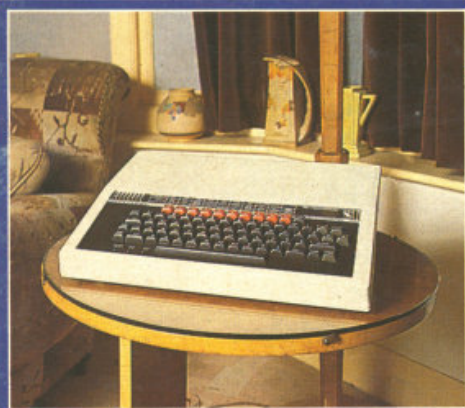


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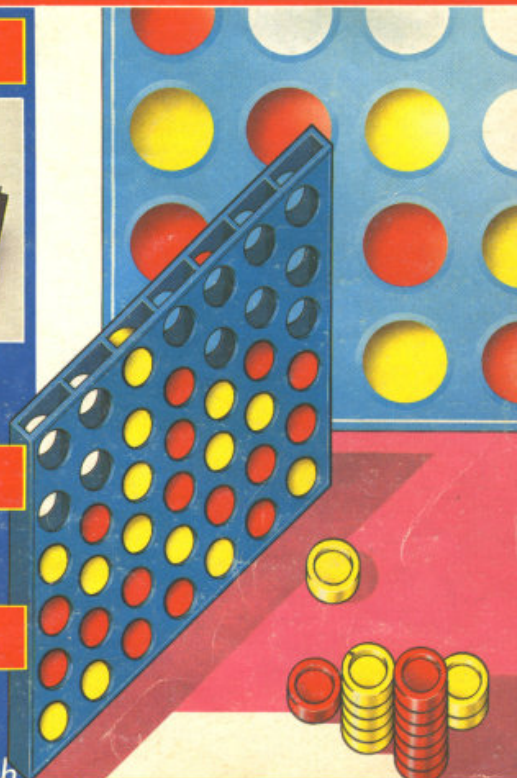
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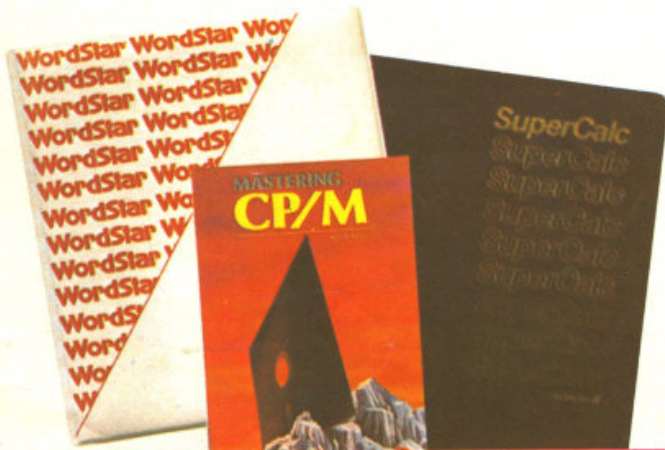
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62 Oxford Street,
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Issue number 15. April 1984.

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9: The software must support the baud rates used by your modem (check against step 6). If you are simply wanting to chat with the board, find out what mail you've got and place orders then goto step 11, else if you want to download files (including program listings), then goto 10.
10: Your software must sup-

APRIL, 1984

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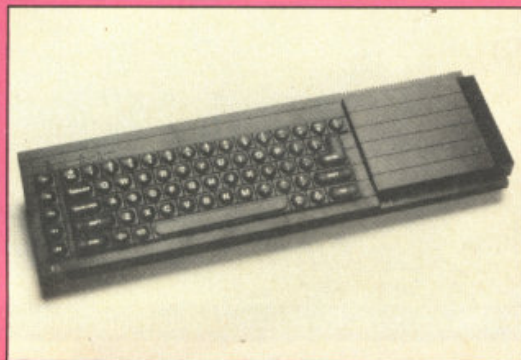
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ZX 81	Universal modem adaptor	£29.95	Microcomputer Resources, 1 Branch Road, Park Street Village, St Albans, Herts. Tel: (0727) 72917.
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Single Side, Double Density, Soft Sector *	15	256	77	IBM Formatted 2736700**	9865
Dual Side, Double Density, Soft Sector	User determined	User determined	77	Unformatted	9886
Single Side, Double Density, Soft Sector	26	128	77	IBM Formatted 1766872**	9865
Dual Side, Double Density, Soft Sector	8	1024	77	IBM Formatted 1669045**	9865
Dual Side, Double Density, Soft Sector	User determined	User determined	77	Unformatted	9865
Single Side, Double Density, Hard Sector	32	256	77	Unformatted	9887
Single Side, Double Density, Hard Sector *	26	128	77	Formatted for CPT	9200
Single Side, Single Density, Hard Sector *	32	128	77	Formatted for Philips	9201
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Single Side, Single Density, Soft Sector *	32	256	77	Unformatted	9887

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Single Side, Double Density, 10 Sector *	10	256	40	Unformatted	9896
Single Side, Double Density, Soft Sector *	User determined	User determined	40	Unformatted	9898
Dual Side, Double Density, 16 Sector *	16	256	40	Unformatted	9891
Dual Side, Double Density, Soft Sector *	User determined	User determined	40	Unformatted	9890
Single Side, Quad Density, 96 TPI Soft Sector	User determined	User determined	77	Unformatted	9900
Dual Side, Quad Density, 96 TPI Soft Sector	User determined	User determined	77	Unformatted	9904
Single Side, Single Density, Hard Sector	16	153	40	Formatted for AES Plus Lanier	9250
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Dual Side, Double Density, Soft Sector	User determined	256	40	Formatted for Wordplex 2	9252
Dual Side, Double Density, Soft Sector	User determined	256	77	Formatted for Wordplex 80.3.83	9253

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CABB: UP AND BUZZING!

Get onto *Computer Answers'* bulletin board with this simple step-by-step guide:

1: Check the interfaces on your micro. It must have an RS232 (or, in the case of the Beeb, RS423) serial port. If it hasn't then goto step 2, else step 3.
2: If you haven't got an RS232 port you will have to buy one to plug in. *Fig. 1* gives sources of these.
3: Get a suitable modem. If your 'phone connects to the wall via a standard British Telecom jack-plug, goto step 5, else step 4.
4: Get a BT jack-plug socket installed (normally well worth the £25 expense) and goto step 5; or, if you can't afford it, buy an acoustic coupler (*unless* you have a Trimphone, in which case you will have to get the plug). Goto step 6.
5: As they're cheap these days (£86 instead of £150 +), your best bet is to buy a direct coupled (or 'hard wired') modem, like the Buzzbox.
6: Get the correct type of modem. It must be either: 300/300 baud, CCITT (V21), asynchronous, full duplex, originate—used to communicate with bulletin boards and on-line databases; or 1200/75 baud (viewdata), CCITT (V22) asynchronous, full duplex, originate—used to communicate with Prestel and Micronet and a few on-line databases.

It is useful but not necessary to have options for answer/originate and half/full duplex.
7: Check you have communications software. If not, see *March issue* (page 146) for examples that will run on popular micros. If you have a problem finding the right program go to step 8. Else step 9.
8: Contact the supplier of the micro to find out what software's available, armed with the specifications given below, if no luck contact your user group, if no luck contact us.
9: The software must support the baud rates used by your modem (check against step 6). If you are simply wanting to chat with the board, find out what mail you've got and place orders then goto step 11, else if you want to download files (including program listings), then goto 10.
10: Your software must sup-

port the following protocol setting: 1 start bit, 8 data bits, 1 stop bit, no parity. You will need an error checking protocol to ensure clean transmission.

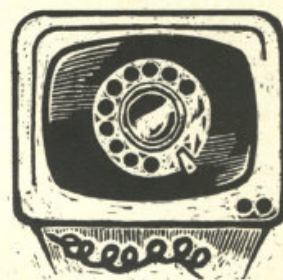
We recommend that you get software that supports the Christensen (also known as 'Xmodem') protocols, which is supported by CABB. These aren't necessary if you only intend to download straight text (ASCII) files, in which case goto 12.

11: Your software must support the following settings: 1 start bit, 7 data bits, 1 stop bit, even parity.

12: If you want to download text files, check that your software supports the X-ON/X-OFF software handshaking protocol and that it has facilities for down/uploading files.

13: 'Phone *Computer Answers* Bulletin Board (CABB) on (01) 631 3076 (24 hour service).

By Tony Dennis, deputy editor.



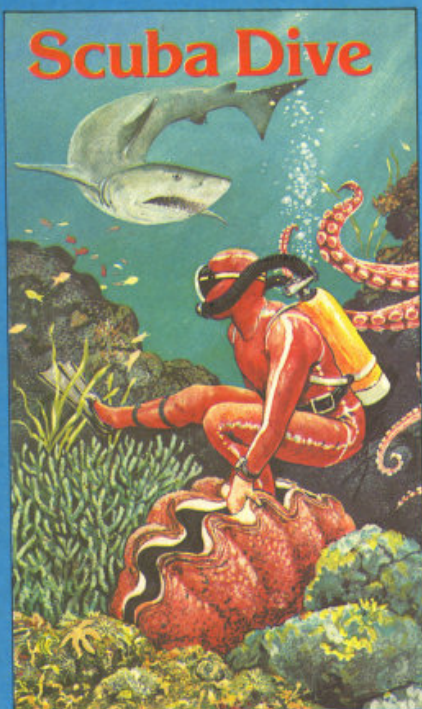
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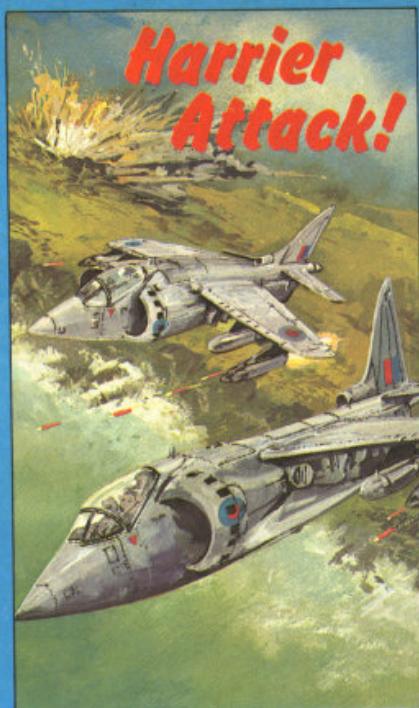
'Bulletin' information continues on page 144.

FIG. 1
RS232 add-ons

Micro:	Interface name:	Price:	Supplier:
Apple 11e, 11	RS232 interface card	£108	Apple dealers.
Atari 400/800 600/800 XL	850 interface	£135	Atari dealers.
Commodore Vic, 64	RS232 interface	£23	Minor Miracles, PO Box 48, Ipswich IP4 2AB. Tel: (0473) 50304.
64 only	Modem/RS232	£95	Commodore dealers
Dragon 32, 64	RS232 interface	£49.50	Cotswold Computers, 6 Middle Row, Chipping Norton, Oxfordshire.
Lynx	Hardware modification		(See next issue.)
Oric/Atmos		£31.50	Modular Concept Peripherals, 13 High Street, Clydach, Swansea SA6 5IF. Tel: (0792) 844465.
Tandy TRS-80 (IV)	RS232 board	£79.95	Tandy dealers.
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ZX 81	Universal modem adaptor	£29.95	Microcomputer Resources, 1 Branch Road, Park Street Village, St Albans, Herts. Tel: (0727) 72917.
ZX Spectrum	Micro Mania interface (+ software)	£33.50	J W V Software, 139 Allington Drive, Stroud, Kent.



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 Oric 16-48k
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Spectrum 16-48k



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PREVIEW

SPECTRAVIDEO CAUSES PROBLEMS FOR MSX

MSX, the standard for home micro-computing that should mean users being able to swap programs and ROM cartridges, is under threat of becoming corrupted. As revealed in the January issue of Computer Answers, Spectravideo's so-called MSX 318 and 328 machines aren't MSX. They differ in a number of important respects, not least of which is the Spectravideo ROM cartridge slot, which won't accommodate MSX cartridges.

Some differences in the Basic are also emerging. Only three of the four MSX graphics modes are available on the 318, and there are fewer file options (for example, on the 318 you can't treat the screen contents as a file, which you can under MSX Basic).

The original claim that the Spectravideo range is MSX compatible came from Spectravideo Hong Kong, and is believed to have annoyed Microsoft, which developed the standard for Japanese micro makers. However, to be fair on Spectravideo, 318 was a prototype hardware implementation of MSX whilst the standard was still being fixed, and a few last-minute adjustments are likely to account for the incompatibility.

In a letter to dealers, Spectravideo distributor CKSupplies claims that the 318 and 328 are '95 per cent' MSX compatible, a strange claim given that compatibility doesn't admit to degrees; something either is or isn't compatible. An adaptor, bringing the 318 and 328 up to full MSX spec, is due for launch imminently, at an expected price of over £40, and we now hear that a Mark II version of the 328 is due for launch within the next three months, which will be a proper MSX machine. The company is also planning two expander units, designated 605 and 605A, complete with disk drives.

Though Spectravideo users seem happy with their machines (we gave the 318 the thumbs up in our review published in the January issue), they will no doubt be annoyed when the Jap MSX micros finally arrive and they find that all the accompanying cartridge software refuses to fit in the Spectravideo cartridge slot.

NEW VIEW FOR THE BEEB, AND PASCAL FOR THE COMMODORE

A couple of new releases expected in a month or so are an updated View ROM wordprocessor chip for the BBC, presumably fixing some of the bugs and restrictions of the

current version, and a Pascal compiler for the Commodore 64. Both valuable new packages, particularly the Pascal, which will make fast programs much easier to develop on the Commodore, a much needed benefit, given that the 64 has one of the most primitive Basics around (it's Pet Basic, which makes it one of the oldest micro Basics around).

XEROX'S NEW STAR TO ECLIPSE LISA

One of the least known computers, despite very impressive specifications, is the Xerox Star, a forerunner of the Apple Lisa. Unfortunately for Xerox, the computer is over-capable for most of the market; over-capable going hand in hand with 'too expensive' in this case. Xerox has obviously twigged that cheapness is in most cases more important than computing power, and will be releasing a cut down version of Star as a competitor for Lisa. What would be more impressive, though, would be a mouse-driven, high-resolution competitor for the Apple Macintosh. It's about time Xerox became better known, and benefited more from the bottom end of the micro market.

MOTOROLA'S GRAPHIC CHIP: MADE FOR THE QL?

Deep in the Scottish countryside, the chip maker Motorola is working on a range of powerful new semiconductor products, probably including a 256K dynamic RAM chip, the 68000 series of processors, and a new graphics processor. The graphics processor is only compatible with a few central processors, in particular the 6809 (Motorola's 8-bit processor, as used in the Dragon) and 68008 (currently only found inside the QL, if you can find a QL). However, few new machines, if any, are being launched with the 6809 (which has really been superseded by the 68000 series), which leaves the 68008 as the graphics processors most likely mate. Interesting, because Sinclair has probably booked up the supply of 68008's for a long time to come. So will Motorola wait till there is a plentiful supply of them, or will it appear in a Mark II QL? Whenever it does eventually appear, we can look forward to high resolution screens of about 600 by 500 pixels, with 4 colours, or less resolution with more colours. The chip also supports multiple screens for full animation, so there will be plenty of fun to be had when it appears (which will probably be sometime in 1985).

Sir Clive has done it again – at least, it looks as if he has. But quantum leap or not, the Sinclair QL is likely to prove to be another best seller.

With the machine's technical specification it should be very capable – with perhaps the Microdrives being the weak link. Even without a review machine, we found we could sniff out a few other details about what it might be like to use it.

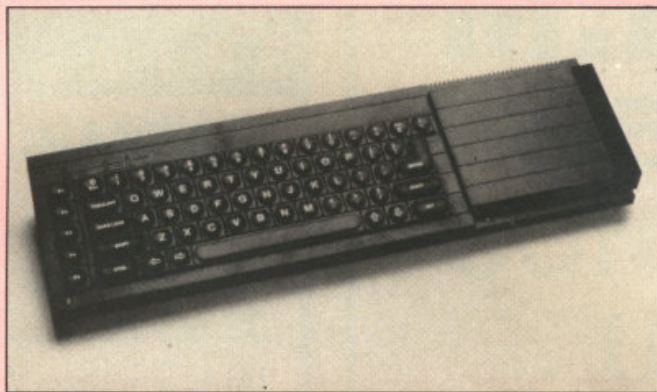
The main processor is a Motorola 68008 running at 7.5MHz. The 68008 has a number of 32-bit registers, and is capable of 32-bit arithmetic, but the data bus is only 8-bits wide, which will slow things down a bit. The 68000 series of chips has proved to be very popular with programmers, largely because 32-bit registers take away a lot of the hassle associated with smaller ones, and it has a comprehensive instruction set.

The main memory of the QL is organised into four 256K-byte chunks. Only the first 256K comes with the machine as standard, but half of this is dedicated to machine functions. Fig. 1 shows the basic memory map of a fully expanded QL. The first 32K ROM contains a new operating system, called QDOS, and a Basic Interpreter for what Sinclair call 'a radical enhancement of Spectrum Basic', called SuperBasic.

QDOS is capable of multi-tasking (not to be confused with multi-user), so it can run a large number of programs apparently simultaneously. The screen can be divided into windows of various sizes, each window independent of any other, which can display the input and output of the programs as they are running. It is important to note that only programs written under QDOS can be multi-tasked.

We say that the programs 'apparently' run simultaneously, because of course the processor is only capable of working on one at a time. What happens is it works on one for a certain length of time (called a time slice) then quickly switches to another for a second time slice, then to a third and so on, back round to work on the first again. The decision as to which program is worked on is done by a 'priority job scheduler'. A scheduler will normally select a program depending on a

SINCLAIR QL



JUST HOW MUCH OF A QUANTUM LEAP IS THE QL? WE SCRUTINIZE SINCLAIR'S LATEST RELEASE.

general strategy, such as 'shortest programs first' or even 'longest programs first'.

Whatever the strategy Sinclair uses, a number of important questions are raised. Multi-tasking is often used on mainframes, but when a program is not being worked on it is written out (with the current state of its data) to (typically) very fast drum store. This allows many more programs to be worked on than the size of the computers memory. Sinclair's Microdrives (two are built into the QL) have been 'enhanced', so that their average access time is around 3½ seconds, but this is obviously too slow to swap programs in and out. So all programs are held constantly in RAM.

SuperBasic is similar in a number of ways to the Basic on

the BBC. It has such features as procedures with local variables, structured statements and so on. It is also claimed that there is a 'clean' machine code interface and that the operating systems facilities are accessible from it. Fig. 2 shows some examples of some of the constructs available in SuperBasic. SuperBasic also acts as the front end of the operating system: the user accesses the facilities of the operating system using Basic commands. So, like many other micros, when the machine is turned on you talk to the Basic Interpreter.

The video screen is capable of a maximum resolution of 512 by 256 pixels in four colours, or 256 by 256 in eight colours. The text display on a monitor can be up to 25 rows of

UPGRADE

80 columns, but for TV's this can be dropped to either 60 or 40 columns. The bit-mapped screen area will take up 32K of the 128K user RAM.

The sound capability is little more advanced than the Spectrum – *beep-beep-beep*, as opposed to *beep-beep*. Nuff said.

The keyboard is (a first for Sinclair!) a proper 65-key QWERTY job, complete with a full space bar and five function keys. Its quality is nothing to get too excited about, but at least typists should not have to re-learn their trade. The single keyword entry system of the Spectrum has also been dropped – something which we welcome (though we have heard a few slight grumbles from some avid Spectrum users).

Prospective users may be confused into thinking that because the ROM cartridges and Microdrives are the same size as those used on the Spectrum, that they are somehow compatible. They are not. The construction of the ROM cartridges for the QL is the same physical process as for the Spectrum, but that is where the similarity ends. As the two cartridges will contain ROM programs for different processors, they will be totally incompatible. Second, the QL cannot read Spectrum Microtapes, and *vice versa*. It would be possible to reformat (and hence scrub) a Spectrum tape and get the QL to use it, but again there is no software compatibility.

The only way, it appears, that anything can be transferred from a Spectrum to a QL is via Sinclair's local area network, called LAN. This will transmit data (there will be no point transmitting Spectrum programs, they won't work) at a claimed 100K baud.

An interesting peculiarity centres round the use of a second processor, an Intel 8049, to control (among other things) the receiving of data via the RS232C ports. The transmitting of data is presumably done in software, but it would appear to be difficult to control data received. If data comes you've just got to take it. So in general, compatibility with the Spectrum has not been a major design consideration.

A few other interesting features (and non-features) of the QL is that it has two ▶

IF RELIABILITY HOLDS OUT, THE QL IS A WINNER. IT IS WELL LIKELY TO SPAWN AN INDUSTRY SIMILAR TO THE SPECTRUM'S.

QL SPECIFICATIONS

Price: £399 (inc. VAT).

Processor: Motorola 68008.

Memory: 32K ROM (QDOS and SuperBasic), 64K I/O, 128K user RAM, upgradeable to 640K user RAM.

Keyboard: 65 full keys, including five function keys, no single keyword entry.

Interfaces: two RS232C serial, two joysticks, TV and RGB, parallel (optional), hard disk I/F (optional), LAN (local area network).

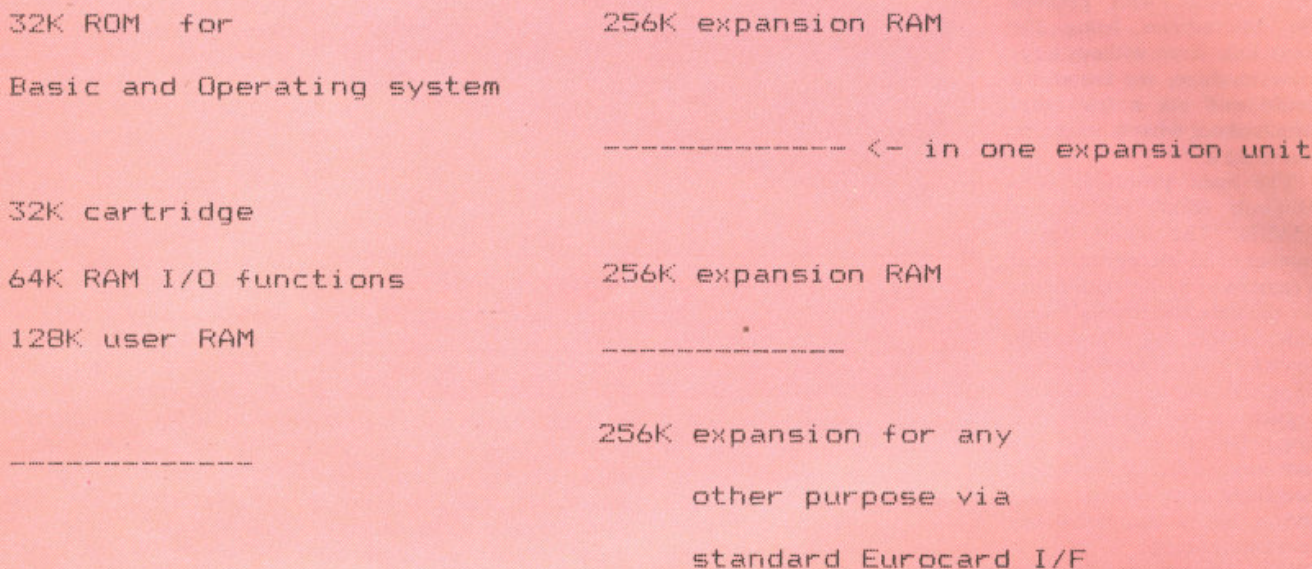
Disks: two inbuilt microdrives (100K each), access time 3½ sec average.

Display: 40, 60 or 80 by 25 lines of text – 512 × 256 pixels, 4 colours; 256 × 256 pixels, 8 colours.

