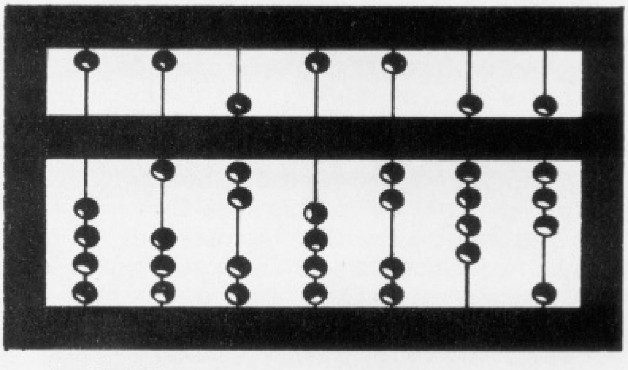
And if you think that's bad, then what about the 'Heston Numerator' which was designed as a 'pocket calculator'. It was positively dangerous to use since it had sharp spikes to store data on and when I tell you it weighed about ten pounds, you can imagine the size of pocket required to carry it. Not surprisingly, this and other devices never became going concerns largely because the limits had already been reached with purely mathematical machines. It needed the birth of electricity to get to the next stage in computer design.

An American statistician called Herman Hollerith took the punch card system one stage further by introducing an electromechanical card reader that vastly increased the speed and accuracy of data handling. Hollerith's machinery would also punch the holes in blank cards so that for the first time data could be written as well as read – the first genuine 'Input and Output' peripheral device. It was also not only built but used to great effect in the collation of the official U.S. Census of 1890. Hollerith's equipment was the forerunner of the more modern punch card systems still in use today and it meant that data could be stored – not in whirring gear wheels as they clunked up the digits – but in box files. Ease of access and operation became more feasible. It is interesting to note that in 1911, when Hollerith's devices were in more general use, he joined up with two other small companies to launch the Computing Tabulating Recording Company which in later years was to be better known as International Business Machines Corporation (I.B.M.)

Paper tape

The beginning of the twentieth century saw considerable progress in the field of electronics but it was to be some years before the first fully electromechanical computer arrived. At about the same time as Babbage's ideas were being re-discovered, Howard Aiken at Harvard University started work on something called the Automatic Sequence Controlled Calculator. As well as punched

▶ 88



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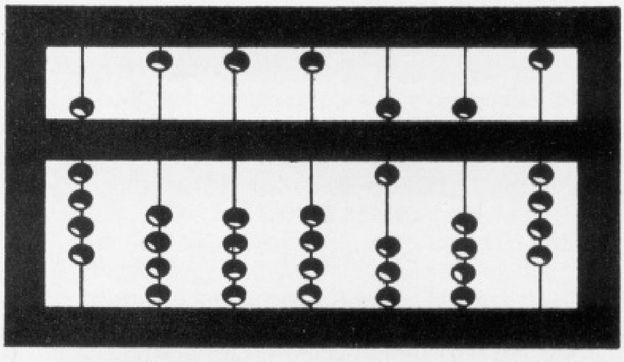

equals 9,000,654

Figure 1

TOMMY'S TIPS

Everyone seems to be jumping on the bandwaggon and knocking BASIC these days. Healthy criticism is not a bad thing provided it is constructive, but you must not say, "BASIC is useless", rather, "BASIC would be better if ...." So I am going to start a little competition. What feature would *you* like to see in BASIC? Here are two just to start the ball rolling. Many BASICs have a "LOAD and RUN" command which loads a program and executes it all in one go. How about a "SAVE and RUN"? When you are developing a program you often want to save a modified program before running it but no BASIC that I know of has a single command for this. My second entry is that when you load a program, BASIC should remember the name you used, so you can just say "SAVE" (without a name at all) and BASIC will save the program with that name. Many times I have gone through a suite of programs doing a small mod to each, and it is always a worry that I have saved one with the wrong name! Anyway, you must have some ideas, so how about letting me know? A Silver Space Invader badge for the best entry.

Apple stalk

Now for an Apple tip. This was presented to me by a colleague of mine from the Midlands, Chris Page. Chris runs a large engineering company which build Apples into all sorts of machines. He has gone very quickly from being an absolute pencil-sucker of a beginner to the stage where he is now giving me advice. If I don't watch out, he will be after my column! His problem was how to print a vertical line down the middle of the screen quickly. The first-glance solution runs like this:

```
100 FOR I=1 TO 24 : PRINT TAB(25);"!" : NEXT
```

This wasn't quick enough for Chris, so he came up with the following trick:

```
10 VL$ = CHR$(10) + CHR$(8) + "!"
20 FOR I = 1 TO 4 : VL$ = VL$ + VL$ : NEXT
100 PRINT TAB(25);VL$
```

Quite simple really, isn't it? The heart of the matter is line 10. CHR$(10) is a line feed, which moves the cursor down a line, and CHR$(8) is a backspace, which moves the cursor left one column. These can easily be changed to suit your own micro. Line 20 just makes a string up of the elements in line 10, and line 100 prints the string. After printing one exclamation mark, the control characters move the cursor down and back one ready for the next exclamation mark.

Another tip from one of our readers. In April's issue, we had a request from a reader as to how to test if a printer was connected to his PET. As he had no disk drive, if the printer was not connected or turned off, all his programs bombed out with "DEVICE NOT PRESENT". Patrick Walshe has written to me across the water from Ireland with his little routine:

```
100 SYS 61650 : IF ST=-128 PRINT "PLEASE SWITCH
PRINTER ON"
110 IF ST=-128 THEN POKE 150,0 : SYS 61650 :
   GOTO 110
```

This is for BASIC 4. BASIC 2 users should change the SYS call to SYS 61622. The SYS call is to one of the IEEE routines which sends an Attention sequence to the bus. This routine will not work if there is a disk drive connected to the system, but then you can just use ST as normal.

Skeleton keys

Dear Tommy,
Can you please explain what ISAM is?
J. P. Watson

ISAM stands for Indexed Sequential Access Method, which was developed by (of course) IBM back in the good old days when computers were the size of *MicroComputer Printout's* offices. Nowadays of course computers are about the size of the room I am allocated to work in and/or the Editor's wallet. It is basically a method of storing data in a file so that you can retrieve a record quickly based on an *alphanumeric* key. Without ISAM it is fairly straightforward to find record number 35 in a file if you know that each record is 143 characters long; it is not so easy to find a record of a particular company using the name as a key. ISAM assists in the latter case by producing a sorted index file, each record of which consists of the key and record number of the corresponding main file record. This is done to save space; the main file records may be up to say 230 characters long; but if the key is say 10 characters, we can produce an index file whose records are only 12 characters long (the extra 2 bytes are needed by the disk operating system). Hopefully, this will now be small enough to fit in memory in it's entirety; but if not, we will have to produce a "coarse" index (that is coarse as opposed to fine, not coarse like what I am on Saturday nights).

Say for instance we have a coarse table consisting of every tenth record in the index. We can hold this table in memory and search it using a binary search technique (see Chris Preston's excellent article on algorithms in the July issue). We might find that the key we want lies between the 3rd and 4th record in the coarse table. This means that we have to search from record 30 to 39 in the index file; which we can do quite quickly. The reason why this method is so fast is that we are doing the bulk of the search in memory, on the coarse table. We then have to read a maximum of 9 records sequentially from the index file, and because reading sequentially does not usually involve much head movement, this will be quite fast as well. Having found the index file record, we have got the record number and we can jump straight to the main file record. Remember that what is really slow with floppy disks is moving the head about from one part of the disk to another.