Languages: SuperBasic (ROM), Pascal (optional, Microdisk).

(Note that the 'optional' items will not be ready for some time after the QL is available.)

FIG. 1
QL
MEMORY MAP



RS232C ports, no cassette interface, can take six external Microdrives, one or two joysticks, and a parallel port is planned as an optional extra. Four software packages (on microtape), written by Psion, come with the machine: these are a word-processor (called QL-Quill), a database (Archive), a graphics package (Easel), and a spreadsheet (Abacus).

The word-processor does much what you would expect it to (justification, indentation, global find and replace, and the rest of it). A general principle that Psion tells us has been applied to all the packages is 'do and see'; that is, press a key and something happens. Another principle, called 'pyramidal' design, is more easily described in reference to the graphics package (this is a business graphics package for drawing pie charts and so on — not a drawing package).

The idea is that the user can enter the package at whatever level they wish; for example, they can simply use the pre-defined charts and colours available, or they can delve a bit deeper and change the colours, or deeper still and change the

colours and shadings of the charts, and so on. This program also allows text to be overlaid and moved around on the screen, graphs to be shown combined, and other interesting features.

At the demonstration of this software we should point out that we didn't see anything that you couldn't get elsewhere on other micros; but then again Psion has a good reputation for quality and as this software is included in the initial price, all things considered you get a lot for your cash.

Other software companies have, as you would expect, shown great interest in supplying programs for the QL; but there seems to be one fairly common grumble, the Microdrives. Floppy disks are, in most cases, sufficiently fast to be able to cope without infuriating the user.

However, the Microdrives cannot match up to the speed of floppies. One possible solution would be to get hold of one of Sinclair's hard disks (when they appear), but as the price of this has been set around £1,600 this may not excite too many people.

Another possible, and more

likely, solution would be to use some of the QL's large memory as a kind of RAM disk. This could provide between about 50K on the unexpanded machine to upwards of 256K on the fully expanded system, as temporary store while the package was in use. Then only at the end of a session need the data be written back out to the Microdrives.

Another grumble of the software houses is that Microdrive cartridges can only be bought from Sinclair, so it can monopolise the price and supply of these.

A further interesting, but less important point, concerns the ROM cartridges. These are not made like most other cartridges (that is, from black silicon chips stuck into a circuit board), but are made simply by sticking the chips directly onto the PCB (that is, no little black boxes!). This makes them much cheaper to produce, except, apparently, in Britain! Most independent companies will find it very difficult to produce ROM cartridges that can compete on price with Sinclair's ones. This is also true for the Spectrum.

As with the Spectrum, it

FIG. 2
SUPERBASIC
COMMANDS

1. CURSOR x, y
2. DEF PROCEDURE
END DEF
3. IF..... THEN..... ENDIF
4. REPEAT
END REPEAT
5. LOCAL <name>
6. SELECT ON x
x=1:
x=2:
END SELECT
7. WINDOW x origin, y origin,
x size, y size

seems a little more ingenuity will be required from software and hardware companies, than is perhaps necessary for most other micros.

At the press launch of this machine, Sinclair was cagey about entering into any discussion as to the QL's suitability for games. This is presumably because they hope that the machine will appeal to business, universities, schools and scientists (an IEEE interface is planned), as well as the hobbyist/schoolkid/games player. They may well hope it will be all things to all men.

Whatever drawbacks the QL has in its construction (Microdrives or whatever), they are very unlikely to prevent the QL becoming another big winner. It simply has, as all Sinclair computers have had in the past, a lot for the money.

By Dr Peter Turcan, technical editor of *Computer Answers*.



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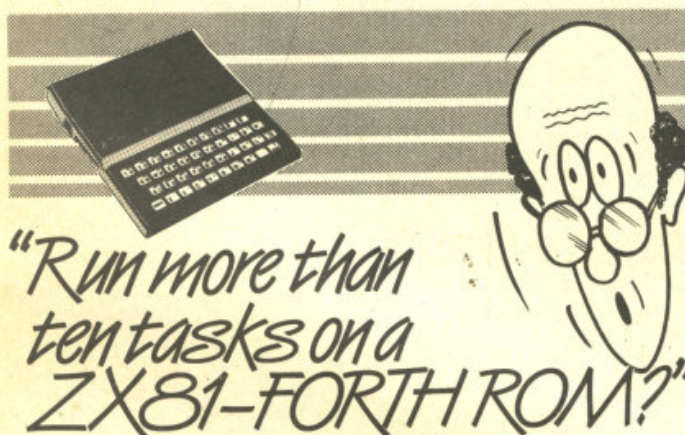
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COMPUTER ANSWERS

UPGRADE

With 1.5 million Apple computers in everyday use throughout the world, their success cannot be denied—so when a company of this pedigree claims to have a product which will exceed anything it has produced in the past, it would be foolish not to take notice.

The new computer described in such glowing terms is called Macintosh. It is a remarkable cut-down version of the revolutionary Lisa micro (it uses the same 68000 processor), and takes up as much desk top space (detachable keyboard excepted) as a piece of A4 paper.

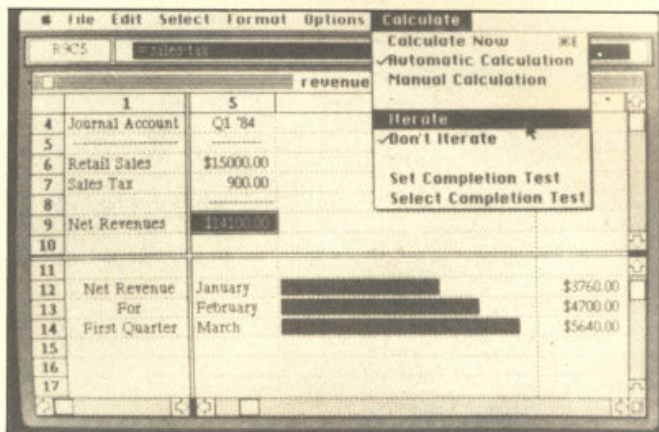
Macintosh fully exploits the advantages of mouse technology, featuring pull-down menus, icons, total integration of software commands and program data, and a superb bit-mapped display. What makes it particularly impressive is its price: Macintosh plus printer and basic software is currently selling in the US for around \$3,000. On its release in the UK in April, it is expected to cost only £1,700.

It weighs 22lbs, can be easily carried around in a canvas hold-all, and features a built-in 9 inch square, black-and-white monitor, an integral 3½ inch floppy disk drive (with a 400K capacity), and a detachable keyboard and mouse. Apple's adoption of the Sony drives should go a long way towards having them confirmed as an industry standard.

The machine boasts 192K memory made up of 128K RAM and 64K ROM. The ROM, which contains the user interface, toolbox, operating system and handles all input/output, is the most important single component of Macintosh after the processor. It is the ROM that allows third party software developers to write packages that 'look' the same, with similar commands to those used in Macintosh's own software. This is a major feature of the Mac: developers are able to use the ROM's software interface to integrate their programs into the machine's mouse, menu and icon driven environment.

As with the Lisa, the Macintosh operates on completely different principles to normal micros. Rather than playing around with technicalities like file names and drive identifiers,

MACINTOSH



**IS THE LATEST FROM THE APPLE BARREL A
WORTHY CONTENDER FOR THE BUSINESS
MICRO MARKET—OR A WINDFALL?**

all the machine's functions are represented by symbols, or 'icons' in Applese, on the screen. By pointing at these, using a cursor manipulated by the mouse, you select the function you want. An example screen is shown above.

On booting up you get a graphical representation of a floppy disk, and the icon representing the Macintosh itself: you are told to hold on with a picture of a wristwatch face.

Using the mouse, you can drag items around, move them, organise your screen-based 'desk top' and pull down menus. There's virtually no typing involved until you get down to the nitty gritty of word-processing and the like.

One feature that users may like or loathe is a disk drive that's under total software control (inherited straight from

Lisa). This means you can only remove the disk when Mac's good and ready to give it to you. This is all very well (it eases tiresome disk swapping activities, like backing up), but the user is gradually losing control of the hardware—a faintly sinister development.

However, even as the machine is launched users have access to an impressive range of software, all of which operates under the benign glow of Mac's smiling face.

Basic software packages from Apple will retail at less than £100 each. Other major third party companies are also developing Macintosh software. Already Lotus has announced a Macintosh version of its 1-2-3 program, and Microsoft has announced five packages for Macintosh, including the *Word* word-pro-

**THE MACINTOSH OFFERS LISA'S
REVOLUTIONARY MOUSE-DRIVEN
SOFTWARE AT A
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MACINTOSH SPECIFICATIONS:

Price: £1,700 (approx).

Processor: 32-bit MC68000 processor running at 8Mhz.

Disks: Built-in 3½ inch Sony disk drive (400 kilobyte capacity).

Screen: Built-in 9 inch high screen with 512 x 342 bit-mapped display.
Features battery operated clock/calendar.

Memory: 128 kilobytes RAM 64 kilobytes ROM.

Keyboard: Detachable 128 character keyboard.

Interfaces: RS232 and RS422 Applebus/Serial communications ports,
polyphonic sound port, external disk drive connector, detachable
mouse control

cessing program for £149 and its spreadsheet package Multiplan—also costing £149. Other major names involved include the Software Publishing Corporation and Peachtree. Apple says that by the end of this year at least 12 word-processing programs will be available for the machine.

In an unusual departure, Apple's own software will not be copy-protected, although it is not known whether third party developers will also adopt this approach. Apple believes that what it calls the 'Apple 32-bit technology' embodied in both Macintosh and the year-old Lisa will become an industry standard; perhaps Sinclair has confirmed this with the launch of the 68000-based QL.

That Apple might have got its sums right is known to be troubling other manufacturers such as ACT, which has enjoyed a runaway success first with its 16-bit Sirius micro and, more recently, with the portable Apricot machine. The Apricot costs about the same as a Macintosh, and also uses two 3½ inch micro-floppy disk drives.

However, the Mac has only one drive as standard, and most users will want two.

Apple claims to have produced a machine that anyone can use. 'Many people don't give a damn about whether or not a computer has 128K RAM or whatever—provided that they can get it to do their graphic representations or whatever task,' said Nigel Hearne, one of Apple UK's Macintosh men.

Macintosh is supplied in one box—unlike its Apple predecessors which were and are supplied as several components. Available extras include ImageWriter, a 120 cps dot matrix printer which is currently the only printer that will work with Macintosh; a carrying case; security kit—for fastening Macintosh and keyboard to a desk or table; a numeric keypad; a modem; and an external disk drive.

Also due for release later this year is Applebus, which will link hard disks and other parallel peripherals to both Macintosh and Lisa.

Apple software available at launch includes MacPaint, MacWrite, MacAssembler/debugger, MacPascal, MacBasic, MacTerminal (VT52/VT100/teletype emulation, MacProject, MacLogo and MacPlan, a financial modelling package).

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CA 4/84

DECIDING DISK DRIVES

THE ADVANTAGES OF A DISK SYSTEM ARE WELL-KNOWN – WE FIND
OUT WHAT'S NEEDED AND WHAT'S AVAILABLE.



ITL Kathmill's Byte Drive 500 (above) offers BBC and Oric users a 3 inch disk drive, power supply for two drives, and a large 419K capacity on the 40 track version (see page 13).

Anyone who has used a disk drive will know just how superior they are to cassettes. In business they are invaluable, because of the large amounts of data they can store and the high speeds at which it can be accessed; but they can be an equal benefit for home users, especially those who regularly indulge in programming.

There is also the added bonus of not having masses of leads lying around to trip over causing hours of work to be lost – the bane of many computer users. But if you want to run disks with your machine, how do you go about it, and what hardware, other than the disks and drive, do you need?

A complete disk system can, in general, be split into four separate parts: an interface, a disk controller, a disk operating system (DOS) and disk drive. The interface is a separate 'unit' from the drive, but the dividing line between controller, DOS and interface is becoming thinner, even disappearing. Except for the BBC, most companies package the interface, controller and DOS into one box.

The interface can be all the chips that make the connection between micro and disk drive, or the actual physical connection joining computer and drive. There is an industry standard connection for 5.25 disks in the form of a 34 pin connector; the BBC has one on its underside.

Everything to do with the motor control of the drive is handled by a controller chip. This looks after such things as the movement of the drive head to the correct position on the disk and reading or writing data. There are various different controllers available on the market for different micros.

Finally the DOS: this is a single chip that contains a program allowing data to be stored on disk. Often it will also contain all the necessary utilities for formatting and verifying a disk, but sometimes these will be supplied on a separate floppy.

When looking for a disk drive for your micro, there are various snippets of jargon that have to be understood before you know what you are getting, and whether or not it will be compatible with your system. One distinction often made by the manufacturer is between single and double-density drives. All this refers to is how much data can be packed into each sector on the disk.

If a drive is single density, each sector usually contains 256 bytes, whereas double density is 512 bytes. Most drives today can handle double density, but unless the controller can move the drive head the correct distance, this facility cannot be used. The 8271 controller chip used in the BBC for instance, does not permit double-density operation. However, if double-density is a facility that you just can't do without, a company called Opus Supplies manufactures a double density DOS. One advantage that it has over single density is speed.

Many adverts will refer to tracks, which are the circular strips of magnetic material on which the data is laid out. Most drives will have 40 (48 tracks per inch) or 80 (96 tracks per inch), and some will allow both to be read. The disk controller used does not make any difference to the drive used in respect to the number of tracks, as the head movement is

entirely a function of the drive's hardware. Where a difference can be made is in the DOS. Some systems, such as those from Pace/Amcom and Watford Electronics, can read 40 track disks on an 80 track drive.

Other drives are often termed double sided, which means that a disk can be read on both sides without being taken out and turned over. Obviously for this to be possible the drive should be equipped with two heads – one to read the top and the other the bottom of the disk. In general, any DOS will be able to read a double sided disk as either side is merely referred to as another drive.

Finally the interface: most machines today use what is termed the Shugart standard, the SA400 in particular – this is one of the most widely used interfaces, and comes in the form of a 34 way pin connector. The BBC uses one and so too do most of the disk interfaces that we looked at (see Fig. 2). Two machines that do not use it, however, are the Commodores (which use IEEE) and the Atari (interfacing through an RS232). There are far less drives available for these two machines.

BBC

The BBC, even at its high price, does not contain the chips necessary to control a disk drive, though all the control circuitry is present on the micro's PCB. The chips can be bought and put into the board of a BBC very easily, if it is issue four or later. With earlier than four, tracks on the board have to be cut. This is a job best left to an experienced Acorn dealer. (The issue number of the board is printed on the middle left of the PCB).

In all, there are ten small logic chips to be fitted and a larger one labelled 8271, which is the disk controller. All the sockets for these are located on the left hand-side of the board. Over to the right of the board, in the same place as the Acorn Basic chip are several spare sockets for users to fit their own chips – the DFS slots into one of these. When fitting chips onto the BBC board remember that each one must be orientated the same way; that is with the small notch at one end of the chip towards the back (north) of the machine; this is most important, as incorrect fitting can cause problems with the chip and even damage it.

All the chips making up the interface can be obtained from most electronics shops and Acorn dealers. The disk interface will be exactly the same from Beeb to Beeb, but the same does not apply to the Beeb's DOS, called the Disk Filing System, or DFS.

Anyone with a BBC has the privilege of being able to choose from more than one DFS. Apart from the Acorn DFS, there is one from Watford Electronics (see *Computer Answers* Dec '83 issue) and Pace/Amcom. Both the alternative DFSs offer the same functions as the Acorn one, along with several functions that may be of use to the computer user. So what do they offer?

The Acorn DFS uses 2817 bytes of RAM and allows a maximum of 31 filenames in the catalogue.

Most modem machines use the 'Shugart' standard – one of the most widely-used interfaces.

Where the user might find a drawback is the hassle of having the utilities such as formatting on a separate disk.

Alternatively, the Watford Electronics DFS offers a maximum of 62 files, though if all are to be used, each can only be 3K. It also contains all the utilities in the DFS ROM and offers the option of transferring tape programs onto disk – a very useful facility that Acorn no doubt disapproves of.

The third DFS from Pace/Amcom is part of a complete system that can be bought as a single chip or part of an upgrade that includes a switch for the keyboard links. As with the Watford DFS, it is possible to have more files than the Acorn DFS with longer file names (7 characters plus). Only 1793 bytes of RAM is used, and it formats disks without a separate utilities disk.

As mentioned, there is a wide range of drives that can be used with the BBC. Of course there's one from Acorn, though that tends to sound like clockwork. Virtually any 5.25 drive (such as Cumana, TEAC, Hitachi – see Fig. 1) can be used with the BBC because of the standard 34 pin drive connector on its base. In most cases the drive will have a separate lead that, rather than going into a pin connector, goes directly to the Beeb's power supply, getting its power from the micro. Acorn has taken the time to manufacture a power supply on the later machines that provides extra current at low voltage for a disk drive. This means that if you have an earlier machine, and cannot exchange your power supply for a later version, the drive must have its own supply, so as not to put too many demands on the Beeb's.

There are so many drives on the market for the BBC that to mention them all would take up far too much space, so we will only look at some of the more unusual ones. One of the newest, and smallest, drives to hit the BBC is the Micro Disc Drive (MCD-1) £113 (exc. VAT). As a space saver the MCD-1 is a winner. The drive uses small 3 inch diskettes and the whole system can be sat on top of the Beeb without any fear of overheating the machine. Each disk has a capacity of 100K unformatted and can store up to 60 files. This means a new DFS is required which Electronequip, one of the first distributors of the drive, will exchange for the Acorn DFS at a cost of £12. This doesn't mean that Acorn disks can't be used, because the DFS

can read and write to them, and also format them, as the utilities are stored in ROM.

The compatibility with other types of drive is an important feature to look for when buying a drive. In general with the Beeb there shouldn't be any problem because the disk controller in the micro, the 8271, is a minifloppy controller and is compatible with both micro disks and 5.25 disks.

One of the most encouraging events for the BBC Micro user over the past few months was the introduction of the low cost Byte Drive 500 from ITL Kathmill. This system offers the user a complete system that includes a 3 inch disk drive, power supply for two drives, 34 way straight through cable, and a system called Zap. It also features a comparatively large capacity: 419K on the 40 track version, costing £256.40 (inc.VAT).

Zap is a utilities ROM that fits inside the BBC and gives the user such facilities as FORMAT and VERIFY. There is also talk of an Assembler and Monitor being given with the package but at the time of writing ITL Kathmill had not decided.

Finally, Northern Computers, a Cheshire based company has produced a 3 inch drive with the name Micro Pulse. The drive comes complete with a double sided 100K utility disk, cable and manual. As with the other drives mentioned, Micro Pulse is compatible with a 5.25 disk system and has a built in write protect function. With a utility that Northern Computers calls the Micro Pulse Mirror system, the user can transcribe software from cassette or 5.25 disk onto a 3 inch one. The total package retails at £169.90 (exc. VAT).

SPECTRUM

When we started looking for a disk interface for the Spectrum, the likelihood of finding one seemed about as hopeful as spotting Lord Lucan in Oxford Street, but after some searching we managed to track down several.

Most companies have given up the idea of designing a disk interface for the Spectrum because of the introduction of the Microdrive. After all, a Microdrive only costs £49.95 and an Interface 1 £29.95 (if purchased with the Microdrive). Extra cartridges then cost £4.95 a piece, each giving around 85K bytes of storage space. However, for all its low cost, the Microdrive cannot match the speed and reliability of the disk drive and certainly cannot

SOME DISK DRIVE SUPPLIERS:

Cambridge Microcomputer Centre,
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Tel: (0223) 355404.

Cumana,
Pines Trading Estate,
Broad Street,
Guildford,
Surrey GU3 3BH.
Tel: (0483) 503121.

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36-38 West Street,
Fareham,
Hampshire PO16 0JW.
Tel: (0329) 230670.

ITL Kathmill,
The Old Courthouse,
New Road, Chatham,
Kent ME4 4QJ.
Tel: (0634) 815464.

Microware (London),
637 Holloway Road,
London N19 5SS.
Tel: (01) 272 6237/
6398.

Opus Supplies,
158 Camberwell Road,
London SE5 0EE.
Tel: (01) 701 8668.

Premier Microsystems,
208 Croydon Road,
Anerley,
London SE20 7YX.
Tel: (01) 659 7131/778
1706.

(Continues on page 14.)

FIG. 1
DRIVE
COMPARISON

Drive	Size (ins)	Capacity	40 track	80 track	Sides/density	Price	Supplier
MCD-1	3	100			ss/sd	129.95	Electronequip
TEAC	5.25	100	yes	no	ss/sd	155.00	Cambridge Micro
Opus 5401	5.25	200	yes	no	ss/dd	179.95	Opus Supplies
TEAC	5.25	200	yes	yes	ss/sd	190.00	Cambridge Micro
Byte Drive 500	3	440	yes	yes	ds/dd	192.37	ITL Kathmill
Cumana CS100E	5.25	100	yes	no	ss/sd	196.65	Cumana
Premier	3.5	400	no	yes	sd/ss	213.00	Premier
Cumana CS100	5.25	100	yes	no	ss/sd	217.35	Cumana
Control Data ZL141	5.25	250	yes	no	ss/dd	225.00	Microware
Opus 3402	3	400	yes	no	ds/dd	229.95	Opus Supplies
Control Data ZL241B	5.25	500	yes	no	ds/dd	240.00	Microware
Cumana CS200E	5.25	200	no	yes	ss/sd	244.95	Cumana
Cumana CS200	5.25	200	yes	no	ss/sd	263.35	Cumana
Control Data ZL141B	5.25	250	yes	no	ss/dd	275.00	Microware
Cumana CS400E	5.25	400	no	yes	ds/sd	281.75	Cumana
Cumana CS400	5.25	400	no	yes	ds/sd	297.85	Cumana
Control Data ZL142	5.25	500	yes	no	ss/dd	360.00	Microware
Control Data ZL291	5.25	1000	no	yes	ds/dd	380.00	Microware

(Note: the Premier disks are due to be available in April)

Key to sides/density column: ss=single sided, ds=double sided, sd=single density, dd=double density.

All these disk drives use the standard 34 pin interface.

UPGRADE

INTERFACE AND DRIVE SUPPLIERS:

Acorn Computers,

Fulton Road,
Cambridge CB1 4JN.
Tel: (0223) 24500.

Advanced Memory Systems,

Green Lane,
Appleton,
Warrington WA4 5NG.
Tel: (0925) 62682/
62907.

Commodore Business Machines (UK),

675 Ajax Avenue,
Trading Estate,
Slough,
Berkshire SL1 4BG.
Tel: (0753) 79292.

Cumana,

Pines Trading Estate,
Broad Street,
Guildford,
Surrey GU3 3BH.
Tel: (0483) 503121.

Dragon Data,

Kenfig Industrial Estate,
Morgam, Port Talbot,
West Glamorgan,
Wales SA13 2PE.
Tel: (0656) 744700.

Haytech France,

68 Bd. de Port-Royal,
75005 Paris,
France.
Tel: (1) 354 86 66.

Interactive Instruments,

Unit 6, Pilot House,
King Street,
Leicester.
Tel: (0533) 551594.

ITL Kathmill,

The Old Courthouse,
New Road, Chatham,
Kent ME4 4QJ.
Tel: (0634) 815464.

Morex Peripherals,

Dept. MF,
172B King's Road,
Reading, Berks. RG1 4EJ.
Tel: (0734) 584238.

Oric International,

Cowarth Park,
London Road, Ascot,
Berks. SL5 7ES.
Tel: (0990) 27641.

Pace Disk System,

92 New Cross Street,
Bradford BD5 8BS.
Tel: (0274) 729306.

Peripheral Solutions,

Littleton House,
Littleton Road,
Ashford,
Middlesex.
Tel: (69) 48411.

offer random access filing because the information is laid out serially on the tape, so that several passes have to be made before the data's found (see *Computer Answers* Dec '83 issue).

Technology Research, a small London company, has not been swayed by Sinclair's Microdrive and has designed a floppy disk interface called the FDC-1. This fits to the Spectrum's edge connector and has a 34 way interface on its rear for connection to 5.25 floppy disk drives. The Disk Operating System (DOS) and utilities are contained in a single 4K EPROM on the card. The good news is that the interface only takes up 1K of RAM; unfortunately where there's good news there's always bad, and in this case it is the price: the FDC-1 with utilities disk but no disk drive costs £81.50 (inc. VAT and p/p), and a second version that also has a Spectrum interface on it costs £98.75 (inc. VAT and p/p).

Peripheral Solutions is another company that is designing a disk interface for the Spectrum, but the way that it was to have been done would have infringed the copyright laws. The interface would have worked along the same lines as Sinclair's Interface 1, with all the commands such as LOAD, SAVE and CAT in a EPROM. To do this, Peripheral Solutions would have had to take out chunks of Sinclair Basic and put them into its own EPROM, so breaching copyright. However, not to be put off, the company has changed its design.

As yet the interface is not ready, but the finished product should have an 8271 controller and DOS. But don't get too excited yet - it appears that when the interface is completed, it will not be sold as a separate unit but with a disk drive. The total cost of which could be somewhere around £250.

Two other companies that offer, or hope to offer, disk interfaces for the Spectrum are Interactive Instruments and Morex Peripherals. Interactive Instruments has already launched its system, which comes complete with a 109K Shugart drive. Morex, however, had not launched its system at the time of writing, but from the pre-production bumph the specifications look very impressive; double density floppy disk interface, one or more 5.25 drives, cables, SP-DOS manual, DOS on a diskette, Masterfile database program, Tasword word-processor and Omnicalc spreadsheet package. There was no

price settled, but it is hoped to be around £260.

An alternative strategy for connecting a disk drive to a Spectrum is to buy a package that includes both interface and drive. The Spectrum chain of shops is selling a disk drive at the present time that is manufactured by a company called Viscount. The Viscount system is a rather ungainly affair, a large black metal box containing the controller card sits between the computer and drive. This connects to the Spectrum via the edge connector and to the drive on the other side. The disk is a 5.25 size and stores 100K. However, the price is high at £245, being nearly three times the price of the Spectrum micro itself.

A cheaper solution could be the Byte Drive (mentioned in the BBC section), as ITL hopes to have a Spectrum version ready later in the year. This will differ from the Beeb version in respect of the way that it controls the drive; because the Spectrum does not have its own interface, all the control circuitry has to be put outside the micro.

Another drive for the Spectrum comes from across the Channel - or at least it is supposed to. The Cyborg disk drive offers, according to the advertisements, a 5 inch drive that can store 720K on a single floppy disk. What makes the Cyborg so interesting is its ability to LOAD text files into almost any machine using what Haytech, the manufacturer, calls its personality module and system nucleus. As far as we know the Cyborg has not yet been seen by anyone, and it is only possibly available for the Spectrum and Oric at the moment. Only time will tell if this drive exists, or if it is a figment of the French imagination.

ORIC

Drives for the Oric are even thinner on the ground than those for the Spectrum. The Byte Drive 500 for the Oric is as yet one of the only real choices for the user of this machine.

Because the Oric does not have its own disk interface, ITL Kathmill in conjunction with Tyrell Systems has developed a 'Hybrid' Cable. At one end of the cable is a small plastic box moulded to a 34 way IDC connector. In the box is all the circuitry to control a disk system. This includes a ULA, 16K ROM with all recognition codes, disk controller chip for use with single and double density disks

FIG. 2
DISK
INTERFACES

Machine	Interface/ controller	Price	Price (incl drive)	Supplier
Dragon	Cumana		328.90	Cumana
	Delta	120.00	320.00	Premier Microsystems
	Dragon		275.00	Dragon Data
Oric	Cyborg		230.00	Haytech
	Byte Drive 500		299.00	ITL Kathmill
	Oric		300.00	Oric
Spectrum	Spectrum Disk System	99.00	228.65	Interactive Instruments
	FDS		260.00	Morex Peripherals
	FDC-1	81.50		Technology Research
	FDC-1 (MK2)	98.75		Technology Research
	Viscount		245.00	Spectrum Centre
BBC	Watford DFS	109.25		Watford Electronics
	Acorn DFS	103.50		Acorn
	Pace/Amcom DFS	109.25		Pace
	AMS (*)		225.00	AMS
Commodore 1541			225.00	Commodore

(* note that the AMS system requires the interface and Acorn DFS ROM)

and daisy chain connections to one or more extra drives. The total package includes one Byte Drive 500, Hybrid Cable, DOS, Disk, User's manual and cased power supply with mains connector. Each 3 inch disk gives the user 419K of storage space on a 40 track version and 869K on the 80 track. The cost of the 40 track version is £260 (exc. VAT).

Oric is not just standing by and watching the disk market taken away from it, but should have its own drive out by the time you read this article. These will be in the form of a 3 inch Hitachi disk drive giving 320K per disk (160K per side). All the control circuitry will be inside the drive, as well as an onboard power supply, as the Oric's own supply can't cope. At the time of writing the price of the drive had not been set, but it should be under £300 for the first one, with any additional drives costing under £200 (some competition for ITL?).

Finally the elusive Cyborg. Again, when referring to the Oric this drive raises its head as it is supposed to also be for this machine; we shall see.

COMMODORE 64/VIC 20

The Commodore 64 and Vic 20 are two of the most established machines on the market, and as such there is a disk option for both machines. But choice is limited. Right from the start Commodore realised the need for a disk-based system and produced its own.

If you look at a Commodore disk drive you'll see that it is a little bulky, due to the fact that all the control circuitry is inside the drive rather than in the micro or a separate connector box. The 1541 single drive unit from Commodore can be used with both the 64 and Vic 20. At £225 the Commodore is a little expensive, especially as the storage capacity of the 35 track, double density disks is only 170K bytes.

DRAGON 32/64

Again, users of the Dragon micro are fairly limited in choice to how many disk drives are available for their micro, but the ones that are around are in general of a high standard.

Unlike some other machines that use disks, the Dragon does not have a port specifically for disk drives, and so uses the 40 pin cartridge port. The box containing the disk controller circuitry is the size of a large cartridge and the disk drive itself a real monster, but very reliable. The disks used on the 5.25 Dragon Data drives are single sided and double density, giving a storage capacity of 175K.

Cumana, one of the best known names in disk drive suppliers also offers a system for the Dragon. Cumana supplies both 40 and 80 track drives starting at £286 (exc. VAT). The 40 track single-sided disk has a storage capacity of 250K unformatted, with the 80 track giving 500K per-side. As Cumana is only a supplier, the controller/interface card with the drives is supplied by Premier Microsystems.

Whereas Cumana only sells the whole package, Premier Microsystems will sell the controller card on its own. The Delta system, as it is called, contains the Delta DOS, user manual and demonstration diskette (£120). Only 2K of user RAM is taken up by Delta as everything is held in an EPROM. If the Dragon 32 user wants a assembler/disassembler/editor then Premier Microsystems will also supply this in an EPROM to fit inside the DELTA case; Encoder 09 costs £29.95.

By Steve Applebaum, staff-writer.

A list of disk drive and drive interface suppliers is given on pages 13, 14, and above left. We have tried to make this list as comprehensive as possible.

UPGRADE

Premier Microsystems,
208 Croydon Road,
Anerley,
London SE20 7YX.
Tel: (01) 659 7131.

**Spectrum,
Sonic Foto & Micro
Centre,**
256 Tottenham Court
Road,
London W1.
Tel: (01) 580 5826.

Technology Research,
356 Westmount Road,
London SE9 1NW.
Tel: (01) 699 5322.

Watford Electronics,
Dept. BBC,
Cardiff Road,
Watford, Herts.
Tel: (0923) 40588.

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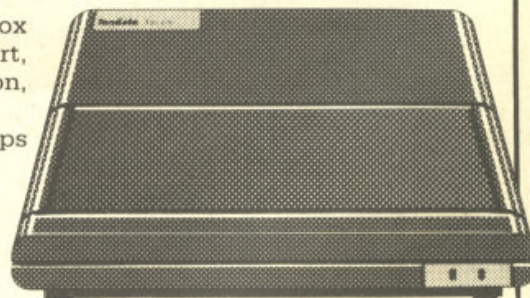


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How many microcomputers you try before All of



Before you buy a micro, you'll need to ask yourself some searching questions.

Exactly why do I want one?

Do I want my kids to turn out like Mr. Spock?

Will I get bored in six months?

Do I want to develop my taxi into a multi-million transport corporation?

Commodore SX 64

Have I got enough in the bank this month or do I need credit?

You'll need to ask some equally searching questions of the salesmen you're likely to encounter.

First snag. You may find they know less about the machines than you do.

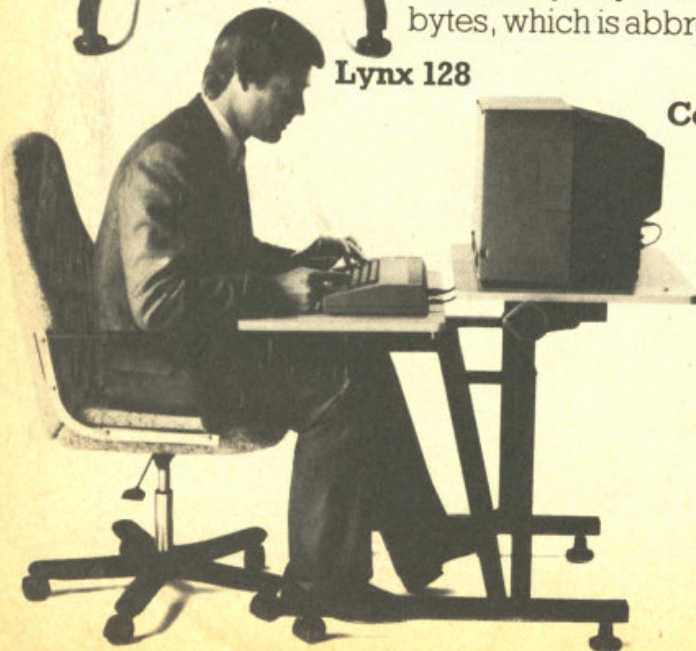
In case you know less than them, here's a quick grounding in the jargon.

Sinclair Spectrum 48

Computers store information in the form of a binary code.

A single digit in that code takes up a byte. A Kilo byte is about a thousand bytes, which is abbreviated to K.

Lynx 128



Commodore VIC 64



A 1K computer would have a memory big enough to store about 25 lines of text, not really enough to be of any use.

And not all of that memory would be available for your use.

Read Only Memory (ROM for short) is the part of the computer's memory that you don't have access to.

Instead, it is used to store the information the computer needs for its operations.

The memory you're interested in as a user is RAM or Random Access Memory.

You use this part of the memory to load your information onto.

But when you switch the machine off, it promptly forgets all the information you spent ages typing in.

You need to be able to store it somewhere.

The easiest and cheapest way to do this is on an audio cassette recorder.

More information can be stored

Micros should be you buy one? of them.

on floppy disks. The normal 5 $\frac{3}{4}$ " size can store more than 100K.

If that information was news to you, you'd probably be interested in trying the Sinclair Spectrum, or the Atari 600XL.

Both are ideal starter computers, with 16K memories, and both can be upgraded with add on memory packs and a wide range of hardware. And, most important of all there's already masses of software available.

You can plug game cartridges straight into the Spectrum and with the Atari you can start with 'My First Alphabet' and go right through to 'Teach Yourself Conversational French'.

Add on the optional 64 K memory, and you'll have a useful small business computer, complete with software like Atari Writer for word processing. (You will also be able to boast that you built your own Atari 800X).

If you truly have ambitions for your business, there's the Commodore SX64 personal computer.

It has built-in high resolution monitor and disk drives, which means it's transportable, compact and doesn't have spaghetti problems.

So it makes your business look smarter before you've even run a financial planning programme.

Acorn BBC-B

These are just some of the computers you can have a hands-on experience with at Laskys.

Prices start at £99 and there's interest free credit and a very professional after sales service. (We know what it's like having your whole business depending on the reliability of a computer.)

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Commodore 64

And if you think trying all the micros in Laskys sounds like a lot of trouble to go to, it's a lot less hassle than trying to make do with the wrong micro.

A word of advice about micros:

LASKYS

Acorn Electron

Atari 800 XL

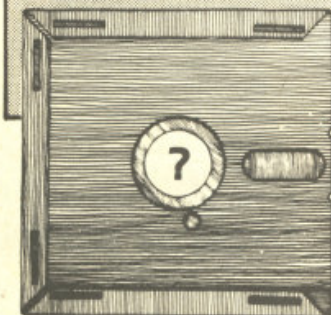
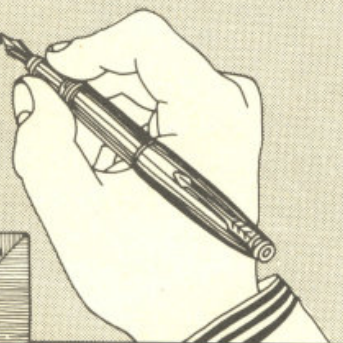
Apple IIE



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Your programs may include data bases printed reports, calculations and comparisons between fields of data, development of menus, forms, letters, memos, cheques, invoices, statements, mailing labels... the possibilities for design are endless. Codewriter operates with most popular micros and will be demonstrated fully at your local dealer.

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MORE SOFTWARE FOR COMMODORE 64:

PRACTICAL (DISK/TAPE) ...	£44.50	£41.50
VIZASPELL (DISK)	£89.95	£49.95
DTL COMPILER (DISK)	£144.95	£109.00
DTL COMPILER (TAPE)	£39.95	£36.95
TOOL 64 (CARTRIDGE)	£49.95	£46.95

SOFTWARE FOR COMMODORE PET/700:

SUPERBASE (700/8096)	£147.95	£125.00
SUPERSCRIP (700)	£147.95	£125.00
SUPERSCRIP (8096)	£147.95	£125.00
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2	MANIC MINER SOFTWARE PROJECTS	7	MR WIMPEY OCEAN
3	ALCHEMIST IMAGINE	8	LUNAR JET MAN ULTIMATE
4	ANT ATTACK QUICKSILVA	9	PYRAMID FANTASY
5	PENETRATOR MELBOURNE	10	CHEQUERED FLAG PSION

FAST MOVERS

Mr. Wimpey (Ocean), *Dimension Destructors* (Artic), *Wheelie* (Microsphere), *Stonkers* (Imagine), *Omega Run* (CRL), *Fighter Pilot* (Digital), *Doomsday Castle* (Fantasy).

TOP TEN		VIC 20	
1	ARCADIA IMAGINE	6	SKYHAWK QUICKSILVA
2	JET PAC ULTIMATE	7	CRAZY KONG INTERCEPTOR
3	LAZERZONE LLAMASOFT	8	BEWITCHED IMAGINE
4	WIZARD & P. MELBOURNE	9	GOLF COMMODORE
5	METAGALATIC LL's LLAMASOFT	10	WACKY WAITERS IMAGINE

FAST MOVERS

Matrix (Llamasoft), *Amok* (Aud/Gen), *Gridrunner* (Llamasoft).

TOP TEN		COMMODORE 64	
1	REVENGE OF M.C.'s LLAMASOFT	6	MANIC MINER 64 SOFTWARE PROJECTS
2	GALAXY 64 ANIROG	7	LAZERZONE LLAMASOFT
3	FALCON PATROL VIRGIN	8	FROGGER INTERCEPTOR
4	HUNCHBACK 64 OCEAN	9	PURPLE TURTLES QUICKSILVA
5	HOVVER BOVVER LLAMASOFT	10	KONG INTERCEPTOR

FAST MOVERS

Quasar 64 (Voyager), *Mr Wimpey 64* (Ocean), *Cosmic Commando 64* (Anirot), *Crazy Balloons* (Software Projects), *Kick Off* (Bubblebus), *Super Pipeline* (Taskset), *Quick Thinking* (Mirrorsoft).

TOP TEN		BBC	
1	HOBBIT MELBOURNE	6	HUNCHBACK SUPERIOR
2	MISSILE CONTROL GEMINI	7	DR WHO BBC SOFT
3	737 FLIGHT SALAMANDER	8	OBLIVION BUG BYTE
4	3D DEEP SPACE POSTERN	9	SNAPPER ACORN SOFT
5	KILLER GORRILA PROGRAM POWER	10	FIREHAWKS POSTERN

FAST MOVERS

City Defence (Bug Byte), *Felix & Fruit* (Program Power), *Mr Men* (Mirrorsoft), *Snooker* (Visions), *Saloon Sally* (Psion), *Apocalypse* (Red Shift).

TOP TEN		ATARI	
1	ZAXXON DATASOFT	6	BLUE MAX SHOWCASE
2	DIAMONDS ENGLISH	7	PITSTOP EPYX
3	DONKEY KONG ATARI	8	ZEPPELIN SHOWCASE
4	FORT APOCALYPSE SYNAPSE	9	MISSILE COMMAND ATARI
5	PACMAN ATARI	10	COMPUTER WAR GAMES THORN

FAST MOVERS

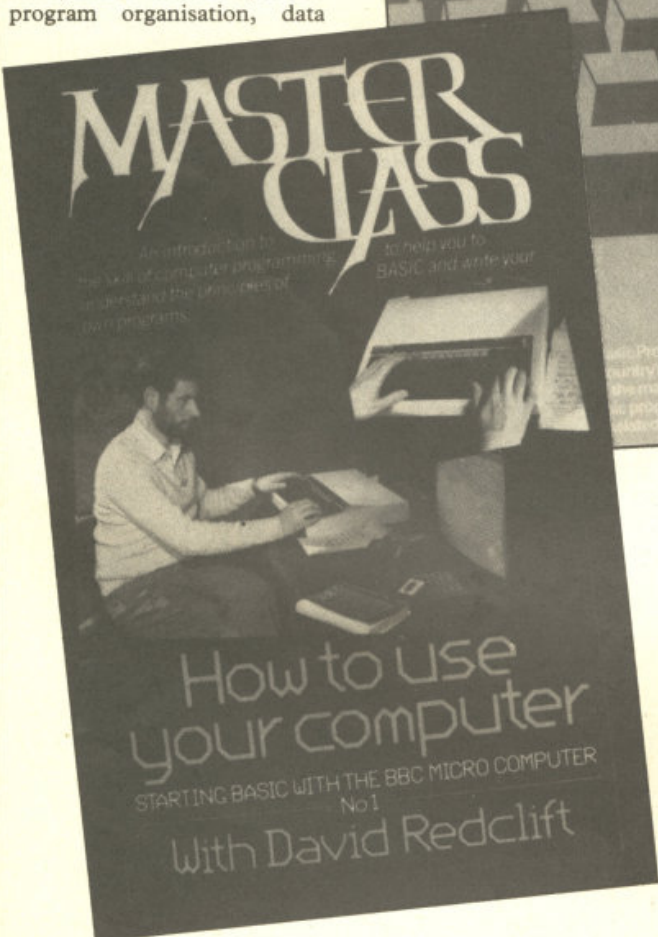
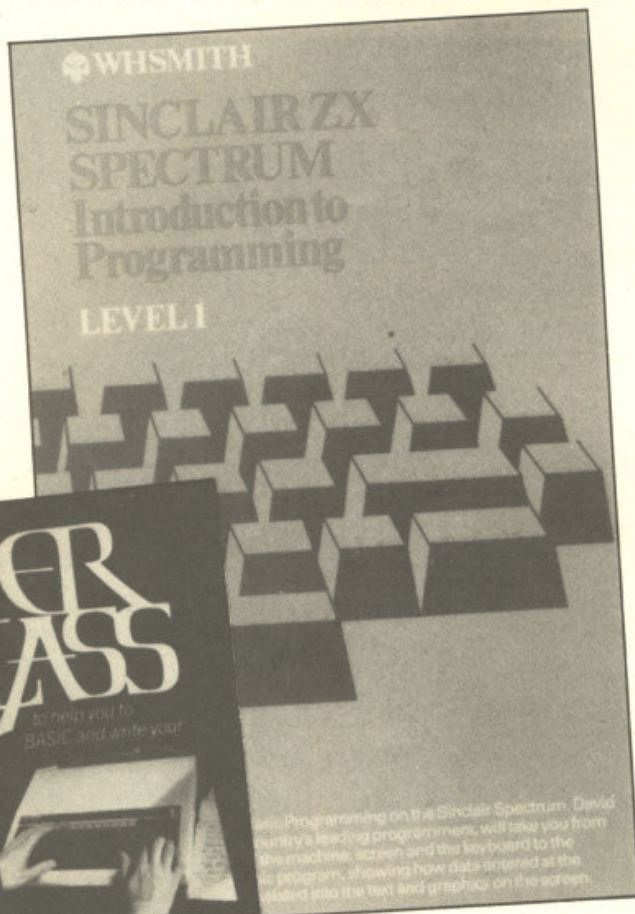
Dig Dug (Atari), *Pole Position* (Atari), *Qix* (Atari), *Pharaohs* (Pyramid), *Pyramid* (Master Control), *Zork 111* (Infocom), *Escape from Pulsar 7* (Infocom), *Krazy Kopter* (English).

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WITH REVIEWS OF THE
TOP-MOVING GAMES!

PROGRAMMING THE EASY WAY?

There are shelves of 'introduction-to-programming' books on the market, few looking very appealing to the beginner. Wading through a terse, typewritten tome of tea-chery is off-putting to many new micro owners; even the initial Users Guide can seem bewildering to the novice.

Realising this perhaps, a company called Holiday Brothers have produced a series of instructional videos which aim to describe the principles of microcomputer programming in a more easily-digestible way. The series, titled *Masterclass*, comprises nine cassettes in all, and covers the Spectrum, BBC and Electron machines. The two BBC cassettes deal with Basic on the Beeb, and cover such aspects as program organisation, data



input and output, processing statements, and so on – moving on to integer operations, string manipulation, graphics co-ordinates and user-defined graphics characters on the advanced level tape.

There's also a video cassette devoted to the BBC Micro in primary education, which looks at ways the micro can be best employed in the classroom (featuring the Logo Language

and Turtles), and another dealing with BBC games and graphics construction.

The Spectrum video cassettes are released exclusively through WH Smith, and are again in two levels, first concerned with the basic principles of data input, program construction and meaning, going on to advanced topics such as graphics, loops and subroutines. The tapes for

both machines cover most areas of the Basic language fairly thoroughly.

These magnetic tutorials are introduced by one David Redclift, who comes to the *Masterclass* after over 15 years of programming and video training experience. During the tapes Redclift sits before his BBC or Spectrum and takes the pupil-viewer through a representative program, examining it line by line, explaining and demonstrating the function or various statements as he goes.

This technique is especially successful when discussing fields such as graphics, where an animated figure can be shown on the top of the split screen, while the routine from whence it was created is outlined below.

The technics are well explained, and of course if you don't fully comprehend something first time round you can always hit the rewind button on your VCR and give it a second squint. The great advantage of this kind of teach-

ing technique is that the exercise is displayed on screen exactly as it would appear on your own monitor, so understanding how the underlying process works is much less abstracted than printout and text in a conventional manual.

This was emphasised by the fact that Redclift seemed to draw much of his material from the respective Users Guide, and make it markedly clearer; however, the videos don't exploit the medium perhaps as well as they could, and retain a slightly stuffy 'Open University' feel to them – but this, at least, leaves nothing to detract from the essential information (apart from Redclift's rather garish sweater).

As a softly-softly tutelage to the principles of computing, *Masterclass* is quite effective. If the £23.95 price tag deters you, the *Masterclass* cassettes are available from some video hire shops.

Each of the cassettes is approximately one hour long (available on both VHS and Betamax formats), and each contains three games programs which can be loaded into your micro directly from the video soundtrack: although nothing exceptional, these extras do provide a useful respite from the intricacies of Basic programming.