So much for the easy part. Now that we have our nice neat sorted index file, what happens if we want to add another record? Sorting the file may take hours, so we cannot sort the file after every addition! One way is to leave "gaps" in the index file called overflow areas, which typically occur at the end of each track. When we add a new record, we also add a record into the overflow area of the index file on the same track as its "proper" place in the sorted file. When we come to search the index file (having already gone through the search on the coarse table) we will not find the record in the sorted part of the index file, so we then look at the overflow area at the end of the track. Remember that because we are staying on the same track this is quite fast.

What happens when an overflow area becomes full? We then have to go to a separate "insertion area" which again holds "index file" records, but not in any order at all. When we add a new record we just put an index entry onto the end of the insertion area. This means that we can only search it by starting at the top and working our way down, so if there are quite a few entries this will take some time. When the time taken to retrieve a record becomes too large, we will have to re-index the file, which gives us a new index file with empty overflow and insertion areas.

In most ISAM systems on micros, the overflow areas are not bothered with, there is just an insertion area where all new records are indexed. This tends to make the whole thing a lot simpler. However, there are in my opinion, not enough micro manufacturers offering ISAM as a standard feature. This is one feature which is essential for a business micro, but very few of the machines which usurp that title supply ISAM!

Coarse Table (held in memory)	Index File (Sorted) Key		Main File Record		Record No.
	A1	8	B1	G. BLOGGS	1
C1	B1	1	N1	R.U. NEAT	2
N1	C1	3	C1	E.C. CHAIR	3
S2	S1	5	W1	T.V. WATCHER	4
	S2	7	S1	P. GREEN	5
	N1	2	O1	R.U. ONETOO	6
	O1	6	S2	I.M.A. GREATMAN	7
	S1	9	A1	C. ADDERLEY	8
	S2	10	S1	Z. SIMS	9
	W1	4	S2	S. STOTT	10

Here is a diagram showing the elements of an ISAM file. Note that here, the coarse table holds every third key in the index file. A real system would use a ratio of one entry to 10 or 20 index file records. Note that we do not need a record number to go with the coarse table because we know that the 2nd entry corresponds to the 6th record in the index file because we have extracted every 3rd record to construct the coarse table.

On the map

Dear Tommy,

I wonder if you could help me with a phrase which has been puzzling me for some time. What does "memory mapped" mean, and what advantages does a memory mapped screen offer? Also could you tell me what a bit mapped display is?

P. J. Edwards

The phrase "memory mapped" has two slightly different meanings. The first applies to peripherals of any sort when used with certain processors. These processors, such as the 8080, have in addition to the normal load and store instructions, which refer to memory, two extra ones: INPUT and OUTPUT, which refer to an I/O device. These instructions carry out exactly the same functions as the normal LOAD and STORE, but they refer to a different memory space. In practice what happens is that the processor provides a control signal when executing an instruction which says "This is a memory access" or "This is a peripheral access". The advantage of having separate memory and I/O systems is that you can use a full 64k of memory without some of it being taken up by your peripherals, such as disk drives, keyboards, etc. The disadvantage is that you require some extra hardware, and you cannot use any of the processor's other instructions, such as AND, on the peripheral.

When we come to screen handling, a similar situation occurs. Any video system has an amount of memory associated with it to store the data which is displayed on the screen. This memory is continually being scanned by the video display hardware, and the data used to form the picture on the screen. If the screen is memory mapped, then the processor also has direct access to this memory. Most micros in fact have memory mapped screens. The other system means that the processor cannot get at the screen memory directly, only at some control registers. For example, to put a character in a particular part of the screen, the processor may have to set up the address in one register, then put the data into another. "PEEKING" at the screen may not be allowed and even if it is, that means there is another register to set up to say whether we want to read or write the screen memory. The advantage of memory mapping here is that it is very much faster, because only one store operation is required to put a character onto the screen instead of three or four. The disadvantage is that the memory taken up by the screen (which varies from about 500 bytes up to 48kbytes for a good high resolution display) is not available for program storage.

A bit-mapped display is something entirely different really! Any display is built up of things called pixels (picture cells), which is the smallest part of the display which can be individually altered. For example, the Apple display is 280 pixels across by 160 deep. If the screen is bit mapped, then each pixel is controlled by one bit in the screen memory: if that bit contains a 1 then the pixel is lit; if a 0 then the pixel is unlit. In this way each memory location controls 8 pixels (in an 8 bit micro). By setting a pattern of bits throughout the screen memory, you can produce a high resolution display, although believe me, it can be hard work unless your operating system has some decent plotting routines. The opposite of a bit-mapped display is the character display (found on every computer in the world!) In this system if you store a value in a location in screen memory, this is not used directly to light eight pixels, but instead is passed to a "character generator" which uses it to build up the corresponding character which may be 9 pixels by 7, say.

T.V. Monitor

Dear Tommy,

The BBC computer can apparently drive an ordinary colour TV or a colour monitor. What is the difference and which is best?

C. P. Morley

Well, the obvious advantage of the TV is that most people already have one, and so can avoid the extra expense of a separate computer monitor. Of course they then have the problem of deciding which of the family has precedence when it comes to use of the TV! Unfortunately, this system will tend to have a lower quality display. This is because the video signal in the computer has to be converted into a TV signal to be sent to the TV, which then converts it back to a video signal. Two redundant conversions can mess the signal up a bit. A monitor accepts a coded video signal from the computer (the same as that extracted from the TV signal) from which the monitor extracts information to drive the three "guns" which produce the red, green and blue parts of the picture. Because this saves the two conversions, it is possible to get a higher quality display from a monitor, although it does of course depend upon how much you spend on your monitor. ▸

TOMMY'S TIPS

Power corrupts

Dear Tommy,
*I have a problem with my VIC. When I type "PRINT 7 ↑ 7" I get the answer 823543.002, yet PRINT 7*7*7*7*7*7*7 gives 823543. Have you any suggestions as to what causes this, and is this a fault on all VICs, or only mine?*
C. Grainger

This, I am afraid, is a problem on all computers, even the CRAY 1 we reviewed recently. It is caused by rounding errors, which you probably came across at school when you tried to divide 2 by 3, or write the value of PI. The problem is that in any number system, there are some numbers which cannot be written down, such as PI; they would take an infinite number of digits. We have to write down an approximation, and so we get errors. As the VIC, like any digital computer, works in binary, the numbers which cause it problems are different to the ones which cause us problems in our decimal number system. The VIC works to a limited number of binary places (the equivalent of our decimal places), and any number which cannot be expressed exactly in this number of digits has to be rounded. It is a bit like saying "I have 3 apples which together cost me 35p. Therefore each one cost me 35/3p, so I will sell you one for 12p". You are in fact making a small profit because you know I cannot give you 11.66666666666p. Charging me 11.5 pence would be nearer, but then you would be making a loss. The techniques of writing programs which use real variables, as opposed to integer ones like I% are quite complicated, but do read Mike Gross-Niklaus' article in the March 1982 edition. The other reason for your particular example is that when VIC performs a 'power' operation, it converts the number to logarithmic form rather than multiplying it out in full. This method is much faster but also less accurate.

Stacks of memory

Dear Tommy,
In BASIC programming, I occasionally experience "OUT OF MEMORY" errors of the second kind, i.e. when there are still many thousand bytes free. I understand that this second kind of error can be caused by using up the stack with GOSUBs or FOR-NEXT loops, but I have never seen a definitive explanation of a cure for the problem.
R. H. Leaver

I suspect that what you want is "How to avoid bugs". Wouldn't we all!! You are quite right; this error is cause by GOSUBs and FOR-loops. In fact it is nearly always the first, because to use up the stack with FOR-loops, you have to have quite a large number (at least 15 or so) of loops with different variables. If you have a loop which is active, and you try to start another with the same variable, BASIC will throw away the first loop (and any you started since) before starting the new loop., Hence a great many "NEXT WITHOUT FOR" errors from beginners! It is, on the other hand, extremely easy to use up the stack with GOSUBs:

```
10  GOSUB 100
100 GOTO 10
```

If you are suffering from this error, then look through all your subroutines, and make sure that there is no way that you jump out of them by GOTO instead of RETURN. Especially check error exits – these often lead back to an early part of the main program. Some BASICs have a POP instruction which clears up the stack to avoid doing a RETURN. Are you sure that you have not missed one off? I am afraid that there is no short cut to getting rid of this problem – it is bound to be a hard slog.