By Jim Hayes, sub-editor on *Computer Answers*.

The Masterclass series (each priced £23.95 inc. VAT) includes:

- 'Starting Basic with the BBC Microcomputer' (Nos 1 and 2).
- 'Start to Program with the Electron.'
- 'Graphics and Games for the BBC Microcomputer'.
- 'The BBC Microcomputer in Primary Education'.
- 'Introduction to Sinclair ZX Spectrum Programming' (Levels 1 and 2) (available only through branches of WH Smith priced £16.95 inc. VAT each).

Holiday Brothers,
172 Finney Lane,
Heald Green,
Cheadle, Cheshire.
Tel: (061) 437 0538.

COMPUTERS			
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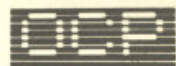
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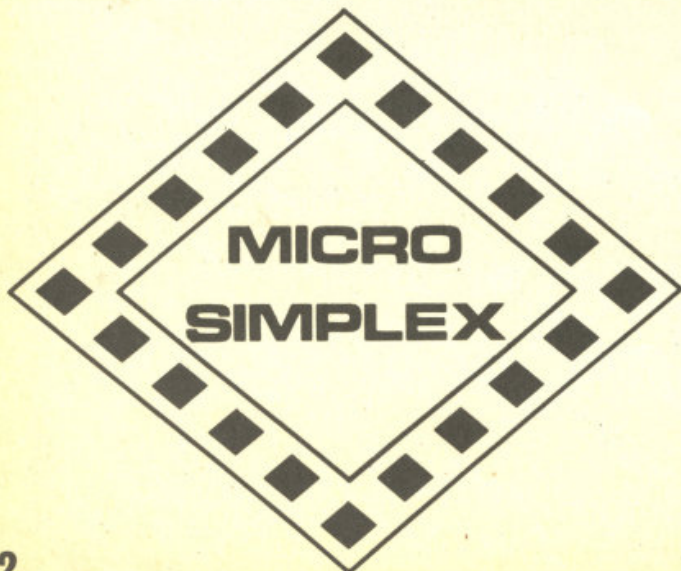


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WAR FOR THOUGHT

WE LOOK AT SOME COMPUTER WAR GAMES THAT RELY MORE ON CONTEMPLATION THAN JOYSTICK-RATTLING FOR EFFECT.

Most of the computer war games that have appeared over the past few years have been of the 'shoot-em-up' or Battleships pastiche 'press-any-key-to-continue' genre – so it is like a breath of fresh air when a game such as *Apocalypse* (for the 48K Spectrum and BBC B), that is both exciting and thought-provoking, arrives.

Apocalypse, from Red Shift, a small software/war games company, is not a game of mindless destruction like so many others, but rather one of tactics and strategy – more in keeping with Chess than *Defender*. In fact, in this game the aim is to avoid armageddon by *not* using nuclear weapons.

The phosphor version of *Apocalypse* owes much to its elder brother. Like so many classical war games, it is based on the domination of areas of land, whilst defending them against the enemy – whoever they may be. Along with the original theme, the 'new' game also retains a lot of the complexity associated with trad' war games. However, once the book of rules has been read and understood, the player can leap into battles of times past, or plough into the future and decide the fate of the world (excellent stuff for budding megalomaniacs).

The game itself begins (after a long time loading) with the player being asked to select a map from a choice of Europe, Britain, London or the Caribbean. Whatever the choice, you then turn over the cassette from the main program and load the map; once this is done you're away. Or nearly so.

Before fulfilling plans to invade Battersea, each player (there can be between 2 and 4) must choose the name of his/her empire, the symbol that will represent them and their empire centres where the army, navy, or even nukes will be situated at the start of play. Centres can be chosen by each player, or, even better, you can let the computer do it so that the process is completely random – about the only chance event in *Apocalypse*.

Once settled, the procedure of distributing forces begins. How many are available to each player depends on the revenue owned, which in turn depends on the type of land the empire centres (cities) are based on; urban areas will have a different revenue value to suburban, for example. Also, unlike real life, there's no question of political dispute over the siting of your silos.

Placing forces in strategic positions at the start of the game is very important, as it could spell success or failure for the entire campaign. Deployment is followed by what is called the 'movement phase' – a time for manoeuvring forces and engaging in conventional combat. Within the movement phase the player is given four options: move, march or sail, occupy and change (choose a different region from which troops are to be moved).

As seen from past experiences of war, whenever a hostile army moves into an already occupied area, skirmishes are bound to break out. The situation occurs in *Apocalypse*: if a combat situation is encountered, the players will be informed by the computer, with the forms of attack available outlined. Here *Apocalypse* wins over most arcade type games, because the players are actually encouraged to talk to one another, and not just sit comatose,

staring at the screen.

The attacker inputs a number corresponding to the form of attack that he/she wants to use, but does not let the defending player see it. The defender then does the same, and if the number is equal to the attackers, then he/she wins. Going higher or lower will determine the success or failure of the attack.

Combat as just described, is based on conventional weapons; however, a player forced into a corner could cause nuclear weapons to rear their ugly heads. It has to be said that although the idea of using nukes in *Apocalypse* is not a good one, as they can start a chain reaction and destroy some of your own forces, the procedure is well-programmed: at the final moment there is the choice whether to fire or abort. Should a nuke be fired, the screen display begins to 'ripple', while the sound of the bomb can be heard whistling towards its target. After the explosion, squares begin to flash on screen representing the areas hit.

If nuclear war is not your scene, then Red Shift has devised a unique expansion system for *Apocalypse* that enables different scenarios to be MERGED into the main program. These include such things as *Europe 1984*, *War in The Pacific*, *Napoleon's Campaign* and *Fall of the Roman Empire* – the last game including new hazards such as disease.

Of all the software companies to enter the war-games battle, Imagine has got to be one of the most surprising. It's not often that a company, usually known for fast moving arcade style games, moves into an area where animation is one of the least important features; but with a game called *Stonkers*, Imagine has straddled the barrier, and the result is a challenging game that features the best of both worlds.

Stonkers was written by Imagine's John Gibson, who also wrote the graphically excellent *ZZoom* program. Rather than choose a known piece of land to fight on, Gibson has created an imaginary landscape that tends, maybe intentionally, to make the game a little less close to home.

The scenario of *Stonkers* is very simple: two opposing forces, one the player, the other the computer, try to take command of an area of land by destroying all the enemy combat divisions or taking over the enemy HQ and port.

Though this sounds like any other war game, the feature that makes it stand out is the use of graphics: a hi-res map takes up most of the display, with the computer's and player's armies represented diagrammatically on either side. The player is able to move a cursor around the screen and with a push of a button, magnify any area of land underneath it. In the same way, an infantry or combat division can be picked up by the cursor and – depending on its mobility – moved to any strategic position the player requires.

This is where the animation comes in. If an infantry is moved, the little stick man representing it walks across the landscape from its initial position to the new one decided by the player. It can be quite amusing when the enemy is on the move and lots of stick men head towards your HQ with tanks and cannons hot on their heels.

If you have a Commodore 64 and don't mind keying-in programs, Century books has produced *Micro Wars* on the Commodore 64. As well as talking about wargaming strategy, the book includes listings for six games (two of which take up as much as 32K of memory), ranging from the ancient conflicts in *Caractacus* to the air battles of *Richtoven*. Priced £5.95, it's available from Century Publishing at 76 Old Compton Street, London W1V 5PA. Tel: (01) 439 9416.

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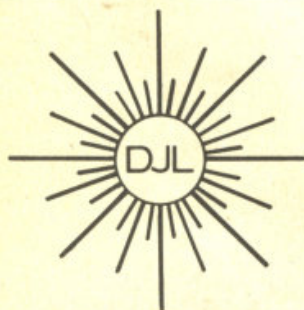
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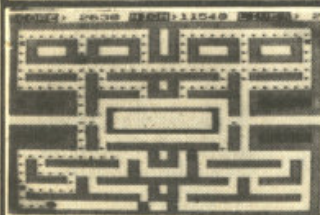


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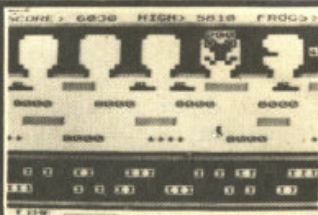
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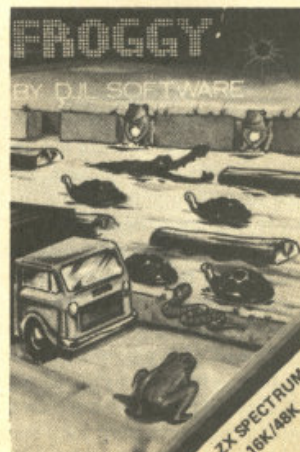
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Because the only antagonist the player can have is the computer, a representation of a ticker tape scrolls across the screen with information on the state of play and how the army is doing for supplies. Keeping the supplies moving is important in *Stonkers*, as without them armies tend to starve to death. Sometimes the supplies might not reach your army in time because the supply ship was slowed by bad weather.

Of course, as in any good battle there are skirmishes when opposing forces meet; and as in *Apocalypse*, the outcome is determined by the strength factor of the different division—an armoured is superior to an artillery division.

Stonkers is a game that should appeal to anyone wanting to get into wargaming. It is not, however, one for the impatient player, because it takes a long time to find out what's going on and what you are supposed to be doing. As with most of Imagine's games, the documentation is a let down, not being consistent with the quality of the software.

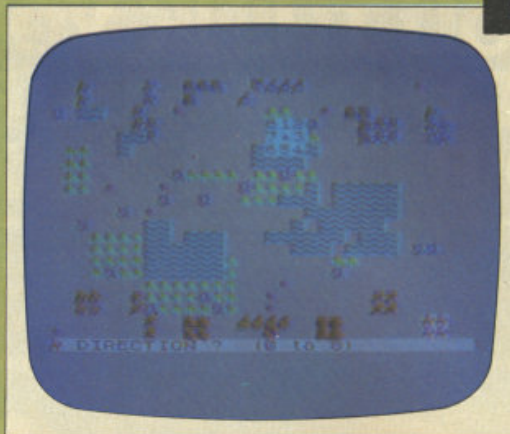
A more prolific producer of wargames is a Cheshire-based company called Lothlorien. Most of their games are part of a series called Warmaster, the mainstay of which is called *Confrontation*. It appears that Lothlorien have taken a leaf out of Red Shift's book, and have made it possible to expand the master program by loading in new scenarios, there's even a map editor on the program that allows the user to design maps and themes.

A game called *Twin River* is provided on the Master tape. The theme involves two countries in Europe trying to control lowland between two rivers. Graphically it is not as good as those from Red Shift and certainly nowhere near *Stonkers*, but as wargames go it's probably closer to the original board version than anything else.

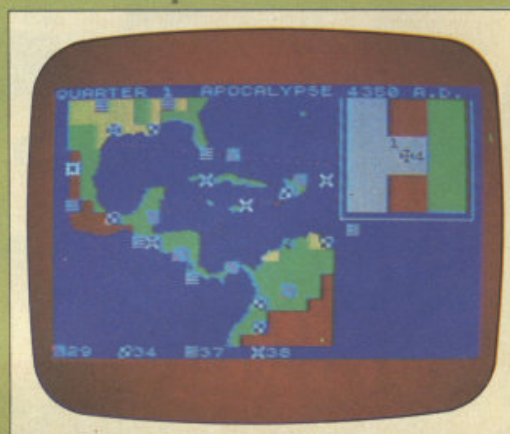
Some of Lothlorien's expansion scenarios include *Paras*, *Johnny Reb* and *Dreadnoughts*. *Paras* involves a small unit of paratroopers being dropped behind enemy lines with the intention of blowing-up a strategic bridge. Before the bridge can be destroyed, all enemy forces must be wiped-out using explosives, grenades or guns.

Johnny Reb is less sophisticated warfare based on the American Civil War. A skirmish has broken out between Union and Confederate forces around a river crossing, and it is up to the player to collect the enemy's flag or achieve a position of dominance in a set period of time.

The third game, *Dreadnoughts*, is a naval battle concerning a British sea force trying to keep a German battlefleet from shelling the East Coast of Britain. It's not only the enemy that player has to contend with, but also the clock.



BATTLE 1917 (NOTE THE ROYAL MOUNTED CAMELS IN THE CORNER).



APOCALYPSE CAN BE PLAYED IN TRENDY 'REAL LIFE' WAR THEATRES.

The games Lothlorien has produced for the wargamer span a wide range of scenarios and machines. As well as the Spectrum, many of the games also run on the BBC and Oric.

Finally a game for the Spectrum called *Battle 1917* from Cases Computer Simulations. *Battle 1917* has the distinction of having won the Cambridge Award for being a 'highly original' wargame.

The difference between *Battle 1917* and the other games looked at is that it's more akin to chess than the wargame theme. As in chess the whole point of the game is to capture the king of the other side. The board on which it is played is randomly produced on each play, so there is a lot of scope for inventing strategy.

Whereas most of the other games have the option of playing the computer, '1917 has not—meaning that every time you play a partner is needed. It would have been preferable if you could play the computer because that is the beauty of the micro, the fact that another player should not necessarily be required.

Whether or not you think war is a subject that should be trivially sold to people (especially young children) the fact is that wargames are here to stay. Red Shift's attempts, and those of the other manufacturers are better than the 'shoot-everything-in-sight' variety, because they do allow the player to think, and avoid having the micro do the thinking for you. If you want a game that lets you think and plan tactics on your micro, a wargame is one of the best examples.

By Steve Applebaum, staff writer on *Computer Answers*.

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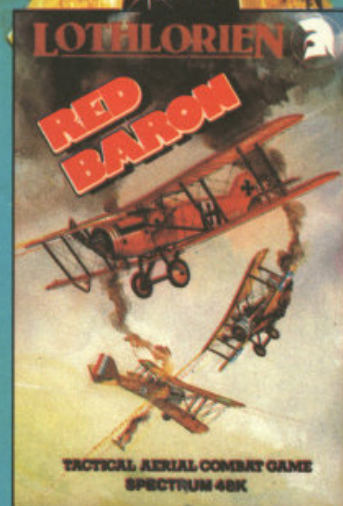
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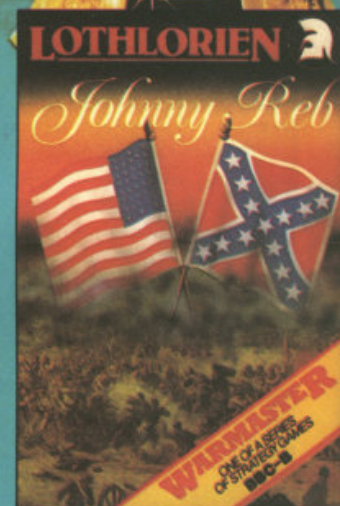
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When it comes to designing a game, an important feature (apart from an interesting theme), is good graphics; but although a user might be good at programming, they may not be artists. Various companies are now coming to the rescue of the programmer with several graphics utility packages that are supposed to make things a little easier.

We tried our hand at a few programs (*Paintbox*, *Melbourne Draw*, *Cartoon Animation* and *Draw15*) for the Spectrum that cover the ground between just drawing lines to user defined graphics (UDGs) and animation.

PAINTBOX

The adverts for *Paintbox* offer the user all sorts of wondrous things. Pictures taken from the demo program show such things as a cover design from *Vogue* magazine, and a very detailed Ferrari sports car. However, as with so many commercial products, what you get is not always as easy to use

as the advertisers' promises. The facilities are impressive; user defined graphics editor, drawing board, sketch pad and precision plotter, to name a few; but each has its own little idiosyncrasy.

The graphics editor allows up to 84 user defined graphic (UDG) characters to be defined - 63 more than the Spectrum on its own. Because of the way that the Spectrum's memory is mapped, it is only possible to have 21 UDG characters in the graphics area at any one time. To overcome this, the writers of *Paintbox* have divided the UDGs into four 'banks' of 21 characters. These can be stored in memory and then called with a short machine code routine whenever needed.

Included within the graphics editor is a drawing board and sketch pad, both of which are used in the designing phase. Characters are designed on the drawing board. The display features what looks like a chess board, and a blank square of the same size. When any squares are filled on the board, a number at the side changes, giving the decimal code of ►

All the illustrations shown above are taken from the respective manufacturer's demo program - but similar effects can be achieved by the determined user.



MORE UDGS FROM THE PAINTBOX DEMO PROGRAM.

the byte. Finally, the user is left with a design, and eight codes that make up the character, which cuts out all the mental arithmetic usually required when designing UDGs. Below the 'chess board' is a box containing several options that enable the designer to inverse, rotate, or produce a mirror image of the character, saving time having to change the attitude of the figure, or re-design it.

To make sure the character designs work, the user is supplied with an on-screen sketch pad. This gives the designer the opportunity to try out the designs, and see what characters look like before saving them to tape, or using them in a program.

All the characters designed using the drawing board and sketch pad can be saved and called from a Basic program using the RANDOMIZE USR function. There are four different RANDOMIZE USR calls needed, one for each UDG 'bank'.

UDGs are useful, but they are not any good for high resolution work; you could not create a *Vogue* magazine cover with them. So to give the 'artist' more flexibility, *Paintbox* also provides a high resolution plotter. All the facilities are there—plot, draw, fill, erase, arc and circle—but the ability to move the cursor around the screen and draw as you go is missing.

MELBOURNE DRAW

Melbourne Draw is a package in the same line as *Paintbox*, and probably has one of the best pedigrees of any design utility for the Spectrum. Not only was it written by Philip Mitchell, one of the programmers of *The Hobbit*, but it was also used to create the excellent graphics used in the same game.

Melbourne Draw, unlike *Paintbox*, is able to draw as the cursor is moved and, even better, small portions of the display can be enlarged between four times and 16—times handy for designing small intricate figures. Just as portions of the screen can be expanded, they can be contracted. However, in this case the effects are non-reversible, so the manual advises that a design be saved onto tape before being shrunk.

On *Melbourne Draw* colour is probably the hardest feature to use. Unlike *Paintbox*, which uses a simple menu from which paper and ink colours can be selected, *Melbourne Draw*'s manual confuses the issue by talking about attributes (see Spectrum manual—yawn...). To make matters worse, there is no real explanation of how to use more than two colours (foreground and background) at any one time; it can be done, but with a great deal of trial and error. After eventually finding out how to change colours, this package is very good for creating still pictures.



GRAPHICS WITH INTENT? FROM THE CARTOON ANIMATION DEMO.

CARTOON ANIMATION

If trying to be an Andy Warhol is not your scene, there is always the Bill Tidy approach, with *Cartoon Animation* from Fowler software. Rather than concentrating on design facilities like those in the other two packages, *Cartoon Animation* is a set of machine code routines that attempt to make creating moving figures very easy.

Cartoon Animation consists of a Basic program and various machine code routines that collectively allow the user to design characters and move them around the screen with the minimum of fuss. Getting started with the package is not very easy, as the leaflet-like manual has a very hazy description of how to begin. Once started, however, it takes the user along the path to simple animation.

Unlike the other packages looked at, *Cartoon Animation* is not really a design program, and as such does not provide the design grid that is so useful. This means the user has to draw up his/her own grid and colour in the squares making up the character or use Fowler's *Draw15* (see below). The character is then stored in memory with the help of a Basic program given in the manual. As the program is typed in, variables are added giving information about the length and height of the character, the location where it is to start in memory, and all the data that makes it up. On running the program, the character is stored in memory, ready to be manipulated with various other commands.

All the other information to get the figure moving is stored in the form of POKE statements; don't be scared or put off if you're not sure how to use these, as all the necessary POKES are given in the manual. If a lot of figures are to be moved around the screen, it means a lot of such statements have to be used, as a different one is used per direction. Other effects such as speed, colour and movement can also be controlled with the POKE command, giving some very acceptable animation.

To overcome the need of having to draw your own grid, Fowler has produced a program that transfers drawings from paper to computer. The utility is called *Draw15*, and it is useful for taking the hassle out of designing new characters.

All the the user has to do is specify the length and height of the character, and the start address of where it is to be stored in memory. Keying-in the information about the dimension of the character produced draws a grid on which a design can be made. A line of squares can be filled using the 1 key for ink and the 0 key to leave a blank. Special keys are provided so that a line can be coloured in, left completely blank or copied to the next. Once com-

Cartoon Animation

(features: characters stored in memory, control speed, direction and colour through simple POKE statements) priced: £10 (inc. VAT).

Draw15 priced £5 from:

Fowler Software

Hendon Mill,
Nelson, Lancs BB9 8AD.
Tel: (0282) 865837.

Melbourne Draw

(features: enlarge screen, change attribute settings, fill command, shrink screen, grids for defining UDGs, screen scroll), priced £8.95, (inc. VAT), from

Melbourne House,

Castle Yard House,
Castle Yard,
Richmond TW10 6TF.
Tel: (01) 940 6064.

Paintbox

(features: UDG Editor, drawing board, sketchpad, precision plotter including: plot, arc, fill, draw, erase, store, erase), priced

£7.50 (exc. VAT + P/P)

Print 'n' Plotter Products

19 Borough High Street,
London SE1 9SE.

Tel: (01) 403 6644.

pleted the design can be saved to tape.

In the manual provided with *Draw15* is a Basic program that allows the characters to be used within a Basic program, or, if it's fast animation you want, they can be used in conjunction with *Cartoon Animation*.

Apart from the demo program supplied on the *Computer Animation* cassette, a games package called 'Giant's Dinner' for young children, also from Fowler Software, gives a good indication of what can be achieved with the program.

All the packages looked at offer the artistic user some advantages over using the basic Spectrum's graphics facilities. They do not, however, give total freedom, as there is always some feature lacking.

Melbourne Draw is certainly lacking in easy use of colour. We managed to get two colours on the screen at one time, but apart from that we had little success. *Paintbox*, on the other hand, gives the user a palette for selection of colour, giving the designer easy access to more than two.

Where *Paintbox* falls down in relation to *Melbourne Draw* is the lack of the ability to draw as the cursor is moved. For tricky, complex designs this is an obvious requirement, but the designers of *Paintbox* have decided to leave it out. The faults in both packages are major deficiencies, but there is the possibility that *Paintbox* could improve when Print 'n' Plotter Products produce expansion programs for the utility, promised for later this year.

STORAGE

The majority of people who use *Paintbox* and *Melbourne Draw* will want to use their designs in a Basic program and it is possible to do so with both.

With *Paintbox*, the UDGs can be stored in memory above RAMTOP and each UDG bank called using the RANDOMIZE USR statement.

SAVEing UDGs with *Melbourne Draw* is much the same as *Paintbox*, but you can also specify where in memory they are to be stored.

The packages from Fowler Software are a different kettle of fish to those from Print 'n' Plotter Products and Melbourne House. Rather than being purely for design, they are more concerned with drawing characters and moving around the screen.

Cartoon Animation is good for building up characters and moving them around the screen, but when it comes to using colour there are again some drawbacks. Unless your characters are black and white, only one can be moved at any time. This detracts from the idea of designing a whole game with the package, but it is good for designing single animated characters.

Draw15 is the closest to the first two packages, but again it is merely for designing characters and storing them above RAMTOP by converting characters drawn onto an 8 x 8 piece of graph paper into numbers between 0 and 255. The user can call up the characters stored using it with a Basic program listed in the manual supplied, or, if a faster speed is needed, with the Basic subroutines of 'Animation'.

All the packages looked at are good design tools in some respect, but on the other hand they all fall down in some way. When buying one of the 'art' packages like those from Print 'n' Plotter Products and Melbourne House, we would recommend the latter package if a lot of colour is not needed. The reason being that it is far easier to use for intricate design. As far as *Paintbox* goes, the main use would be for the user who wants to create a lot of UDGs. The two Fowler Software products are good for experimenting with animation techniques, but not for the design of fast arcade games.

By Steve Applebaum, staff writer of *Computer Answers*.

SKULL

LOADING

Type LOAD"" to load program.
Wait 5 minutes for program to load.
Program will run automatically.