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Architects are no strangers to the computer. They were among the first users of computers, way back in the late 1940s, among professional people, although it was at first the number-crunching capability of computers which made them attractive. Their use elided the drudgery of engineering stress calculations rather than aiding the design process; it was not until many years later that computer-aided design became commonplace amongst architects. Nevertheless, some famous buildings could never have built without their help: examples are the Sydney Opera House and the net structures of the ill-fated 1972 Munich Olympics.

Computer use amongst architects may be divided, as with many other professions, into two convenient categories: administrative and creative. These are not clear-cut distinctions; both kinds of program – let's say a drafting, or 3-D visualising program, may be included in the same sort of package which contains a word-processor designed specifically for drawing up building specifications and standard contracts, though the software may be very different in the writing.

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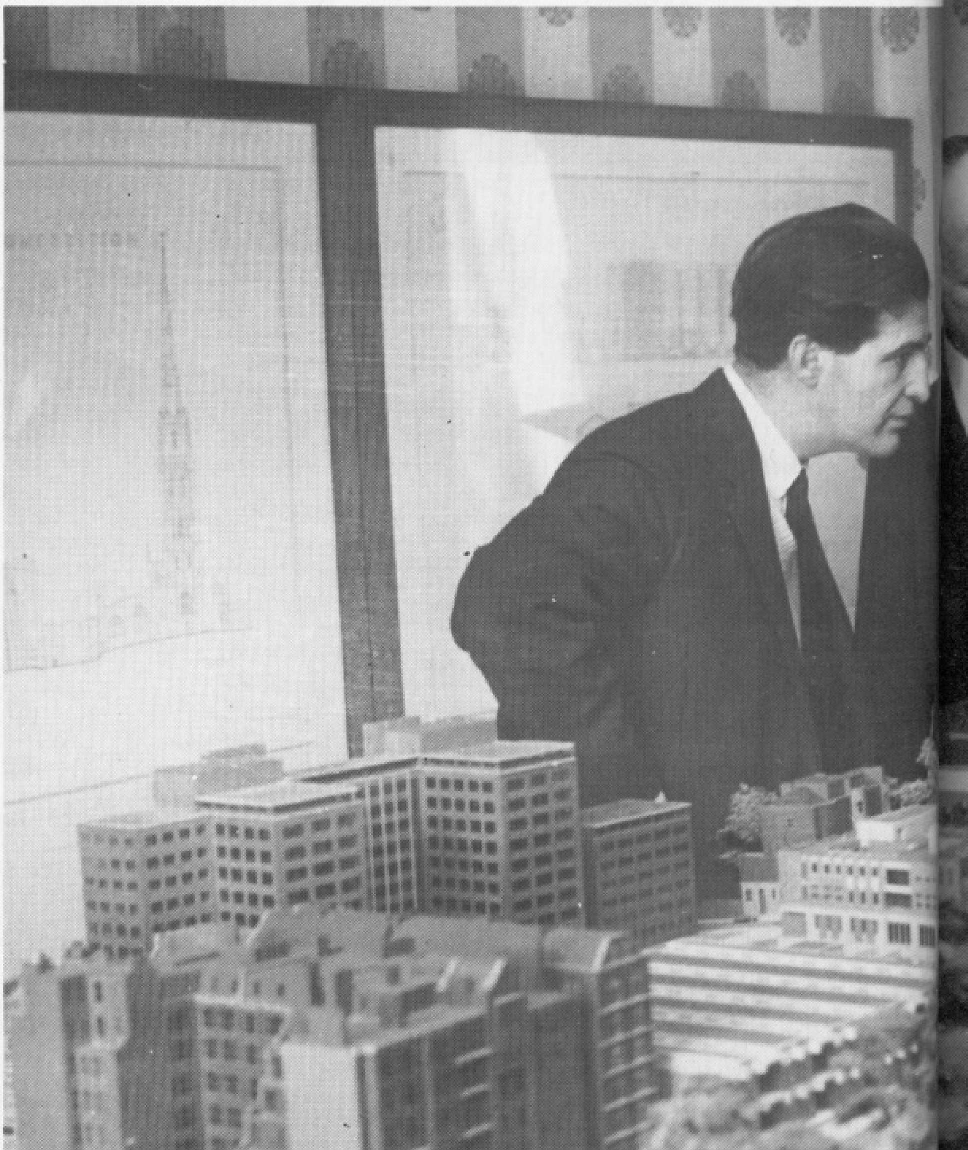
Can computers help desig



By Martin Hayman

The problem for architects, and for software writers who need to get a handle on this industry, is its sheer size and the diversity of the tasks which it undertakes. Nevertheless, it is a potentially immensely profitable field. Despite the severe recession in building – by one calculation, at the present rate of replenishing housing stock in London, each existing home will have to last 30,000 years – the construction industry is still the largest employer in the UK, with more than two million workers producing 11% of the gross domestic product. Clearly, as soon as the recession ceases, construction firms will be looking to increase their efficiency by building more with fewer people.

Obviously certain tasks in building, especially small-scale domestic housing, ("rehab" and "infill") are irreducible. No microcomputer is going to speed up a plumber and mate in their time-honoured duties of installing sinks, lavatories and heating systems; nor, at the other end of the scale, can it control a crane which picks up a pre-stressed beam from the ground and hoists it into its assigned place high up on some Green Giant-type structure. These tasks depend on the dexterity and the derring-do of the tradesmen involved. The more skilful the tradesman, the quicker he gets through his work, the better pleased will be the main contractor.

Sub-contractors

But with the increasing tendency towards specialisation, even at a lowly level, many tradesmen or sub-contractors are looking to the main contractor to schedule and progress the job by getting all plans and materials to the site in an orderly fashion, according to a proper schedule of works. In this respect the job of an architect, and of a contractor, is akin to that of a systems analyst. It is of very little use if 100 timber window frames arrive on site when there is no roof on the building to keep out the rain, and the concreters are still laying floors.

Equally, it is no use having a gang of first-fix carpenters arriving to install windows when the windows are still at the depot. Even the most apparently crude of construction industries, road-building, involves a staggering amount of data analysis in order to minimise use of plant on cut-and-fill operations. One can only admire the engineers of the past, such as Brunel, who was able to visualise the sweep of a railway across hill and dale, and arrange for his toiling armies of navvies to move their barrows of soil from cuttings to proposed embankments. The logistical problems of billeting and feeding those thousands of diggers at constantly changing sites makes the problems of disposing scrapers and tippers pale into insignificance.

Now if Brunel had had the use of a computer he would almost certainly, in common with 85% of architects, have done his own software development. This is a remarkably high figure. As we have seen in previous articles on the professions, those who develop their own software for professional applica-

ITECTS

gn better buildings?

tions are the exception rather than the rule, and in some cases are even regarded as cranks. But it is because of the very diffuse nature of architects and construction that individuals have found it more satisfactory to write, or at least to modify, software so that it best corresponds with their own methods of working.

The architect's characteristic working environment is at the drawing board. In that space he's the boss, no matter whether he's outlining the Pompidou Centre or working up the details of the ducting through a new hospital wing. For this reason the micro – rather than any other computing solution such as time-sharing on a mainframe or a bureau service – appeals to the architect, who can park one beside his drawing board. It is described as "user sovereignty" in this context. The disadvantage with user sovereignty is in the proliferation of different methods, languages and operating systems if firms go about acquiring microcomputers in a hap-hazard fashion. The main thrust towards standardisation, which would allow at least some portability of programs and cut down on duplication of effort in the solution of similar problems, has come from the Construction Industry Computing Association.

BASIC Drawbacks

CICA, originally the Design Office Consortium, was commissioned by the Property Services Agency (in one of its better-founded speculations) to write a report on the use of micros in construction in the late 1970s. It was an overdue move because the profession's august body, the Royal Institution of British Architects, after sponsoring a conference in 1973, had fallen asleep on the issue, and there was a need for definite guidance for architects who wanted computers but did not know where to turn for advice.

CICA's report is unusually positive. Though dated 1979, it spots CP/M as the *de facto* operating system of the future and advocates the adoption, for this reason, of Z-80 or Z-80A processor-based machines. It acknowledges the strength of BASIC for its ease of use by the relative newcomer, but is frank about its drawbacks. In its view they are: it makes for inefficient software; there is a proliferation of dialects; it lacks structure. It remarks that most construction industry programs – classic number-crunching stuff on stress analysis and so on – are written in Fortran. Most BASICs have a low numerical precision and have various disabilities such as limited length to identifiers (variable names), poor subroutine forms, file handling and I/O routines. For the construction industry, the report favours Fortran or Pascal. So far, so damning; but as we shall see, some useful work can be, and has been done by economic programming in BASIC.

This report, fearfully expensive to buy, is now being revised to take account of the experiences of new users since the original publication, and to include the specs of some current micros which have appeared since, and to which it provides a useful guide. Among other activities which CICA has recently been involved in is the drafting of the spec of a standard workstation for the EEC. CICA director, Rob Howard, told me that such a workstation was being studied from the ergonomic as well as electronic point of view – an entirely appropriate pre-occupation for those concerned with design. Current workstations are generally "too heavy" and difficult to integrate with the existing office environment.

CAD packagers have paid insufficient attention to the useability of these design aids, and have suffered from the illusion that as soon as a CAD or drafting system is installed, the office drawing boards will be thrown out. This is far from the case: as in many other professions, people are jealous of the methods which they have devised and which have served them well, and need to be wooed by positive advantages. "It will be a long time before people are prepared to do away with paper," Rob Howard says, and we may expect a parallel manual system to support design and drafting workstations for many years to come.

Rule-of-thumb

Communications will also play a vital part, and it is here that standardisation will improve the acceptability of architectural computing. A large building may employ four or five consultants and 50-60 different contractors. If they are all running different systems and communications protocols, then the scope for misunderstanding will be very wide.

Rob Howard reckons that the price cut-off for the average partnership's investment in a computer is around £20,000. He does not make a distinction between micros and minis: the usual rule-of-thumb, that a micro is a machine which can be placed on top of a desk, does not obtain here because of the space required for specialist configurations such as drafting machines and digitizing tablets. But a micro with general use in an architect's office will in his opinion have at the least management accounts and word-processing as standard (hence the importance of a standard operating system). If the user's requirements lean towards engineering, then the system is likelier to need substantial power and precision, arguing for the adoption of Fortran.

The architect, on the other hand, is pre-occupied with spaces and perspectives, and will need CAD for drafting and 3-D modelling. Again, engineers require more precision and are hanging back for the arrival of 16-bit micros for drafting systems. Such systems have been around for a while and many packages are already available from the US, though these have mostly been developed from airframe design and PCB design applications, and tend to be no quite right.

Market leaders in Britain are two British companies, Applied Research Cambridge with its GDS system, and GMW Computers with is RUCAPS. RUCAPS, which boasts among its 50 or so users that most successful of partnerships, Richard Seifert, ranges in purchase cost from £65,000 to £250,000, with an average installed cost of around £120,000, so it's not a purchase likely to be taken lightly.

Such a system would typically include substantial high-grade peripherals which bump up the base price of the PDP 11/23 and the resident GMWC-written software: monitor and keyboard, of course, heavy-duty printer, "electronic drawing board" and flat-bed plotter. Its advantages over manual practice are in its interpretation of a single "model" in terms of plan, section and perspective; the ability to move between plan, sections and perspectives quickly and seamlessly, to maintain creative continuity as the "model" is improved and refined; and the constant updating of all data, including building schedules, costings and specifications as any of the original parameters are changed. On a large and complex job this last is a vital asset: RUCAPS will sweep out all changes made since the previous drawing so that changes may be studied in isolation. This level of co-ordination comes expensive: in the higher-level systems, DEC machines are replaced with Primes.

Artist's impressions

One extension of the RUCAPS system is Autoprod, a "bolt-on extra" which has distinct advantages for presenting finished drawings to clients. It is a three-dimensional visualising program which converts drawings into "artist's impressions". This can be vital both in selling an idea to the client and for such purposes as planning permissions – in fact to anyone who is less than familiar with interpreting architect's drawings in three dimensions. This leads to the intriguing possibility of presenting the client, or the public with an automated stroll through the as-yet unbuilt structure on video or film. One off-the-wall application of this program was used by BBC-TV's *Nationwide*, who wanted to do an animation sequence giving the viewer the impression of "overflying" the British Isles at a height of 600 miles (on a day with perfect visibility). The frames for this amazing sequence, claim GMWC, were generated overnight.

One of the main problems architects face is getting the client to perceive a 3D structure. Computers can help by creating artistic impressions direct from plans.

However, there are few architectural partnerships who can dispose of this sort of high-flying hardware. There are few very large buildings currently being built in the UK and most partnerships do not need the sophistication which RUCAPS offers. CICA, in the course of its researches for the EEC, has drawn up a three-level plan for architects workstations. Consistent with the aim of improving communications and pushing for standardisation, all include word processing and accounts management and a wide range of communications interfaces.

The first level would consist of an eight-bit machine with a vertical-format, A4 size memory-mapped screen. The second level would be based on a 16-bit processor with engineering calculation programs; a database manager; and 10MB of hard-disk storage. The screen would be A3, horizontal and there would be some graphic output capability although the machine would be principally a number-cruncher. The top level would again be 16-bit, adding more storage, another screen plus an A2 digitizing pad and interactive graphics; it would be fully capable of network communications and would probably use the Unix operating system, and would have development tools.

Architects are still under some illusions about the usefulness of computers, says Rob Howard: demonstrations such as those given at exhibitions like the RIBA spring exhibition tend to give the impression that one has merely to think a shape and drop it into place on the screen with the light pen. Every CAD package has some kind of digitising pad, he remarks, but this is not a total solution, unless you have appropriate interpretive software. Between the joystick and the finished drawing there is room for a great deal of inaccuracy which can only be tightened up with commensurate effort – either on the part of the writer of the interpretive software or, more likely, the user who is quite likely in the end to have to key in data. This is where BASIC falls down: there may be a huge library of standard components to draw from, but in BASIC it is difficult to identify them properly.

Pen & paper

Rob Howard reports that confusion is beginning to clear in the progression, which was overwhelmed by the arrival of a large number of systems around 1980. There is a better graduation between systems, he says, and they are now beginning to get a feel for the subject. Right now, the arguments rage over which is the likelier way forward: 2-D or 3-D? Two-D visualising aids have a lot going for them: they are established, and therefore cost-justifiable and many people have experience of them. Furthermore, the technique is not so different from the existing use of pen and paper. On the other hand it still does not solve problems characteristic of two-dimensional planning of three-dimensional artefacts: bluntly, making errors like putting a pipe through a beam.

On the other hand, thinking in three dimensions, while more difficult, takes the computer right back to the design stage of the building, allowing the user a much more accurate analysis of how his ideas will look. Ideally it will also include programs to analyse the environmental and energy performance of the proposed building; cost analysis (by calculating areas, counting components and so forth and relating them to a constantly updated table of costs). Ultimately it will be possible to hold a 3-D model in memory, Rob Howard hopes, together with all quantities and schedules. Such a system, which is what the third level of the workstation project should achieve, would have a potential market of 100,000. By contrast, the level one machine would be of interest to some 500,000 European firms, and by 1986 would be affordably by any firm with more than about 10 employees.