INTRODUCTION

The object of the game is to collect treasure from a maze without losing lives and thus to achieve the highest score possible. Each item of treasure is worth a number of points, the more treasure collected, the higher the score.

There are a number of hazards within the maze, pitfalls, trapdoors, portcullis and wandering **SKULLS**. The **SKULLS** will attempt to guard the treasure by catching you, but you may find within the maze a green cross which will give you a period of safety during which you may attack the **SKULLS**.

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Following the purchase of a micro, one of the first problems we encounter is something like, 'No! you can't watch *Little and Large*—I'm trying to debug this program,' and so on.

While a great many people now have two TV sets, it is not uncommon for them both to be in use, so we still have a problem. The usual answer is to purchase another TV (which may cost more than the micro), use a black-and-white set for development, or purchase a monitor. In the case of the monitor, the only question is, 'do I require RGB or composite video, and can my micro drive one?' So what are the answers?

Let's take a look at how a monitor works, and what these methods are. *Fig. 1* shows the signal path from the micro to a standard domestic TV. The modulator may or may not be built into the micro; if it is external (like with the Vic 20), then the signal to it, from the micro, is true composite video, and will contain a sound component if the micro produces sound through the TV.

If the modulator is internal (meaning that you plug your TV aerial straight into your micro), then you may either have a separate composite video output or, at the risk of invalidating your guarantee, you can run a line from the internal modulator (as on the Spectrum). The modulator is usually a small bare metal box with the TV aerial connector coming out one side and two wires (composite video, the one you run a line from, and earth) coming out the other.

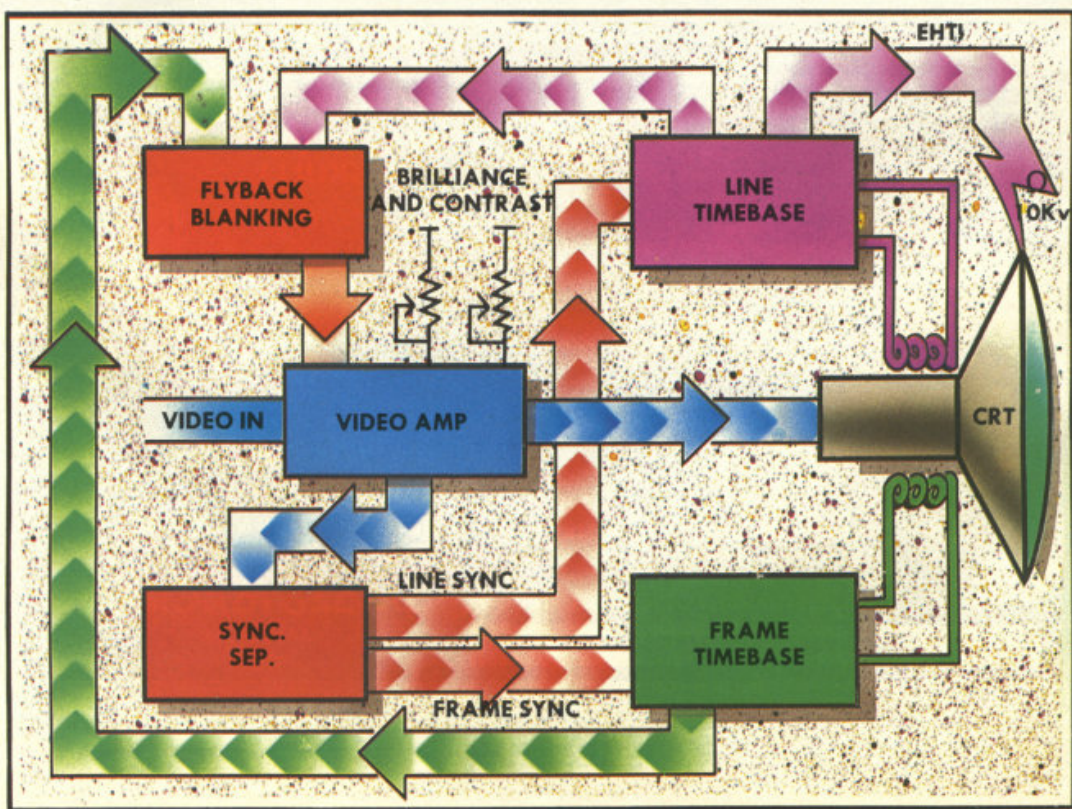
The signal leaving the modulator is a radio frequency, usually around channel 36. In effect, the modulator is a tiny transmitter (if an aerial were fitted to the modulator, your TV would receive it over a surprising distance, you might also be surprised by a summons from the Post Office). The TV set, when tuned correctly, receives this signal and ultimately changes it back to composite video, and extracts the colour and sound content. All this signal processing naturally loses some of the definition, but still we all key on.

In *Fig. 2* we see the single path for a composite video monitor, which makes much more sense. So what is the difference between composite video and RGB drive? True composite video is a complex waveform (often carried on one line) containing the following components:

- Video (or luminance) information—the black-and-white picture.
- Colour (chrominance) information.
- Colour burst. A signal used to tell the receiver that the signal is colour, and is used in colour correction circuits.
- Horizontal and vertical synchronization pulses, to lock the time bases that scan the screen.
- Sound component.

These individual components are extracted as required, within the TV or monitor. Some micros, however, do not generate true composite video (in a TV sense): the composite video available does not contain colour information. This is not such a big

Block diagram of a display, showing the main components.



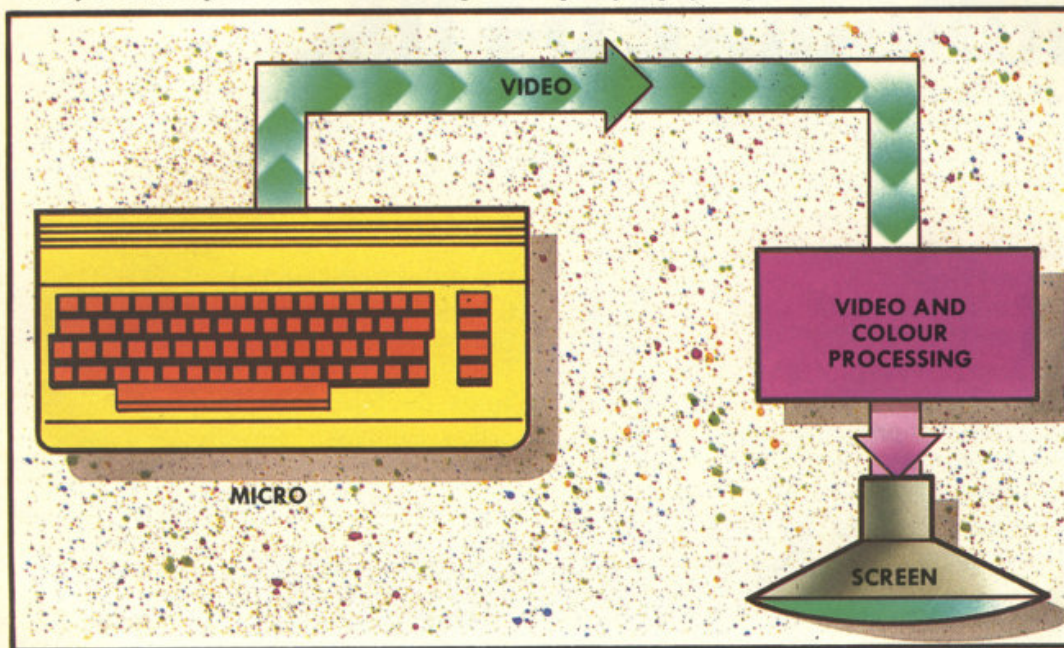
problem, as we shall see later when we look at the conversion of VDUs.

RGB (standing for red, green and blue, the primary colours in TV pictures) delivers three video frequency signals to the monitor. Each signal has a luminance component and also a single colour component. Hence, connecting red drive only would produce only red detail on the screen. The colour is not processed from its luminance part, it is used after amplification to drive the tube. Sync (for timing the signal) is also part of the RGB signal. Another factor that donates to the superior display on a monitor (or VDU) is that bandwidth is wider – it can handle higher frequency signals – and the actual tube quality is higher.

Can you convert your TV to RGB or composite

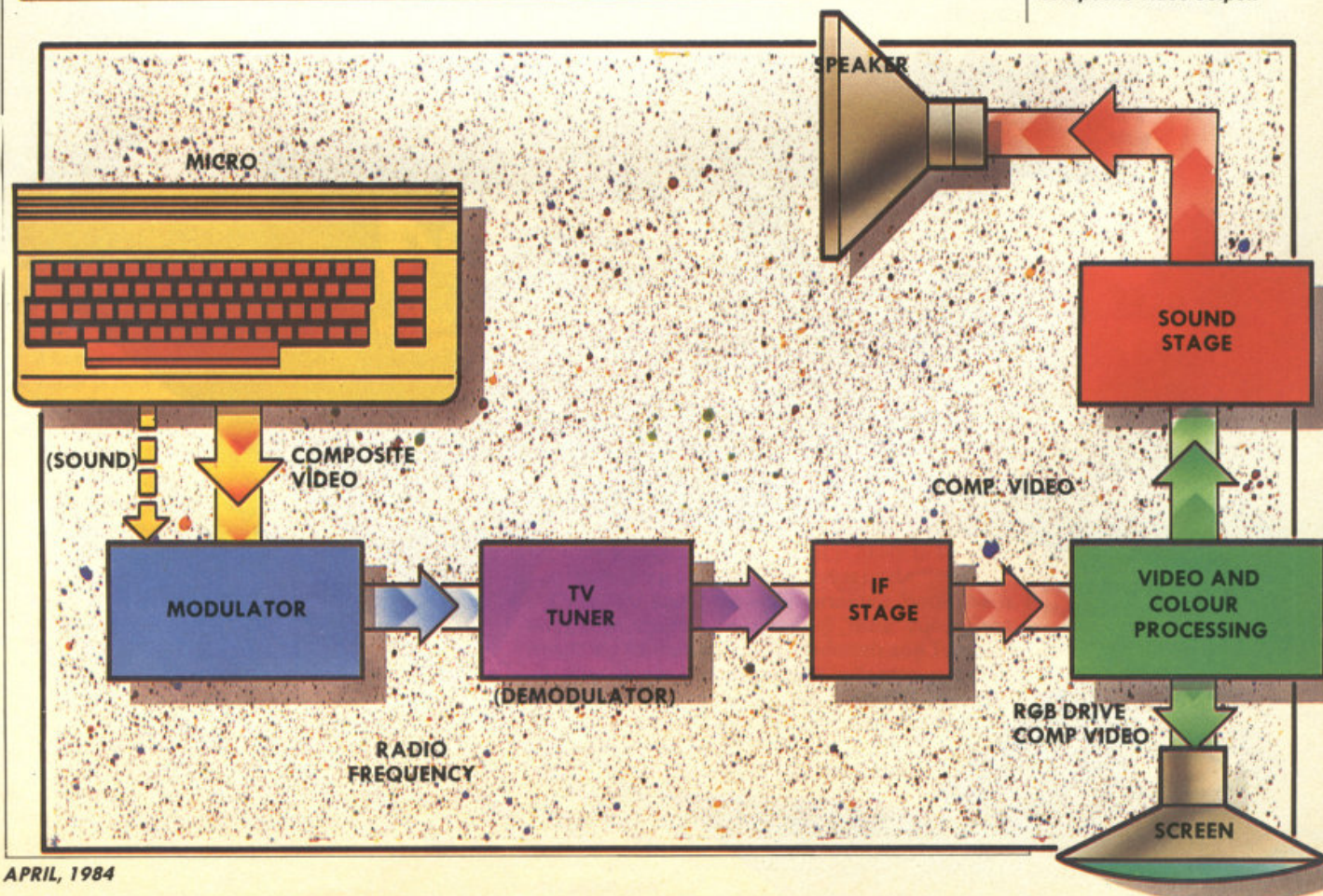
video? Unless you are very well informed on TV, *no!* The vast majority utilise a live chassis, which means the 'Earth' rail of the circuit is connected to neutral mains (though many people try to fry TV engineers and connect it to mains live). Still more common among switch mode power supply sets is for the chassis to float at around 300 volts. This is why you do not have an earth on your TV; hook it up to your micro, and you soon will have – via most of the chips within! The aerial socket on the TV is critical component to ensure isolation. Don't ever bodge it, should it be damaged.

This concludes our somewhat brief look at the connection between micro and TV. Now we can look at a cheap and effective way to obtain monitor quality displays. If you use a monochrome



Left: The path taken by a video signal from your micro to the television.

Below: the simpler path taken by a video signal when going via a micro's composite video output.



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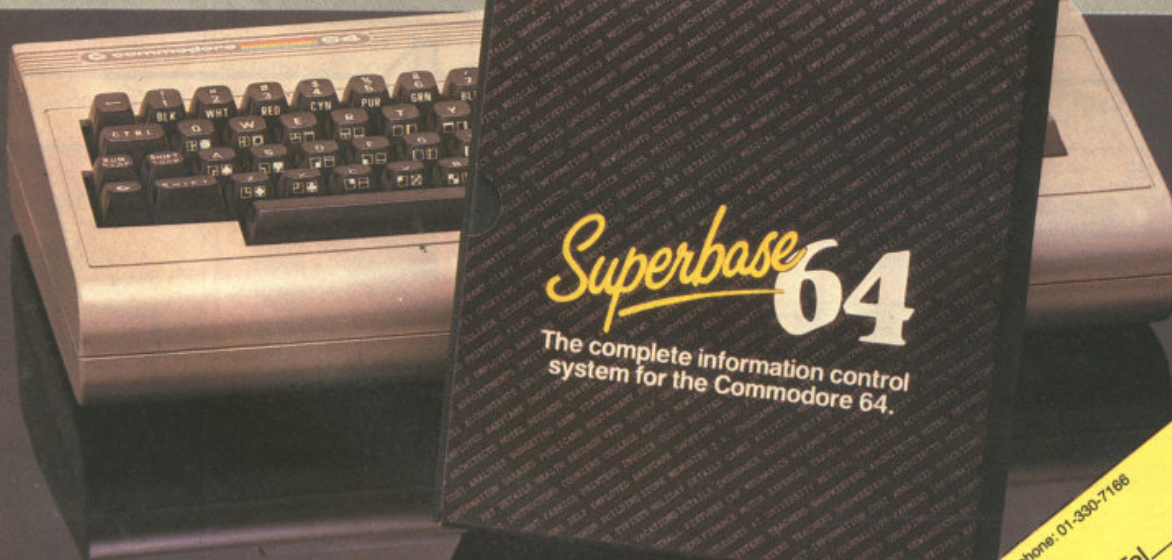




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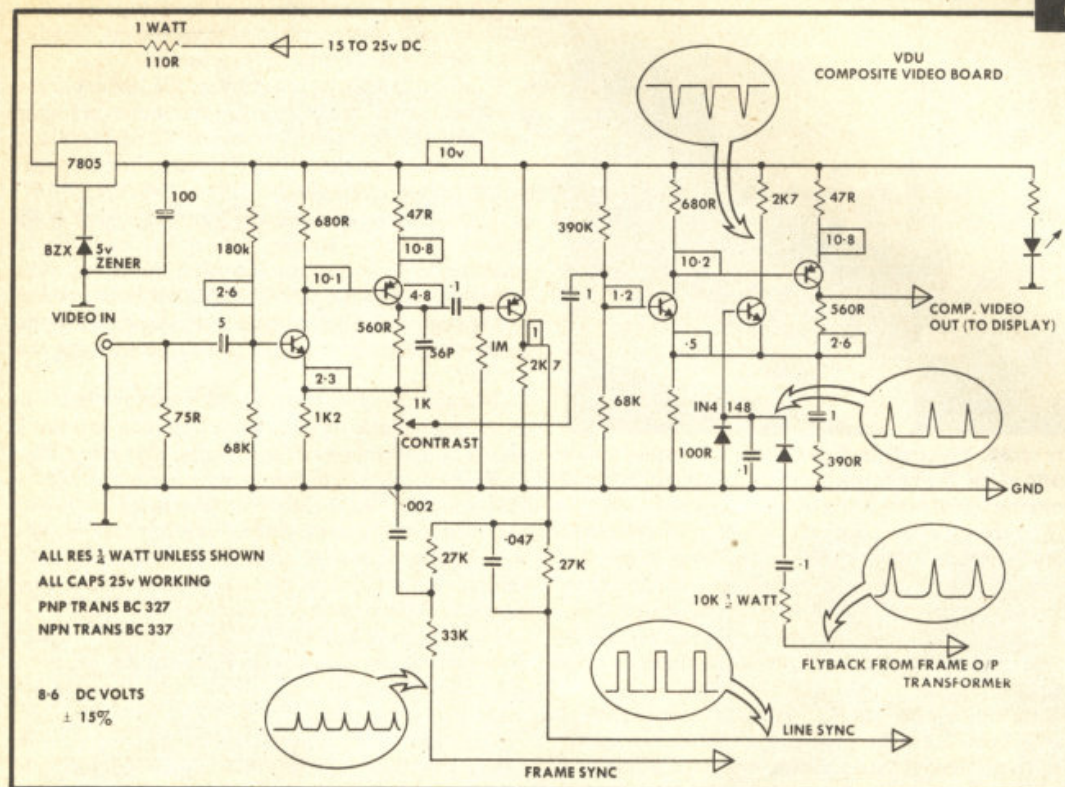
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Left: circuit diagram for a video board, connecting your micro's composite video output to a VDU.

display, you can, of course, make all your colour statements, get the thing working, and then run the finished result on the colour TV (three am is a good time, when nobody is watching it). It is then a simple task to change any colours that do not appear very well.

This still entails getting a mono display, or VDU (that is, a video display unit, a screen on its own, not to be confused with a terminal, which would include a keyboard and extra circuitry). When writing programs the advantages of a good quality display, even a black-and-white one, are considerable – reading reams of text on a TV screen is hard on the eyes.

The computer market is continuously expanding: as fast as one user buys a system, another is scrapping his old system and starting again with the new generation equipment (this has led to an equally steady growth in computer system scrap dealers, and second user dealers: the main interest of the scrap dealer is the precious metal in the backplanes and so on. There appears to be little demand for the VDUs that these dealers obtain as they buy up old systems).

There are many types of VDU, so what you need to know is how to identify the type that can be converted. Also, as a guideline, do not pay more than about £20 for your scrap VDU, unless you are certain it is worth more. An unpopular model that nobody wants will probably come your way for as little as £10. Haggle! These are the types of terminal that you may encounter:

- Composite video monitor.
- TTL monitor.
- Controller driven VDU.
- Conventional dumb VDU.
- Intelligent VDU or terminal.

It is important that these types of VDU are explained. Some of them are of no use to us, and even within the ones that look okay, there could be trouble. Basically, there are two components in a VDU – the display and the logic. It is the display, and how the VDU manufacturer has gone about designing it, that is of prime concern to us.

When a manufacturer designs a VDU it has two

options in the display area; it can either design its own scanning circuits to drive a CRT (cathode ray tube) or buy in a complete assembly. The latter approach is more usual, and is the type of VDU we require. There are many manufacturers of CRT displays, and these are the three main variants: composite video monitor; TTL monitor; and monitor without horizontal timebase.

The first type speaks for itself. It will work just by plugging in. Only one problem may occur, which we will discuss later. TTL monitors and those without horizontal timebase require a lot of conversion work, so are not really worth buying.

So, we are looking for a VDU, in which the system manufacturer has used a bought-in standard display, that accepts composite video. How can you identify the sort that will be easy to connect? Here are some guidelines, but at this point you might need the assistance of someone (TV engineer?) who can help.

○ If only the display and logic circuits are in, one board construction (plus the power supply unit, PSU), the VDU was probably designed by the system manufacturer for use in its own system – in which case this isn't the VDU for you.

○The same applies if the printed circuit boards for logic and display are all the same type of design (check for similar tracks, etchings, colour and part numbering).

○ If the display looks like an independent unit (own PSU, contrast, brilliance controls and so on) separate from the logic board, it is likely to be what you are looking for – get your wallet out!

Data 100 and Memorex terminals both use a bought-in display in some of their equipment (made by Motorola). DEC, Videcom and Ferranti do not. Some Newbury terminals are suitable. There are so many makes that it would be impossible to list all the types you may find. Ex-hospital equipment is really good, as due to the user application, ex-hospital VDUs often have very wide bandwidths.

Having got a VDU, you require an interface card to extract the component signals from the compo-

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site video. You may be lucky and get a display that's ready to go. We have one like this, but it still benefits from the signal processing of the video card.

The circuit shown does this job. We have decided not to include a layout, as we feel that if you are going to make this conversion, you should have enough experience (or help) to construct it as shown. The originals were constructed on Vero-board, and connectors fitted to allow them to plug into the backplane of the VDU.

The only problem you may encounter is that of frame flyback blanking. Again, it is not my intention to go deeply into the workings of CRT scanning, but, put very simply, an electron beam is made to scan the tube horizontally. This scan produces a line across the screen. By applying a magnetic field in a different direction, this line is 'opened' up, and a number of lines fill the screen - this is called the raster. The timebase that 'opens' up the scan is the vertical or frame timebase. After

one frame, the beam has to go back to the start to scan another, the moment of time during which it does this is called frame flyback period.

If we were able to see it (due, for instance, to a fault), we would see white lines about one inch apart on top of our display. All domestic TVs have inbuilt circuits that turn the CRT off during field flyback - not all monitors do!

The reason such circuitry is not regarded as the norm in VDUs is simple. It is quite usual for the manufacturer to arrange blanking in his software/hardware. All he has to do is to push the video signal out at the correct moment in time. A simple timing problem when you consider some of the timing that has to be set.

The circuit shown overcomes this problem by including a blanking network, although the point at which you extract a suitable signal may need some experimentation, the frame scan output being the best place to start. For those among you with oscilloscopes, various waveforms are shown, also the DC levels. For interest sake, a block diagram is shown of a typical monitor layout, to show what happens to the composite video signal.

The screen of any CRT is coated with phosphor dots (unless we complicate things with Triniton, AX series, Toshiba *et al*). The smaller the dots, the more you get on the screen, the greater the definition. The most important benefit you will get from a VDU conversion will be higher resolution.

Finally, a word on where to obtain the sort of terminals required. The computing trade journal *Computer Weekly* (which isn't available on bookstands) has many such advertisers in a regular feature called 'Market Place'. A couple of other sources are listed on page 33.