What of the very many firms who have fewer than 10 fee-earners, have a rough and ready relationship with a few builders and tradesmen and regard any job of billing more than £3,000 as worthwhile, the local paper small-ads "Plans, conversions and estimates" people? Can the computer benefit them?

Eventually, it appears, yes. A true micro-based entry-level system running on a PET for the small contractor is made by a firm called Valtec. Unlike the space-age visualising of the DEC and Prime based systems, this is strictly an administrative tool and as such perhaps represents the bread-and-butter of computer usage for construction. Valtec's Microspec – like many other software packages designed to run on off-the-shelf micros – aims to speed the tedious office work involved in drawing up a building specification for small-scale work. Its target is all the architects and chartered surveryors working on rehabilitation, and that means the majority of people involved in the design stage of UK construction work. It estimates the cost of the job as soon as the working drawings are complete, from pre-entered costings based on the building costings "Bible", Spon's, and prints out an uncosted spec for the builders to tender.

Competitive tenders

Valtec's team is typical of the kind of cross-disciplinary skills which the computer is so good at revealing: the four partners are an architect, a designer, and engineer and a programmer; like many others, necessity was the mother of invention: "The idea came about three years ago after we had put together a spec using pen and paper and scissors," David Angus told me. He says that specifying and costing rehab. work is a haphazard process and prone to errors, but which more importantly takes an awful long, long time. Most local authorities will tell you, he said, that consultants leave a lot of "fat" in their specs; Valtec's objective is to tighten up the imprecise science of cost-estimating and to reduce office time for tendering purposes, resulting in more competitive tenders.

Born out of experience, this program builds in a unit rate for general trade factors (plastering could be plussed up ten per cent for a London job over a Brighton job, for example) and keeps in its library most of the clauses needed to print out a job spec. The menu looks like this: Task library maintenance; Clause preparation and maintenance; Cost estimate print program; Schedule of works; Factor maintenance program (for updating costs); End of program use. Programmer Ray Parker worked in compiled PET BASIC using 32K and an 8050. He managed to fiddle his way successfully around the limiations of PRINT USER and two-digit identifiers, but he warned that it needs plenty of care. An implementation for CP/M is now under way.

Valtec actually uses their own product in a live situation and say that so far capacity has proved easily adequate. Of the 500 jobs held on disk, only half have been used so far. And at £875, their software looks likelier to be within the bracket that most architects are prepared to pay.

LIFE — IN THE FAST LANE

The pattern generating game of 'Life' has fascinated computer freaks for years. **David Maxwell** has developed a version for the ZX81 which uses machine code both for increased speed and efficient use of memory.

Recent articles in computer magazines have provided BASIC programs for the game 'Life', *MicroComputer Printout's* January issue included. Most of these have set up arrays or strings to achieve this but on the 1K ZX81 these take up so much space that only the smallest pictures are possible. Obviously with such a limited memory, the shorter the program, the larger the display on the screen and the larger the display the more interesting and varied patterns can be seen.

Machine code routines are just the answer for the 1K ZX81 and here is a program that can set up as large a display as 17 x 32, achieving this by storing the results of analysing each 'day' in the 'Life' in binary code. It gives a nice illustration of the 'set', 'reset', 'rotate' and 'shift' machine code instructions. In this example the machine code is stored in a REM statement.

The program first allows you to set up your own initial display pattern with the help of the 'RST0010' ROM instruction onto a 17 x 32 rectangle (pressing key 1 will print 0 and pressing key 0 will print a blank). This section may be speeded up by POKEing 16550 to lower values.

It then analyses each square in the pattern in turn according to the rules of 'Life' and stores the result in binary (i.e. one byte to represent eight squares) in the latter part of the REM statement. When this is done the new display is set up. Each cycle is completed in less than one second. The carry flag is used in the routine to decide which of the two above tasks is to be carried out.

The machine code routine may be loaded quite easily using the following BASIC program. The REM statement must contain 225 characters (use X's for example). The length of this may be checked: PEEK 16511 should equal 227.

```
10 REM – 225 X's –
20 FOR A = 16514 to 16670
30 INPUT B
40 POKE A,B
50 IF PEEK 16442 = 2 THEN SCROLL
60 PRINT A; "one space"; PEEK A
70 NEXT A
```

Running this program allows you to enter the machine code instructions one by one (i.e. 118, new line, 118, new line, 42, new line, 12, new line, 64 etc). The program provides a continuous listing of addresses and their codes for you to check and running it in FAST mode will speed things up a little for you. Having entered the routine you will find that BASIC program will no longer display properly. It will 'stick' at 10 REM because of the first two HALT instrucations, whose function it is to prevent the whole REM statement being listed and edited. (If this were to happen there is a risk of the routine being partly destroyed or of the display entering an interminable loop). The rest of the BASIC program can be displayed by, for example, LIST 20.

Once the routine is entered it is essential to check it all. Add to the BASIC program:

There are many pattern generating programs but few as simple and elegant as "LIFE", an evolving creative display designed by John Conway in Cambridge in 1970. His rules state that each square in the grid should be analysed separately. If a square is occupied (or "live") and has either two or three "live" neighbouring squares (either transversely or adjacent) then in the next "generation" that square remains "live". Otherwise it becomes blank (or "dies"). If a square is initially blank (or "dead") and has exactly three neighbouring squares that are "live", then in the next generation it will become "live". Otherwise it remains "dead".

Many "LIFE" programs change each square once it has been analysed, which produces a rather messy display (and is not how Conway originally planned it). This program "reads" the whole display before setting out the next generation. As the generations evolve, the display splits into colonies that move about the screen growing, dying or settling into a repeating pattern that can be quite mesmerising to watch.

(if in FAST mode) 21 GOTO 60
or
(if in SLOW mode) 21 GOTO 50

and then RUN. Any mistakes can be corrected by POKEing the relevant address with the correct code.

Lastly, instructions 20 to 70 should be deleted and the game 'Life' can be called up by adding:

20 RAND USR 16516

This program must be run in SLOW mode (in order to see the initial display being set up). Once the display is created then pressing BREAK will call a halt.

Other adjustments are fairly simple. Without going into the technical details of the machine code, a rectangle of X columns (X must be a multiple of 8) and Y rows may be created by the following changes:-

Column adjustment	**Row adjustment**
POKE 16520, X	POKE 16521, Y
POKE 16577, (X/8)	
POKE 16595, (256 -(X+1))	POKE 16572, Y
POKE 16616, (X-2)	
POKE 16625, (256 -(X-2))	POKE 16590, Y

You will find that a 22 x 24 rectangle gives a more square display but only contains 528 squares (as opposed to 544 in the 17 x 32 rectangle).