By Mike Houghton, *A computer consultant.*

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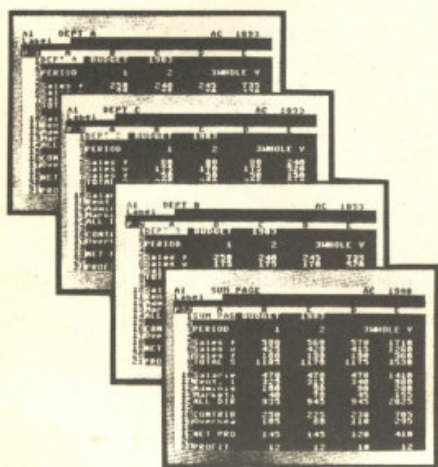
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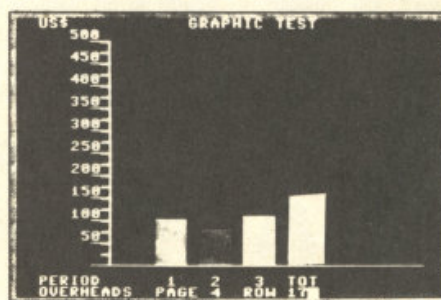
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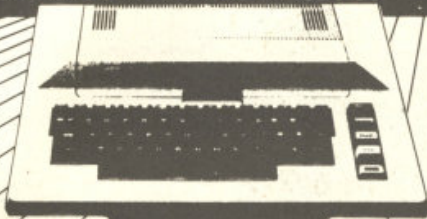
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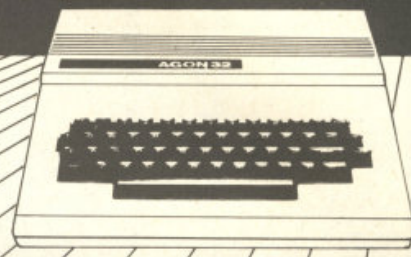
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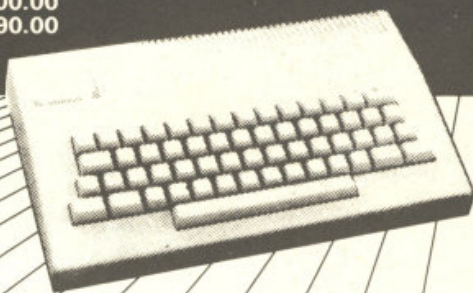
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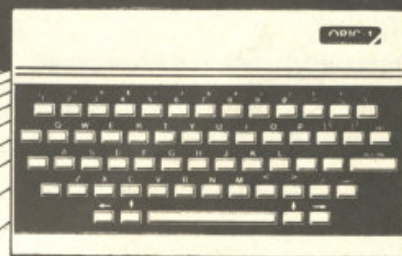
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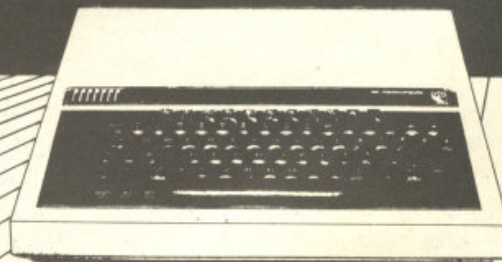
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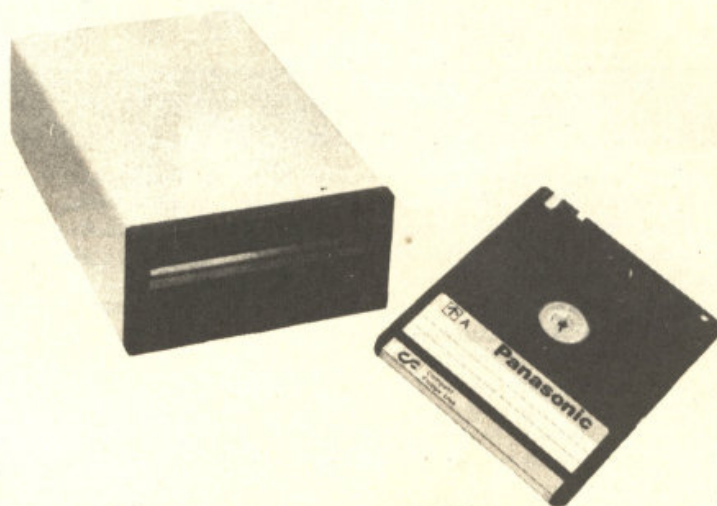
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DOCUMENT AND SURVIVE

DOCUMENTING YOUR PROGRAMS CAN SAVE A LOT OF HASSLE IN THE LONG RUN — WE SHOW YOU HOW.

If a program is really of any use then it will still be so in a year's time — the trouble is the purpose of all the procedures and variable names will be lost in a haze of distant memory. The answer is, of course, to document the program.

Many published program listings are now including some form of documentation. Sometimes just an overall picture is given, but it is becoming more common to document by line numbers and procedure names. This is certainly a move in the right direction, allowing the user to make amendments or just to give them some understanding of what's going on.

More formal methods of documentation have been specified, with the aim of making amendments and improvements possible by people other than the original programmer. You may feel there is a touch of overkill to the approach described here, but you can selectively omit any irrelevant parts and simply use the headings as a basis for organising your own documentation methods.

Documentation can be a big snore, but it's not nearly so painful as having to rewrite a 'not-quite-but-nearly-useful program' over again because you can't understand what the hell's going on. Also, if there are specific rules and headings, documenting doesn't take that long anyway. The five main headings are:

- Program specification.
- Program Descriptive Language.
- The Program.
- Test data and expected results.
- Results from test data.

The first two should be written on a word-processor (because there will always be changes) and the rest would be a mix of printer listings and notes.

Program descriptive language is nothing sinister, but is simply a high-level description of a program in a Pascal (that is, structured)-style syntax. It may not be necessary for a program written in Pascal, Algol or perhaps a well written Structured Basic program, but is very useful for mushy (that is, most!) Basics, and extremely useful for assembler programs. The program specification can be further subdivided into the following headings:

- Title.
- Main purpose of program/function.
- Details of exact inputs.
- Details of exact outputs.
- High level design decisions made within the program.
- Calculations performed.
- Error conditions.

The first two sections may be no more than one word or one sentence long. The inputs and outputs include detail of global variables altered (especially sneakily altered) by the program, as well as what would be described as the 'main stream' of data. A

global variable is one that applies to the whole program, whereas a local variable only applies within the procedure in which it is declared. The beauty (if that's the right word) of this system is that the same format can be applied to the program, any sub-programs, any main procedures and functions, right down to the smallest routine. Consistency is its virtue.

The high level design decisions will include things like which type of algorithm is used, say for sorting, searching, or whatever. This section would probably be the largest (say one or two paragraphs), and should be in plain English text. All quirks, anomalies, short-cuts and sneaky bits should be explained here in full. There is a separate section for calculations, so as not to bog-down the other sections with maths.

The program description language (PDL) shows the structure of the code and data in a language-independent form (that is, unhindered by silly omissions, mushy or unnecessary syntax, or whatever of any computer language). The example given shows some typical PDL (Fig. 1).

The listing of the program should include who wrote it, and, of prime importance, when it was written and last amended. Given two long and nearly identical listings it can be murderous to tell which is the most recent. *Date things!* The code itself should be a well commented and neatly printed copy (Fig. 2). A good rule of thumb is that there should be no less than one comment line for every three lines of code. Basic programmers may well disagree with this rule, as REM statements can slow things down and become a bit of a nuisance. If REMs are avoided then the documentation, as well as being even more essential, needs to be more detailed with regard to the use of variables and so on.

The test data (Fig. 3) should include a typical example of what would normally be fed into the program or function, and what should appear at the other end. But it should also include the extreme examples, like when there is tons of data, or none at all. Examples of test data that go down every major branch of the program, with details of the expected results, is another useful inclusion. Admittedly for many scientific applications this would be practically impossible, because of the complexity of the program. Testing programs is really a full subject in itself, and will be discussed in greater detail in a future issue of *Computer Answers*.

The final section contains the actual print-outs from test runs. Essential when trying to convince someone (a boss) that it really does work. And what happens if it doesn't? Well you documented it as you went along so it'll be easy to find the bugs! No? — Back to the drawing board...

By Dr Peter Turcan, technical editor of *Computer Answers*.

Example:

1:Program Specification

1.1 Title

Number Base Conversion

1.2 Purpose

To convert any number in any given base, to another base.

1.3 Details of inputs

The input is all from the keyboard, three values need to be typed: the number, its base, and the desired base.

1.4 Details of outputs

The output is only to the screen. After a heading, prompts are made for the required input, and the results are displayed.

1.5 Design decisions

This is a utility package, designed mainly for use with developing computer programs. For this reason the maximum base catered for is base 16 (hexadecimal). As many numbers may need to be converted, the conversion procedure can be repeated any number of times. It is anticipated that the most common conversions would involve bases 2,8,10 and 16, however all other bases in the range 2 to 16 are catered for. Only integers can be converted, no fractions.

The procedure is to read in a number in the form of a string (to allow non-numeric input for bases 11 to 16) and to convert this string to a decimal integer. This decimal number is then converted to the required second base. This is done by repeatedly dividing the decimal number by powers of the second base.

1.6 Calculations performed

To convert the string into a decimal number each character in the string is taken in turn, starting with the first, and applied to the following equation:

$$\text{Total} = \text{total} + \text{character} * (\text{source base to the power of the characters position in the string})$$

The character first has to be converted from ASCII to a numeral in the range 0 to 15. If it is found that the number does not lie in this range, then the number cannot be converted.

To convert the decimal into the desired base it is continually divided by a power of the second base. The first number the decimal is divided by is the second base to the power of 20, then to the power of 19, then 18, and so on down

to 0. Note that anything to the power of 0 is 1. The final number is not totalled up, but is printed out as it is calculated. After a digit has been printed out, the value that it represents is deducted from the decimal number.

1.7 Error conditions

The program detects inconsistent input, but will not work properly in the following circumstances:

- a) the converted number requires more than 21 digits. This is only likely to occur when a large base is being converted to base 2 or 3, and can easily be resolved by upping the initial dividing power to more than 20.
- b) the initial number input requires more characters than are allowed in a string (highly unlikely).
- c) the initial number is anything but an integer.
- d) where rounding errors affect the divisions.

Because of the utility nature of the program, rock solid input validation and error messages have not been implemented.

2:Program Descriptive Language

Note: ** means 'to the power of'

PROGRAM CONVERT NUMBER BASES

BEGIN

REPEAT

READ (NUMBER)

IF NUMBER<>0 THEN

BEGIN

READ (SOURCE BASE)

READ (CONVERSION BASE)

IF SOURCE BASE AND CONVERSION BASE ARE LEGAL THEN

BEGIN

DECIMAL=0

FOR CHAR=0 TO LENGTH(NUMBER)-1

BEGIN

DIGIT=NUMBER(CHAR)

IF DIGIT IN 0..9 THEN DIGIT=DIGIT-ASCII('0')

IF DIGIT IN A..Z THEN DIGIT=DIGIT-ASCII('A')

IF DIGIT>SOURCE BASE THEN ERROR

DECIMAL=DECIMAL+((SOURCE BASE ** CHAR)*DIGIT)

END

ZERO FLAG=0

FOR POWER=20 DOWNT0 0

BEGIN

DIGIT=(DECIMAL/(CONVERSION BASE ** POWER))

IF DIGIT<>0 THEN ZERO FLAG=1

IF ZERO FLAG=1 THEN PRINT INTEGRAL PART OF DIGIT IN

FIG. 1
CONTINUED

```

NEW BASE

      DECIMAL=DECIMAL-(INTEGRAL PART OF DIGIT * (CONVERSION
BASE ** POWER))

      END

      END

      END

      UNTIL NUMBER = 0

END OF PROGRAM

```

FIG. 2
PROGRAM

```

1 REM      NUMBER BASE CONVERSION
2 REM      DR PETER J. TURCAN
3 REM      WRITTEN: 20TH APRIL 1983
4 REM      LAST MODIFIED: 25TH JAN 1984
5 REM      -----
9 REM      A$ IS FILLED WITH HEX UNITS
10 DIM A$(15)
20 FOR I = 0 TO 15
30 READ A$(I)
40 NEXT I
50 HOME
55 REM      PRINT A HEADING
60 PRINT "*****"
70 PRINT "* NUMBER BASE CONVERSION *"
80 PRINT "*****"
90 PRINT
94 REM
95 REM      A NUMBER IS ENTERED AS A STRING
96 REM      TO ENABLE NUMBERS WITH BASES
97 REM      GREATER THAN 10 TO BE CONVERTED
98 REM
100 PRINT "ENTER NUMBER TO CONVERT-"
110 PRINT "QUIT BY TYPING 0"
120 PRINT
130 INPUT "NUMBER: ";NM$
140 IF NM$ = "0" THEN END
150 PRINT
160 PRINT "ENTER BASE OF NUMBER-"
170 INPUT "SOURCE BASE: ";BS
174 REM      LARGEST BASE IS 16
175 IF BS < 2 OR BS > 16 GOTO 160
180 PRINT
190 PRINT "ENTER BASE OF CONVERTED NUMBER-"
200 INPUT "CONVERTED BASE: ";BC
205 IF BC < 2 OR BC > 16 GOTO 200
209 REM      TT: TOTALS UP NUMBER FROM STRING NM$
210 TT = 0
220 FOR I = 0 TO LEN (NM$) - 1
225 REM      RE: TAKES CHARACTER FROM STRING
230 RE = ASC ( MID$ (NM$, LEN (NM$) - I,1))
235 REM      IF RE<64 THEN IT IS A NUMBER 0..9
236 REM      IF RE>64 THEN IT IS A LETTER A..Z
240 IF RE < 64 THEN RE = RE - 48
250 IF RE > 64 THEN RE = RE - 55
255 REM      IF RE IS LARGER THAN THE BASE
256 REM      THEN NUMBER CANNOT BE CONVERTED
260 IF RE > = BS THEN GOTO 50
270 IF RE < 0 THEN GOTO 50
280 TT = TT + ((BS ^ I) * RE)
290 NEXT I
299 REM      TT NOW HOLDS A DECIMAL NUMBER
300 REM      CONVERT DECIMAL-BASE2
310 PRINT
320 PRINT "CONVERTED NUMBER: ";
325 REM      FG: SUPPRESSES LEADING ZEROS
330 FG = 0
335 REM      CONTINUALLY DIVIDE TT BY THE
336 REM      POWERS OF THE DESIRED BASE
340 FOR I = 20 TO 0 STEP - 1
349 REM      0.00001 IS ADDED TO HELP AVOID ROUNDING ERRORS
350 N1 = (TT / (BC ^ I)) + 0.00001
360 IF INT (N1) < > 0 THEN FG = 1
370 IF FG = 1 THEN PRINT A$( INT (N1));
380 TT = TT - ((INT (N1)) * (BC ^ I))
390 NEXT I
400 PRINT
405 REM      WAIT FOR ANY KEY
410 INPUT "READY ?";YY$
420 GOTO 50
425 REM      DATA IS HEX DIGITS
430 DATA 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F

```

FIG. 3
TEST DATA

4: Test Data and Expected Results

To test the program a random number is entered to base 16, the result in base 15. This number is re-entered at base 15 and converted to base 14. This process is continued until the number is converted to base 2. This number is then converted back to base 16, and if it is equal, there is a good indication the program is working correctly.

The random number chosen was AB01, to base 16. The final result should be AB01.

A second test is to convert between the most common bases. Starting with AB01 to base 16, through base 10, base 8, base 2 and back to base 16.

5: Results from test data

The first test showed the effect of rounding errors

Test 1:

Number input /base	Number output /base
AB01 16	CEB7 15
CEB7 15	11D4C 14
11D4C 14	16C05 13
16C05 13	21400 12
21400 12	2A9B6 11
2A9B6 11	43775 10
43775 10	66037 9
66037 9	125376 8
125376 8	241422 7
241422 7	534353 6
534353 6	2400043 5
2400043 5	22223331 4
22223331 4	2020001012 3
2020001012 3	1010101011111100 (2)
1010101011111100 (2)	AAFC 16

A total of 4 units were dropped in this sequence of conversions.

Test 2:

In the second test the conversions are all done correctly.

AB01 16	43777 10
43777 10	125401 8
125401 8	1010101100000001 2
1010101100000001 (2)	AB01 16

(ENDS)

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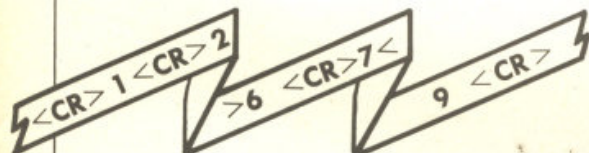
One of a micro's biggest drawbacks is the lack of off-line storage, especially for those amongst us who cannot afford disk drives. There is however, a technique by which this problem can be reduced — data compaction.

For the user with two tape drives, part of the benefits gained by this technique will already have been acquired — faster access to data, reduction in memory usage (only single tape users), less physical tape usage for data.

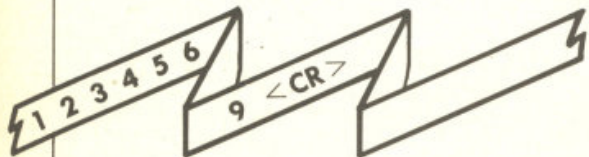
The main benefits for both one and two drive users is in reduced tape usage, for non-data and faster retrieval. Using the technique described here a quantity of data will take less physical space than the conventional method when using the full length of a pre-defined field. It will also result in a shorter time to read/write. In percentage terms, if we take as an example a file of five, 10 character data fields (fully used) per record, the technique will give a saving of eight per cent.

In character terms, on a file of 1,000 records, the saving would be 4,000 characters out of a total of 55,000. All this reduction is achieved by the concatenation of the individual data fields into a record. Faster access to data is gained by reducing the number of read/writes required for a given quantity of data. Also, because more data is 'packed' into a 'block', more data is read in less time.

If we now use an example of nine single character fields, the data would previously have looked like this:



Using the technique the data would now be written like this:



Because we know each field is only one character long, there is no need for separators.

Reduction in memory usage is gained by reducing the number of data fields that need to be dimensioned. Only stored records themselves need to be dimensioned, all the individual fields need only a single definition. This also reduces the number of characters required to reference a variable in the program, and this again reduces memory usage. In the example below, 12 characters are saved on definition alone. Although extra coding is required to convert R(25) to its constituent parts A/B/C, every reference of these fields will save three or four characters, or even more if a variable is used in place of a value.

DIM A(25),B(25),C(25)

DIM R(25)

Reduction in physical tape usage is achieved by

using more of the wasted space consumed when data is written. On the Commodore CBM 4032 for example, at least one carriage return is written for every PRINT command used, regardless of the length of the field, by eliminating these characters the usage is reduced.

From this it can be seen that a one character field will require two characters of tape space in which to be written. Using this technique 80 single character fields can be written in 81 characters of tape space. By the normal method this would require 160 tape characters, a saving in this case of approximately 50 per cent:

Before	1	C _R	2	C _R	3	C _R	4	C _R	5	C _R	6	C _R								
After	1	2	3	4	5	6	C _R													

The concept behind the technique is simple. All data can be stored in alpha-numeric fields or variables. Integer and decimal fields can be converted to alpha-numeric format by use of the STR\$ command (decimal points will automatically be inserted as a 'period'). Following on from this, all alpha-numeric fields can be concatenated by using the '+' action — the result is a record containing a number of fields. To recreate the individual data fields the string handling and numeric conversion commands can be used, and these are LEFT\$, RIGHT\$, MID\$, and VAL(), which can be seen in the examples.

To use the string handling commands, it is necessary to know the length and start position of the field within the record. It is obvious now that the method just outlined will not be completely adequate, as all fields have different lengths and all numeric fields also vary. Now it can be seen that the first action to be taken after the decision to use

Fig. 1 (left) shows a Record Create, and Fig. 2 (below) a Field Extraction routine using the first method of program coding.

FIG. 1

```
100 X1$=STR$(C%)
110 X2$=STR$(I)
120 R$=X1$+" "X2$+" "N$+" "
130 PRINT#1,R$
```

FIG. 2

```
200 INPUT#2,R$:X2=1:X1=0
210 FORX=1TOLEN(R$)
220 IFMID$(R$,X,1)=" "THENGOSUB250
230 NEXTX
240 GOTO500
250 X1=X1+1
260 ONX1GOTO280,290,300
270 PRINT"FIELDS ERROR":STOP
280 C%=VAL(MID$(R$,X2,X-1)):GOTO310
290 I=VAL(MID$(R$,X2,X-X2)):GOTO310
300 N%=MID$(R$,X2,X-X2)
310 X2=X+1
320 RETURN
```


PROGRAMMING

The technique given here apply to Pet Basic, which covers the Pet range of machines, the Vic 20 and Commodore 64.

the record technique, is to decide on the length and start location parameters for each field. In some cases it is not always required to have a start location, as we will see later in the examples.

Let's begin by using a traditional example to demonstrate the technique, an invoice. The individual fields will be:

C%	Customer No.	Range 1-9999	Numeric
N\$	Customer Name	Max length 25	A/Numeric
I	Invoice value	Range 0.01-9999.99	Numeric

(Note that when using decimal fields, one should be added to the maximum length of the field to allow for the decimal point.)

There are two methods within the technique by which the data can now be concatenated into a record.

○ Convert the numeric fields to alpha-numeric; concatenate the three fields together; remove space from the front of converted numeric data; insert special characters in between data fields.

○ Convert the numeric fields to alpha-numeric; remove space from the front of converted numeric data; expand each individual field to its maximum length with special characters; concatenate the three fields together.

Below is a representation of how both methods would appear. The '*' is used to denote the special character.

DATA - C% = 9876 I = 12.34 N\$ = A.N.OTHER
 Method one: Before: 9876C%12.34C%A.N.OTHERC%
 After: 9876*12.34*A.N.OTHER*C%
 Method two: Before: 9876C%12.34C%A.N.OTHERC%
 After: 987612.34***A.N.OTHERC%

The advantages of one over two are:

○ The records written in one are shorter than in two.

○ The extraction of the data fields is simpler in one than two, this will be seen in the coding examples.

FIG. 3

```

100 R$=""
110 X1$=STR$(C%)
120 X2=4:GOSUB170:R$=R$+X1$
130 X1$=STR$(I)
140 X2=7:GOSUB170:R$=R$+X1$
150 R$=R$+N$
160 PRINT#1,R$:GOTO63999
170 IFLEFT$(X1$,1)=" " THENX1$=RIGHT$(X1$,LEN(X1$)-1)
180 IFLEN(X1$)=X2THEN230
190 IFLEN(X1$)>X2THENPRINT"DATA FIELD ERROR":STOP
200 FORX=LEN(X1$)+1TOX2
210 X1$=X1$+" "
220 NEXTX
230 RETURN
    
```

Fig. 3 (above) shows a Record Create, and Fig. 4 (right) a Field Extraction routine using the second method of program coding.

FIG. 4

```

100 INPUT#2,R$
110 C%=VAL(LEFT$(R$,4))
120 I=VAL(MID$(R$,5,7))
130 X1$=RIGHT$(R$,LEN(R$)-11)
140 GOSUB170
150 N$=X2$
160 GOTO230
170 X2$=""
180 FORX=1TOLEN(X1$)
190 IFMID$(X1$,X,1)="*"THEN210
200 X2$=X2$+MID$(X1$,X,1)
210 NEXTX
220 RETURN
    
```

○ There is no need to remove the special characters, inserted to pad the field to its length, to enable reconstitution of alpha-numeric to their original form. For original numeric fields this does not pose a problem, as the VAL command will ignore them.

○ Care must be taken in two, that the data fields do not exceed their stated values or lengths. This does not occur with method one.

Unfortunately although method one does have these advantages over two, it does not give the tape usage reduction benefit. As can be seen in the example, the carriage return has only been replaced by an asterisk. However, the faster access and core usage reduction are still present.

If the data fields to be used are always the same field length, then method two will give the most benefits. Note here that the maximum field lengths should be used when calculating the number of possible fields in a record. If one record is not adequate for all the fields, any number may be used, however, a record type code will be required to identify which record has just been read, to the program. The coding for this type of data is more complex than that in the examples, but the principle remains the same.

Optimum record sizing is an important action in this technique and must be carried out for each program. Each machine will use a different 'buffer' size, and the number of records within the buffer will differ in each program. On the Commodore CBM 4032, for example, the buffer is 191 characters long - so using 80 character records would leave 31 characters after each two writes. On the next write the machine will have to output the buffer area to tape and may write those 31 characters as blanks. Therefore, the record sizing should leave as little space in the buffer as possible.

PROGRAM CODING EXAMPLES

The details of each example follows:

Method one: Record Create (see Fig. 1)

Field Extraction (see Fig. 2)

Variables R\$ Record field.

X Character field.

X1 Field no.

X1\$ Temporary field.

X2 Field start character position.

X2\$ Temporary field.

Method two: Record Create (see Fig. 3)

Field Extraction (see Fig. 4)

Variables R\$ Record field.

X Character no. within field.

X1\$ Expand/Contract input field.

X2 Field maximum length.

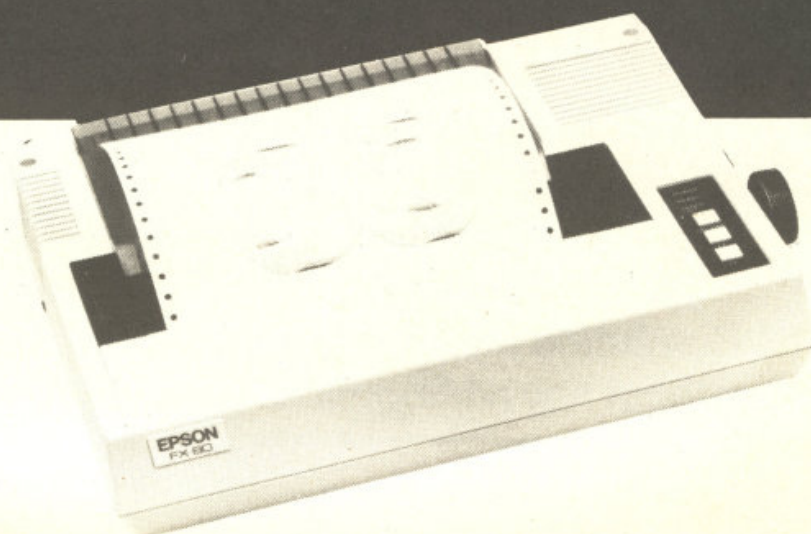
X2\$ Contract output field.

It is necessary to identify the end of file to the program, and using this technique this is quite simple. As the last record output on a file, the literal EOF should be written. On reading the file this can be checked for, before the reconstruct routine is called, and the appropriate end of file programming actioned. The methods and routines given here are for general record usage, but with individual parameters added by the programmer. It is possible to make the technique even more general by writing those parameters as the first record on the file. On re-reading they can be used to define the field lengths, and so on.

An additional program is required to create the data file originally, with the parameter record written to it, but this could use the coding given in this article, and of course one program would create all files. So as you can see, this is just the first step along the road to record handling.

By Len Keighley, a member of The Readers Council.

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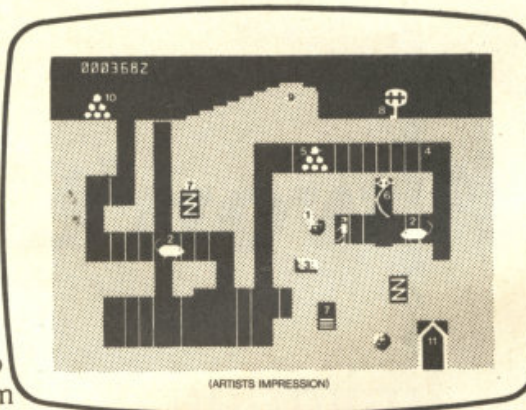
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SECRET VISIONS

PROGRAMMING

DISCOVER THE ATARI 800's 'HIDDEN' GRAPHICS MODES.

Hidden within the Atari 800 micro is a remarkable array of graphics possibilities. One of the most powerful allows you to have different display modes on the screen at the same time. But how can they be exploited?

Inside the Atari is a list of numbers that tells the computer which graphics mode it is in, and changing the graphics mode alters this list. There is one number in the list for each row of graphics on the screen (see Fig. 1). For instance, graphics mode 3 has 24 numbers, graphics mode 7 has 96 numbers; therefore we call this list of numbers the Display List. We can alter the Display List inside the computer to give us different graphics modes on one screen. In other words we can create our own custom display list.

FIG. 1
MODE LIST TABLE

Graphics mode	Mode type	Number of vertical rows	RAM required (bytes)
0	Text	24	993
1	Text	24	513
2	Text	12	261
3	Graphics	24	273
4	Graphics	48	537
5	Graphics	48	1,017
6	Graphics	96	2,025
7	Graphics	96	3,945
8	Graphics	192	7,900

We have to first decide how we want the screen to look when we have finished. In the example program (Fig. 2) we have used a screen that has a large graphics mode 2 heading with a graphics mode 1 sub title. The rest of the screen is given over to graphics mode 3. We cannot, however, just mix these modes as we please. The Atari will only let you use 192 scan lines for graphics display.

What's a scan line? Well, the television display that you look at is produced by a light beam that travels across the screen from left to right and top to bottom. It scans a complete screen around 50 times every second. Each line that the beam produces on the screen is called a scan line. Each graphics mode is a certain number of scan lines high. Mode 8 is one scan line high, this gives us the Atari's maximum resolution of 192 lines. Mode 3, if you remember, is made up of 24 rows so each row has 8 scan lines in it. This information is vital because when we make up our custom display list we must not exceed the Atari's maximum resolution of 192 scan lines.

In our example we have allocated three rows of mode 2, two rows of mode 1 and sixteen of mode 3. A mode 2 screen is made up of 12 rows, and if we divide this into 192 the answer is 16. This is the number of scan lines in each mode 2 row. Mode 1 on the other hand uses eight scan lines per row; this means that our heading will have 40 eight scan lines in mode 2 and sixteen in mode 1, making 64. This leaves us with 128 scan lines. Surprise, surprise!

Each mode 3 row uses eight scan lines, 128 divided by 8 leaves us with 16 rows of mode 3. The best way to design a custom display list is with graph paper. Allocate 192 lines to represent the scan lines and work within those boundaries.

Now that we have worked out our custom display list how do we get it into the computer?

First we have to allocate a graphics mode for the whole program. This must be the mode that uses the most memory in our custom display list. In the example it is mode 1 which uses 513 bytes of RAM. Next we must find where the display list begins. It is not always in the same place, so we peek into two locations to find it (Line 20).

The next line changes the number in the memory location just before the beginning of the display list. We do not have to alter this line if the graphics mode at the top of the screen is the one that we have used in line 10, in the example it is not. Use the table below to give you the number you need.

Mode: 0 1 2* 3 4 5 6 7 8
66 70 71 72 73 74 75 77 79

Line 40 alters the display list to give us the required graphics modes. We are already in graphics mode 1 so we have to alter the list to accommodate modes 2 and 3. To change the display list we POKE DLIST + ROW number with the correct number for the mode we want in that row. The numbers are obtained by subtracting 64 from the numbers given in the table above. Mode 2 is 7 and mode 3 is 8. Line 40 alters the list to give us the required three rows of graphics 2. Don't forget that we altered the first row in line 30, which is why we are POKEing into only two locations in line 40. Line 50 alters the list to give us mode 3 for the rest of the screen.

Line 60 tells the computer where to end the display list. We do this because we have ended up with less rows than when we started. Graphics 1 has twenty four rows while graphics 2 has only twelve. To do this we POKE 65 into the next display list location. This tells the computer to return to the beginning of the display list. We also remind the computer where the beginning of the list is. When using your own custom list you will have to alter the locations for the display list (22, 23 and 24 are the redundant row numbers in our example).

Lines 80 and 90 print the title in the desired modes. Location 87 used in these lines puts the computer into the graphics mode that you want to use. Line 80 requires us to print in mode 2 so we poke 87,2.

There are many other ways of customising the display lists and countless ways of entering it into the computer. We have used the one we always use, because it seems simplest. Look around for other ways until you find one that you like. There are many other sources, such as books and programs printed in magazines. You can always tell the start of the display list sub-section because it starts in a line similar to line 20 in the Fig. 2.

Experiment with the program and make up your own display lists. Once you get the feel for it you can add a lot to the look of your programs.

Fig. 1 (far left) shows a table with which to find the number to change the Atari graphics mode.

The example listing (below) demonstrates how graphics modes can be juggled with to obtain interesting results.

FIG. 2
EXAMPLE PROGRAM

```

10 GRAPHICS 1
20 DLIST=PEEK(560)+PEEK(561)*256+4
30 POKE DLIST-1,71
40 POKE DLIST+2,7:POKE DLIST+3,7
50 FOR ROW=6 TO 21:POKE DLIST+ROW,8:NEXT ROW
60 POKE DLIST+22,65:POKE DLIST+23,PEEK(560):POKE DLIST+24,PEEK(561)
70 SETCOLOR 4,4,2
80 POKE 87,2:POSITION 6,0:7 #6:"THIS IS":POSITION 3,1:7 #6:"GRAPHICS MODE":POSIT
ION 8,2:PRINT #6:"TWO"
90 POKE 87,1:POSITION 6,3:7 #6:"this is ":POSITION 1,4:7 #6:"graphics mode one"
    
```


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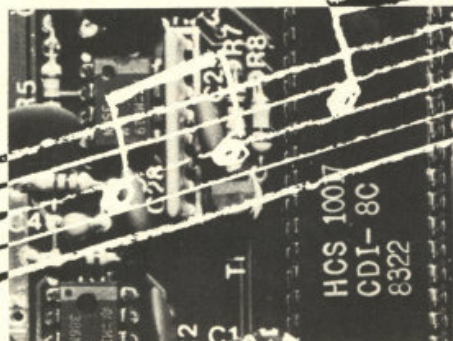
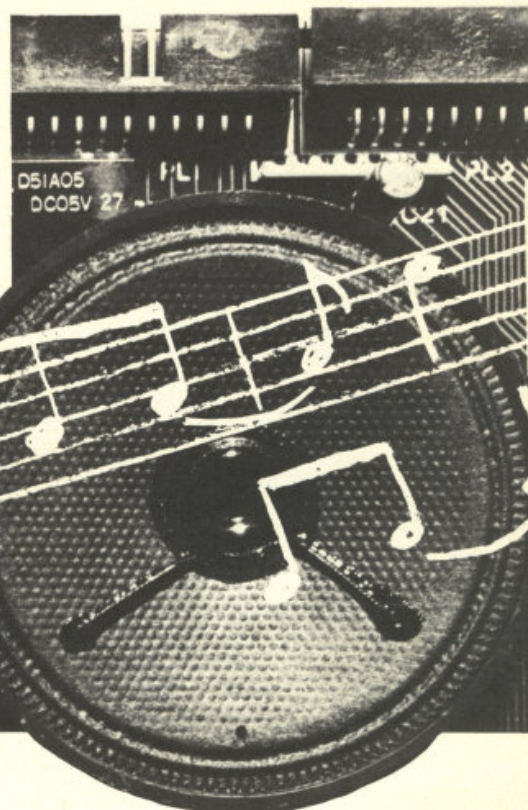
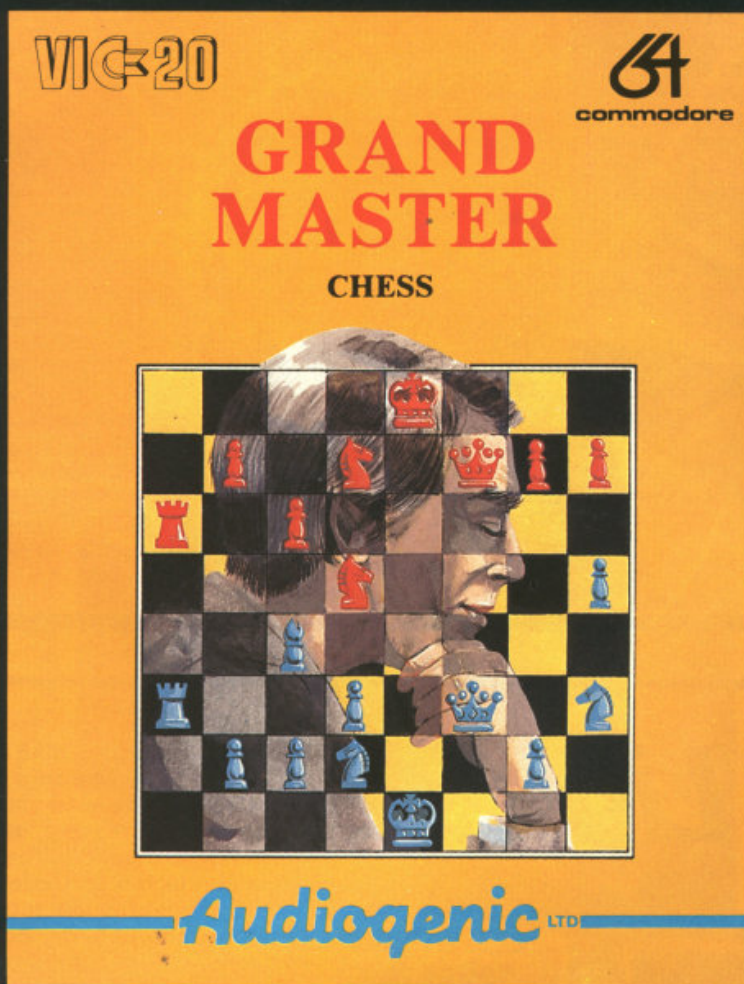


FIG. 1
ORIC SYNTH

```

10 GOSUB1000
20 GOSUBBEGIN
30 GOSUBTUNE
40 GOSUBFINISH
50 END
990 REM SETTING UP ROUTINES
995 REM FIRST READ THE KEYBOARD DATA
1000 CLS
1010 DIM NO$(127,1), 'NO$ HOLDS THE NOTES
    FOR EACH KEY
1020 REPEAT
1030 READK,NO$(K,0),NO$(K,1)
1040 UNTILK=127
1090 REM SET SUBROUTINE ADDRESSES
1100 BEGIN=2000 'DRAWS THE KEYBOARD
    AND SETS MANDOLIN
1110 TUNE=3000 'THE MAIN PLAYING R
    OUTINE
1120 NO=4000 'PLAYS THE NOTES
1130 INSTRUMENT=5000 'CHANGES THE VOICES
1140 MESSAGE=6000 'DISPLAYS CHOSEN VO
    ICE
1150 FINISH=7000 'ENDS PROGRAM
1190 REM DISABLE CURSOR AND CLICK
1200 POKE618,10
1500 RETURN
1990 REM SUBROUTINE BEGIN
1995 REM DRAWS KEYBOARD AND SELECTS FIR
    ST VOICE
2000 CLS
2010 B$=CHR$(160) ' BLACK SQUARE
2020 K2$="! "+B$+" "+B$+" "
2030 K3$=K2$+B$+" "
2040 L$="! "+K2$+K3$+K2$+K2$+" ;"
2050 PLOT2,1,CHR$(9)+"@PPPPPPPPPPPPPPPP
    PPPPPPPPPPPPPPP"
2060 PLOT3,2,L$
2070 PLOT3,3,L$
2080 PLOT3,4,L$
2090 PLOT9,3,CHR$(178)+" "+CHR$(179)
2100 PLOT15,3,CHR$(181)+" "+CHR$(182)+"
    "+CHR$(183)
2110 PLOT23,3,CHR$(185)+" "+CHR$(176)
2120 PLOT29,3,CHR$(189)+" "+CHR$(220)
2130 PLOT3,5,"! | | | | | | | | | |
    | | |"
2140 PLOT3,6,"!ESC!Q!W!E!R!T!Y!U!I!O!P!
    !|DEL!"
2150 PLOT2,7,CHR$(9)+CHR$(34)+"#####
    #####"
2200 DOKE621,48320 'LOWER TOP OF SCREEN
2210 POKE623,19 'REDUCE SCREEN HEIGHT
2300 K$="M" 'SELECT MANDOLIN
2310 GOSUB INSTRUMENT
2320 GOSUB MESSAGE
2500 RETURN
2990 REM SUBROUTINE TUNE
2995 REM WHERE IT ALL HAPPENS
3000 REPEAT
3010 : REPEAT
3020 : K$=KEY$ :REM CHECK KEYBOARD
3030 : UNTILK$<>" "
3040 : REM CHECK THE KEYSTROKE
3050 : N= NO$(ASC(K$),1)
3060 : IFN=0THENGOSUBINSTRUMENT:GOSUBMES
    SAGE:GOTO3100
3070 : O=OC+NO$(ASC(K$),0)
3080 : GOSUBNO
3100 UNTILK$=" "
3200 RETURN
3990 REM SUBROUTINE NO
3995 REM SOUNDS THE NOTES
4000 MUSIC1,O,N,0
4010 MUSIC2,O,N,0
    
```


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```

4020 PLAYCH,Z,E,P
4100 RETURN
4990 REM SUBROUTINE INSTRUMENT
4995 REM CONTROLS THE VOICE
5000 IFK$="B" THEN E=1:P=1750:Z=0:CH=3:OC=
1:I$=K$
5010 IFK$="C" THEN E=1:P=5000:Z=0:CH=1:OC=
2:I$=K$
5020 IFK$="M" THEN E=1:P=2000:Z=0:CH=3:OC=
3:I$=K$
5030 IFK$="U" THEN E=4:P=60:Z=1:CH=3:OC=3:
I$=K$
5100 RETURN
5990 REM SUBROUTINE MESSAGE
5995 REM DISPLAYS VOICE OPTIONS
6000 RED$=" "+CHR$(27)+"A"
6010 B$=" BASS"
6020 C$=" CLARINET"
6030 M$=" MANDOLIN"
6040 U$=" VIBRATO"
6050 IFI$="B" THEN B$=RED$+MID$(B$,3)
6060 IFI$="C" THEN C$=RED$+MID$(C$,3)
6070 IFI$="M" THEN M$=RED$+MID$(M$,3)
6080 IFI$="U" THEN U$=RED$+MID$(U$,3)
6100 PRINTCHR$(30) 'MOVE TO TOP OF SCRE
EN
6110 PRINT:PRINT:PRINTB$
6120 PRINT:PRINT:PRINTC$
6130 PRINT:PRINT:PRINTM$
6140 PRINT:PRINT:PRINTU$
6150 PRINT:PRINT:PRINT"PRESS SPACE BAR T
O END"
6500 RETURN
6990 REM SUBROUTINE FINISH
6995 REM RESET BEFORE ENDING
7000 PLAY0,0,0,0
7010 POKE618,3 'TURN ON CLICK AND C
URSOR
7020 DOKE621,48000 'RESET SCREEN
7030 POKE623,27
7040 CLS
7500 RETURN
9990 REM THE DATA
9995 REM FOR ARRAY NO*
10000 DATA27,-1,12,48,1,4,50,0,2
10010 DATA51,0,4,53,0,7,54,0,9
10020 DATA55,0,11,57,1,2,61,1,7
10030 DATA69,0,5,73,1,1,79,1,3
10040 DATA80,1,5,81,0,1,82,0,6
10050 DATA84,0,8,85,0,12,87,0,3
10060 DATA89,0,10,91,1,6,92,1,9
10070 DATA93,1,8,127,1,10

```

This Oric synthesizer program is by Peter Lupton and Frazer Robinson, and taken from their Oric Handbook, published by PCW/Century, priced £5.95.

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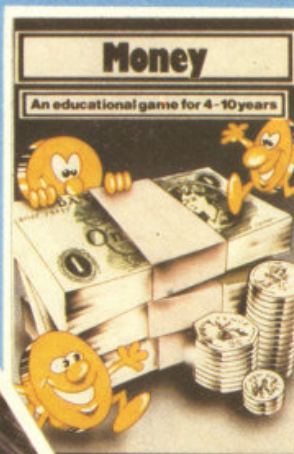
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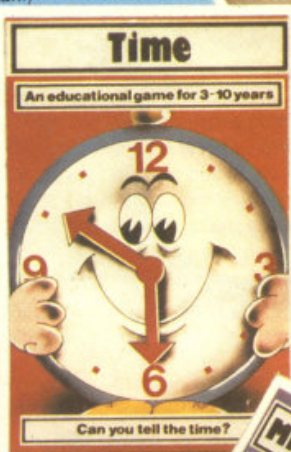
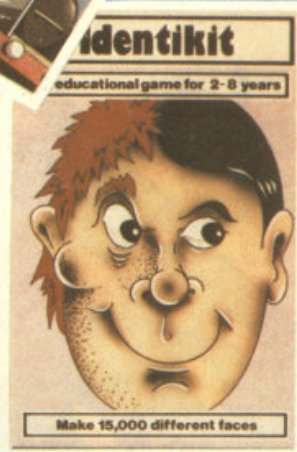
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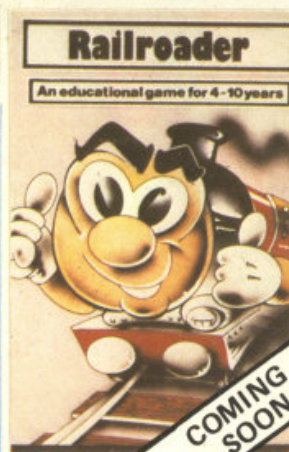


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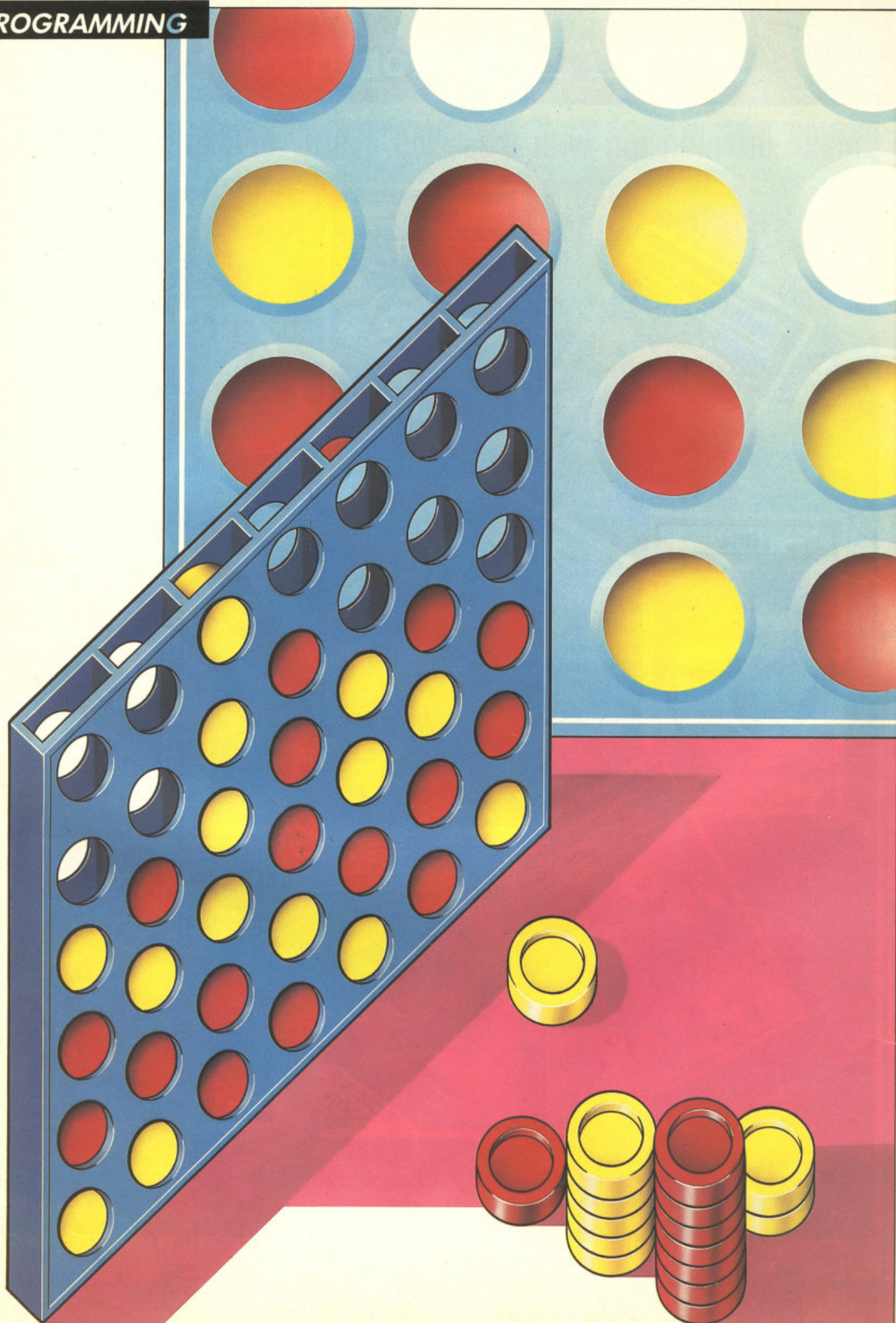
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The concept of the game is very simple: on a board of 7 columns, each 6 units high, the winner is the first to make a line of four. Moves are made alternately, each player dropping one of their own counters into any one of the columns. A winning line can be horizontal, vertical or diagonal, similar in a way to noughts and crosses. *Fig. 1* shows a typical end result, the line of four counters in the fourth row up winning the game. *Fig. 2* gives a listing of the game for the Spectrum, but we will list translations for other micros in future issues.

The player who starts is chosen at random, and then each player alternates until either wins, or 42 moves have been made – a draw. You can select one of four levels for the computer player. Level one is fast and thick, level two is quite fast and defensive, level three is a bit slower but plays better, and level four is slowest to make a move, but plays best.

The computer players strategy is based on summing the following components:

○ *The column and row positions.* In general the lower and more central the position the better.

Column number: 1 2 3 4 5 6 7:

Weight: 1234321.

Row number: 1 2 3 4 5 6;

Weight: 543210.

○ *The attacking value.* A weighting is given to a move that makes two, three or four in a row. The weightings are accumulative, so a move that makes three horizontally and vertically is preferable to one that makes a line of three just diagonally; so that –

For making . . . Weight

For making a win	10,000
------------------	--------

3 horizontally	30
----------------	----

3 diagonally	28
--------------	----

3 diagonally	25
3 vertically	26

2 in any direction	6
--------------------	---

○ *The defensive value.* This is based on preventing the opponent making either two, three or four in a line. Obviously a high value is given to preventing a defeat, so that –

For preventing... Weight

For preventing a defeat	1,000
-------------------------	-------

3 horizontally	15
----------------	----

3 diagonally	14
--------------	----

3 diagonally	11
3 vertically	13

2 in any direction	2
--------------------	---

○ *The human player's next move.* This is a 'what if' evaluation. The higher levels will avoid making a move that results in a good move (not necessarily a win) for the human player. This makes it more difficult for the player to lay a trap for the computer.

In order to be able to calculate the value of a position, the program looks three spaces in each direction, adding up the number of their pieces, the number of empty locations and stopping if an

opponents piece is found. Your pieces are complete red circles, the Spectrum's are magenta circles with a dash in the middle. The pieces will drop into the columns when a move is made.

Your grey matter will not be over-exercised by playing at level one, but you will need to have some 'fore-sight' before you will hammer level four.

By Dr Peter Turcan, technical editor of *Computer Answers*.

Below: Fig. 1 shows the board after two moves; Fig. 2 contains the Four-Sight listing for the 48/16K Spectrum.

FIG. 1 TYPICAL WIN STRATEGY