Those who would like to choose their own character for the display may do this by:-

POKE 16547, C
POKE 16609, C where C is the code of that character
POKE 16642, C

or alternatively reduce the display to 14 rows (by POKE 16521,14 POKE 16572, 14 and POKE 16590, 14) and add the following BASIC instructions:-

```
15 INPUT C$
16 POKE 16547, CODE C$
17 POKE 16609, CODE C$
18 POKE 16642, CODE C$
```

The most impressive display of all can be created by using 15 rows (POKE 16521,15; POKE 16572,15; POKE 16590,15) and making the following changes to the machine code routine:-

Address	Instruction	Machine Code (decimal)	
16661	CALL 3880	205 40 15	CALL SLOW (ROM routine)
16664	POP AF	241	
16665	RET NC	208	RETURN if new display ready.
16666	CALL 3872	205 32 15	CALL FAST (ROM routine)
16669	JR 16563	24 148	to next analysis

And then adjust the BASIC routine thus:-

```
20 RAND USR 16516
30 IF INKEY$ = "C" THEN RAND USR 16666
40 GOTO 30
```

This new program must be started in SLOW mode to allow the initial display to be set up. Thereafter it switches it self in and out of FAST and SLOW and a new generation will be created every time the C key is pressed. If this key is kept continuously pressed, "LIFE" will flash by in an animated fashion at more than FIVE generations a second.

```
MACHINE CODE "LIFE" FOR THE ZX81
                  BY DAVID MAXWELL
ADDRESS      ADDRESS      ADDRESS
      M.CODE       M.CODE        M.CODE

16514 118    16566 64     16618 193
      118          33           16
      42           31           239
      12           65           123
      64           63           209
      1            6            225
      32           17           214
      17           72           226
      197          197          40
      65           19           7
16524 62     16576 6      16628 61
      15           4            32
      215          197          3
      16           6            134
      253          8            32
      62           197          1
      118          48           55
      215          57           235
      65           235          203
      197          229          22
16534 35     16586 213    16638 55
      58           43           24
      37           121          8
      64           254          62
      214          17           52
      239          1            203
      40           3            38
      6            2            48
      254          17           1
      8            223          175
16544 32     16596 255    16648 18
      245          40           193
      62           5            19
      52           61           16
      119          40           184
      62           1            193
      10           4            35
      61           25           16
      16           197          177
      254          65           193
16554 32     16606 126    16658 16
      251          35           169
      193          254          245
      16           52           205
      230          32           67
      35           1            15
      193          28           209
      16           16           208
      215          247          213
      237          14           241
16564 91     16616 30     16668 24
      12           9            149
                                0
```

Memory dump for machine code 'Life'

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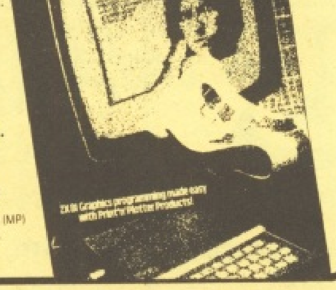

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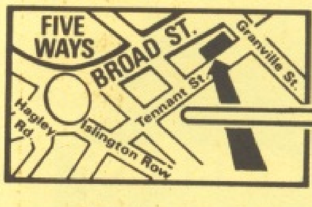

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USER FRIENDLINES

the other how long he can get away with not paying for them. Unless you are writing a program for one-man businesses only, there is a definite case for two separate reports here!

Many computers do not allow a program to test that the printer is connected, turned on and supplied with paper and so on. If yours does have this facility, then please use it. There are few things more confusing to an operator than a machine going completely dead because the printer is turned off.

There are of course many more aspects to ergonomics than those in this short article, and despite my sarcastic comments above, you must ask for confirmation before doing anything drastic, such as scratching the main data file. The main rule in computing is "Plan for the worst possible case". When it comes to making programs easy to use, the word is foolproof. If an absolute idiot can understand it, then it is suitable for use by non-programmers. If any software writers are looking for absolute idiots to test their programs, I believe the Editor is looking for some part-time employment....

◄ 67

EARLY COMPUTERS

cards as a data base, the machine used punched paper tape and was able – like Babbage's machine a century earlier – to switch and alter its programming as the calculation progressed. It was more generally known as the 'Harvard Mark One' and used banks of relays as a means of data calculation. Of course, program execution time was ridiculously long compared to today's micro electronics, and it was hardly a 'micro' itself, being 15 metres in length and 2½ metres high! But it *did* work and it *did* have a typewritten print out and it was the first fully automatic computer.

The use of any mechanical components such as relays slowed the calculation time down considerably. Even the large 'number crunching' device devised by the British in the 1939-45 war to decode the German military encoding machines (Enigma), took several hours to come up with answers which today would take a couple of minutes – though the use of the wartime information which the machine (Ultra) decoded was of great use to the Allied war effort.

Only after the war was over, did the first all electric digital computer arrive. It was also the first machine capable of handling character strings and alphabetics as well as numeric computations. Two inventors at the University of Pennsylvania – Presper Eckert andd John Mauchly – launched ENIAC to a startled world in 1946. ENIAC (Electronic Numerical Integrator And Calculator) operated at speeds of more than 1000 times the old electro-mechanical machines because all the computations and data were stored in electronic memory rather than relays or 'telephone ratchets'.

And its at that point that I must conclude the article because from then on, the pace of computer development speeds up at about the same rate. Many books have been written on the history of computers from ENIAC to the present day but since, as you know, the speed of development in 1982 is growing faster and faster, many of the books are themselves out of date by the time that they're published!

In spite of the bewildering complexity of modern technology, many of the basic computer principles owe their existence to previous centuries of trial and error.

All industries progress by a mixture of luck and sheer hard work. Who's to say that the revolutionary peripheral idea you have just thought up at home won't make you internationally famous a century from now? You might be the Charles Babbage of the 1980's!

◄ 91

FUZZY MATCHING

characters may be entered, thus paralleling the hierarchical search as above. The code is validated to ensure that the first character is alphabetic and the remaining characters are digits.

In either case, the program will print out all the names that match the generated (or entered) code. If no matches are found, the program reports accordingly. You may care to try searching for DE'ATH, McINTOSH, F362 and K523, to see the usefulness of the technique.

The Soundex coding system could be adjusted for national characteristics of language and has a whole range of applications beyond that of surnames; pop groups for your record collection system, trade names in business, names of species of flora and fauna, and geographical names are just a few possibilities. The searching can always be refined by the addition of extra data, such as initials of forenames, dates, characteristics, etc. In fact, the additional data can be Soundex coded in certain cases, e.g. forenames. Wherever searching is done on text fields, Soundex coding could be of significant value in increasing the possibilities of trapping those items which may otherwise have been missed by "fuzzy" spelling.

Major Variables

SC$( )	Array holding code for each letter of the alphabet
N$( )	First minor element holds the Soundex coded name, second minor element holds the original name.
TN	Total number of sample names
CD$	Soundex code being formed
LC$	Previous letter code
TT	Signifies if a match has been found.

The program was written on a PET but is easily converted for most micros – check the ASCII tables for your machine before converting the routine starting at line 110. The only special PET symbol is the Clear Screen symbol (normally shown as a reversed heart) at lines 70, 180, 290, 440 and 510.

◄ 47

VIDEO DISK

video disk adventures, for a while at least.

The humble disk has certainly come a long way since Margaret Hardaway at No. 11 invited me to her house to hear my first single – 'Not Fade Away', if you're interested – in 1964. For various and perhaps Freudian reasons, I have followed the progress of the disk from EP to LP to floppy to Winchester closely ever since.

The video disk is pretty much the pinnacle of the whole process, and perhaps we will all be able to afford them one day. It's a long time since 6s. 8d bought you any kind of disk worth having.

◄ 21

READ/WRITE

Cure for hiccups

I have a ZX81 which I purchased for serious use. On a few occasions I have contacted your offices with programming difficulties, and always met with an extremely helpful and courteous Editor and colleagues. *MicroComputer Printout* certainly provides an excellent service, whether through its pages or not.

May I offer this piece of information to ZX81 users who have difficulty saving and loading, (and there seem to be hundreds of them). Many hints and tips concerning the location of the computer compared to the TV etc. abound. Some may be helpful, although I did not find any of them to be a total cure. My experience was that on listening to the recordings of the programs there appeared to be an interruption on the recording which occurred periodically. After many experiments, I found the following method cured this completely:-

(a) Ensure that TV and computer are plugged into two *separate* power points and not one via an adapter as is suggested, in many books, for neatness.

(b) Run the tape recorder on batteries (high powered, fresh ones).

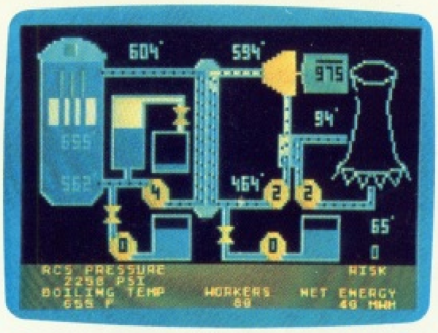
In point (a) above, it was the plugging in of the computer and TV into the same power point which caused this "hiccup" when either saving or loading. This provided an interruption when either the computer was trying to load or the recorder was trying to save.

I found the above two points cured the problem 100%. I hope they can be of use to ZX users.

K. W. Griffiths,
Hereford

After hearing so many complaints about the ZX81 cassette system, it is nice to receive some helpful advice for a change. A useful tip, Mr. Griffiths, though we don't think that it will cure everyone's problem as much depends on the type of cassette unit in use, and the setting of the various controls.

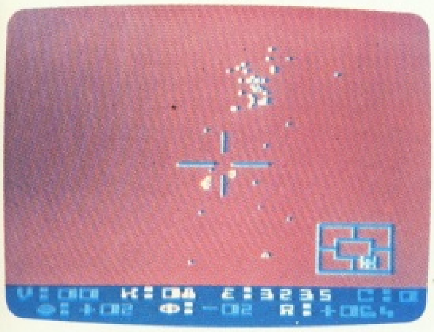
Music Composer



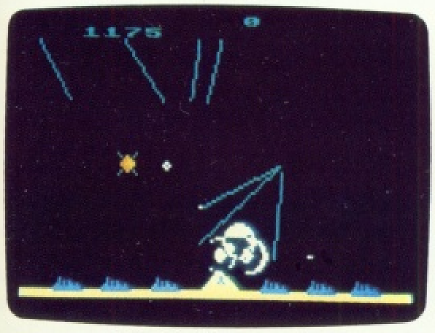
Scram

Graph-it

Intro to BASIC 1


Star Raiders

European Countries



Missile Command

Basketball

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FUZZY MATCHING

"Is that Johnson, Johnston or Johnstone?" How often have you been confused by people spelling their names in peculiar ways? Imagine a computer having to cope with that. Well surprisingly, they can – using a technique known as 'fuzzy-matching'. **Bob Chappell** explains how it works and develops a demonstration utility for you to build into your own programs.

Searching a file for records that match up against a set of precise criteria is a common feature of information retrieval programs. However, there are occasions when the search criteria are less clearly available. A

which the machine (Ultra) decoded was of great use to the Allied war effort.

Only after the war was over, did the first all electric digital computer arrive. It was also the first machine capable of handling character strings and alphabetics as well as numeric computations. Two inventors at the University of Pennsylvania – Presper Eckert andd John Mauchly – launched ENIAC to a startled world in 1946. ENIAC (Electronic Numerical Integrator And Calculator) operated at speeds of more than 1000 times the old electro-mechanical machines because all the computations and data were stored in electronic memory rather than relays or 'tele-

SC$() Arra lett

N$() Fir S

TN

CD$

LC$

TT

The progr

devised to attempt to overcome this problem. This method, named Soundex Coding, was devised to assist in work associated with the 1890 census in the USA. Based not on spelling, but on the pronunciation of names, the system uses a special method of coding text so that similarly sounding names are conveniently grouped under the same, or almost the same, code number.

The technique consists of the following steps:-

1. The first letter of the name is retained.
2. All occurrences of the letters a,e,i,o,u,w,y,q and h, and any pronunciation marks are ignored.
3. Commencing from the second letter of the name, code each letter according to the codes given below.
4. If two or more adjacent letters have the same code number (this includes the very first letter in the name), only the first of this group is retained.
5. The final code must consist of one letter followed by three digits. If there are more than three digits, only the first three are used. If there are less than three digits, the code is padded with zeros.

Codes

Letters	Code
b f p v	1
c g j k s x z	2
d t	3
	4
	5
	6

s follow:-

initial letter, M is coded 5, I is ignored, coded 3, H is ignored. Resulting expanded to S530.

L is initial letter, second L has de and so is ignored, O and Y are ignored, s coded 3, code L3 is expanded to

SHEA S is initial letter, H E and A are ignored, code S is expanded to S000.

OSBORNE O is initial letter, S is coded 2, B is coded 1, O is ignored, R is coded 6, N is coded 5, E is ignored, code O2165 is truncated to O216.

The program has been designed to produce Soundex codes for any name and has some embedded data for you to test the technique. Naturally, you would need to extract the coding routine for placing in your own program and to modify it to code the names from a file, keyboard input or from embedded data, depending on your own need. The code for each letter of the alphabet is stored in an array which is read in at the start of the program, followed by the sample names.

Each name in the sample is then subjected to the Soundex coding routine (lines 110-160); the coded name is stored in the corresponding first element of the two-dimensional name array. The appropriate Soundex codes are found by using the ASC value of each letter of the name as an index to the code array. The ASCII values of A-Z are 65-90 so we have to subtract 64 from this value to obtain the values 1-26 which are used to point to the code for that letter (the codes are stored in A-Z order).

Fast sort

The data is then sorted into name order within Soundex code order, to produce a faster search and a tidier output. It is not essential but readers may be interested in seeing a Shell-Metzner sort in action. The user is then offered the choice of searching by name or by Soundex code. If by name, the program codes the name entered and offers the user the facility to search at one of four levels: on the first character of the code only; the first two characters, the first three, or the full code. The search can thus be as wide as searching on the initial letter of the name, or as narrow as searching only on matches against the full code.

If the user has chosen to search initially by code, then a code made up of 1,2,3 or 4 ▶ 88

PROGRAM LISTING

```
10 REM **FUZZY MATCHING USING SOUNDEX CODES**
20 REM **BOB CHAPPELL 17/4/82**
30 DIMSC$(26),N$(200,2)
40 REM **SOUNDEX CODES FOR ALPHABET**
50 FORJ=1TO26:READSC$(J):NEXT
60 REM **READ IN NAMES**
70 PRINT"c";TAB(8);"SOUNDEX CODING THE DATA":PRINT
80 TN=130:FORJ=1TOTN:READN$:GOSUB110
90 N$(J,1)=N$:N$(J,2)=CD$:PRINTN$;" = ";N$(J,2):NEXT:GOTO180
100 REM **TRANSFORM TO SOUNDEX CODE**
110 CD$=LEFT$(N$,1):L=LEN(N$):LC$=SC$(ASC(CD$)-64):IFL=1GOTO160
120 FORK=2TOL:A=ASC(MID$(N$,K,1))-64:IFA<1ORA>26GOTO150
130 A$=SC$(A):IFA$="0"ORA$=LC$GOTO150
140 CD$=CD$+A$:IFLEN(CD$)=4THENK=L
150 LC$=A$:NEXTK:IFLEN(CD$)=4THENRETURN
160 FORK=1TO(4-LEN(CD$)):CD$=CD$+"0":NEXTK:RETURN
170 REM **SHELL-METZNER SORT**
180 PRINT"cSORTING INTO":PRINT"NAME WITHIN SOUNDEX CODE ORDER":N=116:M=116
190 M=INT(M/2):IFM=0GOTO290
200 J=1:K=N-M
210 I=J
220 L=I+M:IFN$(I,2)<N$(L,2)GOTO260
230 IFN$(I,2)=N$(L,2)ANDN$(I,1)<N$(L,1)GOTO260
240 F$=N$(I,2):N$(I,2)=N$(L,2):N$(L,2)=F$
250 F$=N$(I,1):N$(I,1)=N$(L,1):N$(L,1)=F$:I=I-M:IFI>0GOTO220
260 J=J+1:IFJ>KGOTO190
270 GOTO210
280 REM **OBTAIN INPUT FROM USER**
290 PRINT"c"
300 PRINT:PRINT"DO YOU WISH TO ENTER A NAME (N)":PRINT
310 INPUT"OR A CODE (C)";A$:PRINT
320 IFA$="N"GOTO440
330 IFA$<>"C"THENPRINT"INVALID ENTRY.":GOTO300
340 PRINT"CODE MAY BE A LETTER FOLLOWED BY A      MAXIMUM OF THREE NUMBERS.
350 PRINT:INPUT"PLEASE ENTER THE CODE";CD$:PRINT
360 A=ASC(LEFT$(CD$,1))-64
370 IFA<1ORA>26THENPRINT"FIRST CHARACTER MUST BE A LETTER.":GOTO350
380 L=LEN(CD$):IFL>4THENPRINT"CODE IS TOO LONG.":GOTO350
390 J=2:IFL=1GOTO430
400 K=ASC(MID$(CD$,J,1))-48
410 IFK<0ORK>9THENPRINT"LETTER MUST BE FOLLOWED BY NUMBER(S).":GOTO350
420 J=J+1:IFJ<=LGOTO400
430 A=L:GOTO510
440 PRINT"c":INPUT"PLEASE ENTER THE NAME";N$
450 GOSUB110:PRINT:PRINT"THE SOUNDEX CODE IS ";CD$:L=4
460 PRINT:PRINT"YOU MAY SEARCH FOR SOUNDEX CODES:-"
470 FORJ=1TOL:PRINT:PRINTTAB(10);J;MID$(CD$,1,J):NEXT
480 PRINT:PRINT"WHICH NUMBER ( 1 -";L;")";:INPUTY$
490 A=VAL(Y$):IFA<1ORA>LTHENPRINT:PRINT"INVALID NUMBER.":GOTO480
500 CD$=MID$(CD$,1,A)
510 PRINT"cMATCHING AGAINST ";CD$
520 PRINT"===================="
530 TT=0:FORJ=1TOTN:N$=MID$(N$(J,2),1,A)
540 IFCD$>N$GOTO570
550 IFCD$<N$THENJ=TN:GOTO570
560 PRINTN$(J,1):TT=1
570 NEXTJ:PRINT:IFTT=0THENPRINT"NO MATCHES FOUND."
580 PRINT:PRINT"PRESS SPACE TO CONTINUE"
590 GETA$:IFA$<>" "GOTO590
600 GOTO290
610 REM**SOUNDEX CODES FOR ALPHABET
620 DATA0,1,2,3,0,1,2,0,0,2,2,4,5,5,0,1,0,6,2,3,0,1,0,2,0,2
630 REM**NAMES**
640 DATAABEL,ABLE,ADAMS,ADAMSON,ALDISS,ALDOUS,ALLAN,ALLEN,ALLENBURY,ALLENBY
650 DATAANDERSEN,ANDERSON
660 DATABAILEY,BAILY,BAILLIE,BROWN,BROWNE,BROWNING,BROWNLEE
670 DATACLARK,CLARKE,CLARKSON,COLLINGS,COLLINS,COOK,COOKE,COOKSON
680 DATAD'EATH,DE'ATH,DE ATH,DEATH,DAVIES,DAVIESON,DAVIS,DAVISON,DAVY,DAVYS
690 DATAEDMONDS,EDMONDSON,EDMUNDS,EDMUNDSON,FORSTER,FOSTER
700 DATAFEATHERSTONEHAUGH,FEDROSS,FITHERSTON
710 DATAGARDENER,GARDNER,HAIG,HAIGH,HAIN,HAINES,HAYNES
720 DATAHEWES,HEWETT,HEWITT,HEWISON,HEWSON,HUGHES,HUGHS,HUGHSON
730 DATAIRVINE,IRVING,JOHNSON,JOHNSTON,JOHNSTONE
740 DATAKNIGHT,KNIGHTLEY,KNIGHTON,KNIGHTS,LEA,LEE
750 DATALLOYD,LOYD,MACINTOSH,MACKINTOSH,MCINTOSH,MATHEWS,MATTHEWS
760 DATAMARQUAYS,MARS,MARWAYS,MARRYS,MCINTYRE,MACKINDER,MCANTRY
770 DATAMOORE,MORE,NICHOLAS,NICHOLLS,NICHOLS,NICHOLSON
780 DATAOSBORN,OSBORNE,OSBOURNE,PHILIPS,PHILIPSON,PHILLIPS,PHILLIPSON
790 DATAQUIN,QUINN,READ,REED,REID,ROBERTS,ROBERTSON,ROBBINS,ROBINSON
800 DATATHOMAS,THOMPSON,THOMSON,UNDERHILL,UNDERWOOD,SMITH,SMYTH,SMYTHE
810 DATAVINE,VYNE,WALLACE,WALLIS,WALLS,WILLIAMS,WILLIAMSON
820 DATAXERXES,XERKSES,YATES,YEATS,ZACKS,ZAKS,ZAX
        c=CLEAR SCREEN
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INSIDE TRADER

I hope that no one will be mischievous enough to direct financial modelling expert Graham Summers to the July issue of *Micro Decision*. A photograph of him appears in the supplement over the caption "Be careful of salesmen whose contracts don't offer adequate back up." The same edition already contains a grovelling apology for libelling him in the *June* issue!

Acorn are confident that deliveries of their BBC micro will improve now that they have installed a computer. It is an Alpha micro.

North Star are seeking to interview Caxton Software's Desperate Dave Tebbutt following strange goings on at the National Computer Convention. Instead of demonstrating the wonders of North Star software, the fifty Horizon machines provided for the press mysteriously auto loaded Caxton's *Cardbox* program. "Five minutes friendly chat will do nicely," say North Star 'public relations' operatives. DDT is described as "having a full diary just at the moment".

With the Atari division now contributing the lions share of Warner Communications profits, the aged movie moguls are finding the suggestions of Ray Kasser and his micro men hard to resist. Warner Bros. film scrips currently under consideration include 'I was a teenage Pacman', and 'Godfather IV meets the Space Invaders'.

Perhaps readers can assist all-purpose micro person Robin Bradbeer with a plausible alibi. Having entrusted the precious prototype Spectrum to Bradbeer for the sole purpose of documentation, Uncle Clive is seeking an explanation of how it comes to be where it is. On the desk of Commodore functionary, Kit Spencer. In California.

Pity the underpaid micro hack. A visit to the theatre discloses *Datalink* reporter Ben Woolley reduced to playing the piano at a third rate production of *Toad of Toad Hall*. A glance at the programme reveals a bizarre cast of scribes: Dennis Jarrett as Toad, Boris Sedacca as Badger, Guy Kewney as The Rat, with guest appearance by Anthony Blunt as the mole. Being a cheap production the stoats, weasels and ferrets are played – with difficulty – by Martin 'Legless' Banks.

Three Apple employees languish in San Quentin after the disappearance of a thousand Apple IIIs was finally noticed. A Sherriff's Department spokesman described the criminals as 'dumb' – and the market for hot Apple IIIs as 'not exactly jumping'.

Minneapolis programmer David Walonick it was who first uncovered the now celebrated .1÷10=.001 bug in the IBM Personal Computer. IBM pooh-poohed his discovery. "They told me that inexperienced programmers often have such problems." Unconvinced, Walonick wrote a letter to the New York Times. Suddenly it was playtime, as the IBM P.R. machine was hurriedly switched on. Walonick received a personal phone call from John Opel, President of IBM ("I didn't know who he was; I said 'Hi, John'"). He was invited for an all-expenses-paid trip to the IBM facility at Boca Raton, was treated like a VIP and put up in a hotel suite "bigger than my home". ... I can now proudly announce the Inside Trader Bug: try and print .99 on an IBM P.C. and the result is .9899999. Are you listening, IBM?

Q What is Mickey Mouse wearing these days?
A A Tandy watch.