```
*****
* Computer Answers *
*   Four-sight   *
*****
```

Level : 4

[illegible]

1 2 3 4 5 6 7

I choose column 2

Hard Lines, I've won!

FIG. 2
FOUR-SIGHT
LISTING

```

1 PAPER 6
2 INK 0
3 CLS
4 DIM y(12)
5 DIM x(12)
6 DIM b$(7,6)
7 DIM h(7)
8 DIM z(7)
9 LET tm=0
10 LET wc=0
11 LET wh=0
12 LET st=0
13 LET p2=BIN 00111000
14 LET p3=BIN 01111100
15 LET p4=BIN 01000100
16 FOR i=1 TO 2
17 READ p$
18 FOR j=0 TO 7
19 READ a: POKE USR p$+j,a
20 NEXT j
21 NEXT i
22 GO TO 90
23 DATA "p",0,p2,p3,p3,p3,p2,0,0
24 DATA "q",0,p2,p3,p4,p3,p2,0,0
25 GO SUB 5900
26 GO SUB 1000
27 GO SUB 2000
28 RANDOMIZE
29 REM I=spectrum 0=human
30 LET go=INT (RND*2)
31 IF go=0 THEN GO SUB 4000
32 LET go=1
33 GO SUB 5000
34 IF wc=1 OR tm=42 THEN GO TO 260
35 LET go=0
36 GO SUB 4000
37 IF wh=0 AND wc=0 AND tm<42 THEN GO TO 224
38 PRINT AT 17,3;
39 IF wc=1 THEN PRINT " Hard lines, I've won!": GO TO 300
40 IF wh=1 THEN PRINT " Well done, you win!": GO TO 300
41 IF tm=42 THEN PRINT " Good game, no winner"
42 STOP
43 REM init board
44 FOR i=1 TO 7
45 LET h(i)=1
46 FOR j=1 TO 6

```



```

1030 LET b$(i,j)="."
1040 NEXT j
1050 NEXT i
1100 RETURN
2000 REM draw board
2005 PRINT AT 0,0;
2010 PRINT "*****"
2020 PRINT " * Computer Answers *"
2025 PRINT " * Four-sight *"
2030 PRINT "*****"
2040 PRINT
2050 PRINT
2055 INK 1
2060 FOR j=6 TO 1 STEP -1
2065 PRINT " ";CHR$(138);" ";
2070 FOR i=1 TO 7
2075 PRINT b$(i,j);" ";
2080 NEXT i
2085 PRINT CHR$(133)
2090 NEXT j
2095 PRINT " ";CHR$(142);
2097 FOR j=1 TO 15: PRINT CHR$(140);: NEXT j: PRINT CHR$(141)
2100 PRINT " 1 2 3 4 5 6 7"
2102 INK 0
2103 PRINT
2104 PRINT
2105 PRINT
2120 PRINT " press 0 to quit "
2125 INPUT "which level(1-4):";lv
2128 IF lv>4 OR lv<1 THEN GO TO 2125
2129 PRINT AT 5,0;"level:";lv;
2130 RETURN
4000 REM humans move
4020 INPUT "Column Number:";c
4025 IF c<0 OR c>7 THEN GO TO 4020
4027 IF c=0 THEN STOP
4030 IF h(c)=7 THEN GO TO 4020
4035 LET cw=1
4036 LET rw=h(c)
4037 LET cl=c
4038 LET s$="0"
4045 GO SUB 6000
4050 IF maxc>3 THEN LET wh=1
4060 GO SUB 8000
4070 RETURN
5000 PRINT AT 15,7;"I'm thinking hard "
5001 IF lv>1 THEN GO TO 5015
5002 LET c=1+INT(RND*7)
5003 IF h(c)>=5 THEN GO TO 5002
5005 LET best=c
5006 GO SUB 5540
5008 GO TO 5500
5015 IF tm=0 THEN LET best=4: GO TO 5500
5020 LET best=0: LET mstt=0: LET bcs=-9999: LET c=1
5023 LET cw=0
5025 IF wc=1 OR c=8 THEN GO TO 5500
5030 IF h(c)=7 THEN GO TO 5480
5050 LET cl=c: LET rw=h(c)
5055 GO SUB 5800
5056 LET mys=sum
5060 LET hiss=0
5065 IF h(c)+1=7 OR lv<4 THEN GO TO 5100
5070 LET b$(c,h(c))="X"
5075 LET go=0: LET rw=rw+1
5085 GO SUB 6000
5087 GO SUB 5600
5090 LET hiss=sum
5095 LET b$(c,h(c))="." : LET go=1: LET rw=rw-1
5100 IF mys<1000 THEN GO TO 5130
5110 LET bcs=5000: LET best=c
5120 GO TO 5400
5130 IF mys-hiss<=bcs THEN GO TO 5180
5140 LET bcs=mys-hiss: LET best=c
5150 GO TO 5400
5180 IF mys-hiss=bcs AND mys>mstt THEN GO TO 5200
5190 GO TO 5400
5200 LET mstt=mys: LET best=c
5400 IF mys>10000 THEN LET wc=1
5480 LET c=c+1
5490 GO TO 5025
5500 REM best move
5503 LET c=best
5505 IF lv=2 THEN GO SUB 5540
5520 GO SUB 8000
5530 RETURN
5540 LET cw=1: LET rw=h(c): LET cl=c: LET s$="X"
5545 GO SUB 6000
5550 IF maxc>3 THEN LET wc=1
5555 RETURN
5600 LET sum=(horc+1)+x(upc+5)+x(downc+5)+x(vertc+9)
5620 RETURN
5800 LET cw=0: LET go=1
5810 IF lv=2 THEN LET sum=0: GO TO 5825
5815 GO SUB 6000
5820 GO SUB 5600
5825 LET esum=sum
5830 LET go=0
5845 GO SUB 6000
5850 LET sum=y(horc+1)+y(upc+5)+y(downc+5)+y(vertc+9)
5855 LET go=1
5860 LET sum=sum+sum+z(c)+(6-h(c))
5890 RETURN
5900 REM init arrays
5910 FOR k=1 TO 7
5920 READ z(k)
5930 NEXT k
5935 FOR k=1 TO 12
5938 READ x(k)
5940 NEXT k
5943 FOR k=1 TO 12
5946 READ y(k)
5948 NEXT k
5950 RETURN
5955 DATA 1,2,3,4,3,2,1
5960 DATA 0,6,30,10000,0,6,28,10000,0,6,26,10000
5970 DATA 0,2,15,1000,0,2,14,1000,0,2,13,1000
6000 IF go=0 THEN LET s$="0"
6020 IF go=1 THEN LET s$="X"
6030 LET one=-1: LET two=0: LET three=1: LET four=0
6035 LET con1=1: LET con2=0: LET con3=7: LET con4=0
6040 GO SUB 9000
6045 LET horc=sch
6050 LET one=-1: LET two=-1: LET three=1: LET four=1
6055 LET con1=1: LET con2=1: LET con3=7: LET con4=6
6060 GO SUB 9000
6065 LET upc=sch
6070 LET one=-1: LET two=1: LET three=1: LET four=-1
6075 LET con1=1: LET con2=6: LET con3=7: LET con4=1
6080 GO SUB 9000
6085 LET downc=sch
6090 LET one=0: LET two=-1: LET three=0: LET four=1
6095 LET con1=0: LET con2=1: LET con3=0: LET con4=6
6100 GO SUB 9000
6105 LET vertc=sch
6110 IF cw=0 THEN RETURN
6120 LET maxc=horc
6130 IF upc>maxc THEN LET maxc=upc
6140 IF downc>maxc THEN LET maxc=downc
6150 IF vertc>maxc THEN LET maxc=vertc
6160 RETURN
7000 LET gap=0: LET l=1
7020 IF col=fst OR row=snd OR st=1 OR l=4 THEN RETURN
7050 LET col=col+aone: LET row=row+atwo
7060 IF b$(col,row)="." THEN LET gap=1: LET up=up+1: GO TO 7200
7100 IF b$(col,row)<>s$ THEN LET st=1: GO TO 7200
7110 IF gap=0 THEN LET ac=ac+1
7120 IF gap=1 THEN LET dc=dc+1
7200 LET l=l+1
7210 GO TO 7020
8000 IF go=0 THEN GO TO 8040
8020 PRINT AT 15,5;
8025 PRINT " I choose column ";c
8030 LET b$(c,h(c))="X"
8035 GO TO 8043
8040 LET b$(c,h(c))="0"
8043 GO SUB 9300
8050 LET h(c)=h(c)+1
8055 LET tm=tm+1
8060 RETURN
8100 LET eval=0
8105 IF ac<>0 THEN GO TO 8200
8110 IF dc=1 AND up>2 THEN LET eval=1
8120 IF dc>1 AND up>1 THEN LET eval=2
8195 GO TO 9240
8200 IF ac<>1 THEN GO TO 8300
8210 IF dc=0 AND up>1 THEN LET eval=1
8220 IF dc>0 AND up>0 THEN LET eval=2
8295 GO TO 9240
8300 IF ac<>2 THEN GO TO 8400
8310 IF up>0 THEN LET eval=2
8395 GO TO 9240
8400 LET eval=3
8405 GO TO 9240
9000 LET dc=0: LET up=0: LET ac=0
9035 LET st=0: LET col=c1: LET row=rw
9040 LET aone=one: LET atwo=two: LET fst=con1: LET snd=con2
9100 GO SUB 7000
9115 LET st=0: LET col=c1: LET row=rw
9120 LET aone=three: LET atwo=four: LET fst=con3: LET snd=con4
9200 GO SUB 7000
9220 IF cw=1 OR lv<3 THEN GO TO 9250
9230 GO TO 8100
9240 LET sch=eval
9245 RETURN
9250 LET sch=ac
9255 RETURN
9300 REM drop
9310 FOR j=6 TO h(c) STEP -1
9315 INK 2+go
9320 PRINT AT 12-j,7+2*c;CHR$(159+go);
9330 FOR o=1 TO 5: NEXT o
9335 INK 1
9340 IF j<>h(c) THEN PRINT AT 12-j,7+2*c;". "
9350 NEXT j
9355 INK 0
9360 RETURN

```


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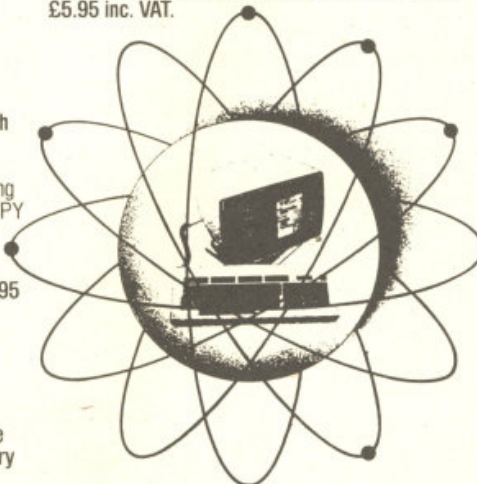
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APRIL, 1984

THE ADVENTURE MAN

WE TALK TO PHILIP MITCHELL –
CREATOR OF THE HOBBIT
ADVENTURE GAME.

Rightly regarded as a software breakthrough, the hugely-successful *Hobbit* was one of our fave-rave games of 1983 (see *Computer Answers* January issue) – so we decided to find out some more about the man who developed it, Australian software wizard Philip Mitchell.

Mitchell, at only 23, has been writing Software for nine years, from his home base in Australia.

In addition to his success with *The Hobbit*, Mitchell has also received a lot of praise for *Penetrator*, a variation on the old 'Skramble' theme. In *Penetrator* you are not confined to the pre-programmed landscapes, but with a special editor, the player can design his or her own. But it is for *The Hobbit* that Mitchell is best known. 'The whole idea behind it was really tremendous because of the things we set out to do', he says of his brainchild. 'We all started out on a part time basis and it went from there.'

The *Hobbit* story began back in early 1981 at Melbourne University, where Philip Mitchell was studying for a degree in computer science. At the same time, Alfred Milgrom, of Melbourne House the book publishers, was trying to move the company into the software field. His aim was to produce a good adventure game, feeling that those around were not making the best of the computing power available, and he wanting to produce something better. Before anything could be done, Milgrom had to recruit a programming team, which he did by posting notices around the University.

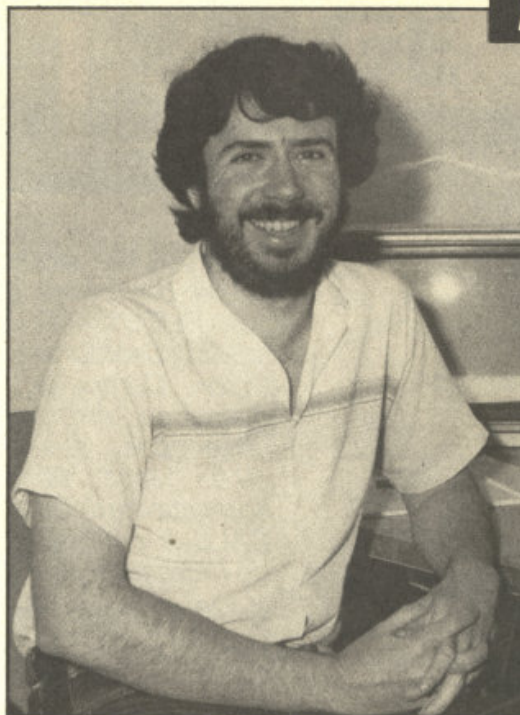
Mitchell tried for one of the posts and got it. He was an obvious choice – apart from using computers as part of his degree, he'd also been building and designing circuits for some years.

Mitchell feels that his knowledge of hardware and how it works has been of enormous benefit to him, especially when it comes to programming in assembly language. 'Being able to understand at a basic level the way it (a micro) is doing things has made it easier to get to grips with a new machine' he says. *The Hobbit* concept took adventure gaming into a new era.

Such features as multiple word entry, and actually talking to the various characters – something that is termed 'Animtalk' – had never been seen before. 'The main concepts we were looking for were a much more sophisticated language analysis and a dictionary including as many words as possible', he says.

The job of writing the language analyser at a high level was given to Stewart Ritchie, a languages graduate studying for a computer science degree, but all the code conversion was then done by Mitchell. If you've played *The Hobbit*, you will know that there are quite a few words in the program's vocabulary. *The Hobbit*'s finished version required a lot of work on 'packing techniques' – cramming a lot of information into a small space.

The sophisticated language analyser used in *The Hobbit* comprises one of the three main parts that make up the program. Mitchell reckons that the



Philip Mitchell: 'My overall aim is to produce something that has a real life-element to it. The more realistic the reaction and responses, the better the game.'

language analyser is a very important feature of the program as it interfaces together all the other parts. It also allows the user to enter quite complex commands, for the rest of the program to understand and act upon.

Although the language analyser is a large part of the program, it (along with everything else) is dominated by a sizeable database. This defines the dictionary, objects (an essential part of any adventure game), surrounds, locations, the various characters and their personalities.

Finally there are various 'bits and pieces' that manipulate the data in the database; the workhorses behind getting everything moving. Though all this sounds quite complex, virtually 95 per cent of the code used in the program is machine independent, the only things that have to be altered for different micros being the Basic I/O routines.

Due to various legal complications, there is not going to be a direct follow-up along the lines of 'Son of *Hobbit*'; what we are going to get is *Sherlock Holmes*, the stiff upper-lipped, pipe-smoking, violin playing, detective. Unlike *The Hobbit*, the *Sherlock* adventure will not be based on any one Conan Doyle story, but on a conglomeration of information from various ones.

However, it will not be just a revamped *Hobbit* disguised in deerstalkers and capes – Mitchell wants to make the new *Sherlock* game extend what was done in *The Hobbit*, and tidy up a lot of loose ends. The area that he most wants to refine is the character's personalities. 'Looking back on it now,' he reckons, 'Thorin was a pretty boring person; he follows you around and sings about gold'.

At the moment Philip Mitchell is having to do most of the work on the new program himself; he has, however, had a special programming tool developed for him to help in the structuring of databases. The game should be ready for the 48K Spectrum early this year.

After the *Sherlock* program, Philip Mitchell isn't sure what direction he is going to take. But whichever, it will probably be more graphics orientated. With progressive games such as *Manic Miner* and *Ant-Attack* on the market, he feels that computer imagery is the path to follow.

By Steve Applebaum, staff writer on *Computer Answers*.

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Before listing the program, here is a description of how the memory is arranged in the 48K Spectrum to help put the process in context. There are 65,535 memory locations altogether in the Spectrum, called addresses, and one address can hold one byte, which is a number from 0-255 (in decimal).

Everything above the RAMTOP address is safe from being overwritten by a Basic program (see later for exceptions to this rule), or NEW then ENTER, or CLEAR then ENTER. For this reason it is a good place to put machine-code programs. You can lower RAMTOP further and further down until you have enough room for your machine-code program.

Initially RAMTOP is immediately below the user defined graphics (UDG) area, and there is no room for any machine-code program above RAMTOP unless you want to overwrite the UDG's. Use the command CLEAR 50000 to set RAMTOP to 50000, and in this way make $(65367-50000)=15367$ bytes available for machine-code programs. Type CLEAR 40000 to set RAMTOP to 40000. Now you have even more room for machine-code programs, but less memory for your Basic program, which fits below RAMTOP.

As well as storing machine-code programs, you can store data above RAMTOP, if you know how to store data in the first place (using the POKE command) and retrieve it (using the PEEK command). This is an efficient way to store data, but each address can only hold whole numbers from 0-255 inclusive (shown diagrammatically in Fig. 2).

The program in Fig. 1 stores the screen display above RAMTOP. The screen display can be thought of as 6912 data items. The TV display is derived from repeatedly scanning these 6912 data items in the 6912 addresses 16384-23295 inclusive. There are 50 scans per second. It is not necessary to understand which address of the 6912 screen addresses refers to which dot or colour on the screen display. It is useful to check the number as follows.

Each address refers to the colours on the screen or to an eighth of a character (eight screen lines make up a full character) and can be from zero to 255. Zero is for blank paper and 255 solid ink. To show this, type POKE 16384,255 (or another number, smaller than 255). Put eight of these rows on top of each other, and you have one character.

Total number of addresses needed for the TV display is equal to: 8 (per character) $\times 32$ (characters per row) $\times 24$ (number of rows) $+ 32 \times 24$ (the attributes to give the colours; one attribute per area occupied by a character). A total of 6912. To store a copy of the screen contents above RAMTOP, first CLEAR 58430 then type in the program in Fig. 1 and type RUN.

The machine-code subroutine is now stored in memory above RAMTOP, and you can delete lines 2,4 and 10. If you load on any Basic program now,

65535	UDG
65368	
spare space for date or machine-code programs	
23296	BASIC PROGRAM (mostly) RAMTOP
16384	SCREEN DISPLAY
0	ROM

Fig. 2 (left) shows diagrammatically the way in which memory is arranged in the 48K Spectrum.

the machine-code program will still be in memory and the Basic program will not overwrite it because it is above RAMTOP (assuming the Basic program does not POKE numbers into addresses 58431 to 58450). When you have a screen display that you want to store, type LET M=USR 58431. To retrieve the screen display, type LET M=USR 58439. If you think you might have a variable M in the program whose value must not be altered, then use another letter or string of letters in place of M.

You can BREAK into a Basic program as it is running, store the screen display as described (in glorious technicolour), and then type CONTINUE to get back into the program. If you want to save the stored screen contents to tape, you must use a 'binary' SAVE by typing in the following: SAVE "name" CODE 58451,6912.

To save the machine code program that stores the screen, type: SAVE "name" CODE 58431,20. To save both the machine code program and the stored screen, type: SAVE "name" CODE 58431,6932.

The following lines of Basic will store the screen above RAMTOP, save the stored screen on tape, and verify it:

```
LET M=USR 58431 [to store the screen above RAMTOP.]
```

```
SAVE "name" CODE 58431,6932
```

```
VERIFY "name" CODE 58431,6932
```

The following lines of Basic will recall the machine code program and the stored screen, so there's no need to type in the program described above:

```
CLEAR 58430 [after switching machine on and off.]
```

```
LOAD " " CODE (load on the stored screen plus the machine code program)
```

```
LET M=USR 58439 [copy the stored screen so you can see it again.]
```

You can save the screen you are looking at with SAVE "name" SCREENS, but you can't verify it. Note that where you see "name" in the LOAD, SAVE and VERIFY statements, substitute your own filename, and text in brackets after lines of Basic is for your guidance, and not for typing in.

By Stephen Fowler, author of *The Draw 15* and *Cartoon Animation* packages.

FIG. 1
STORE

```
2 FOR I = 58431 to 58450
4 READ X: POKE I,X: NEXT I
10 DATA 33,0,64,17,83,228,24,6,33,83,228,17,0,64,1,0,27,
237,176,201
```


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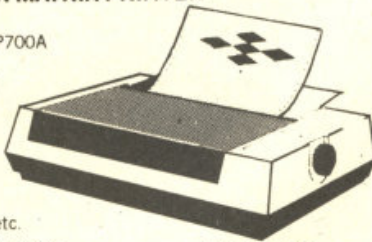
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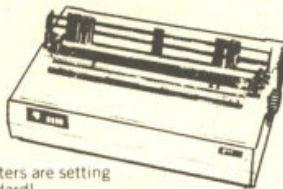
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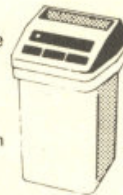
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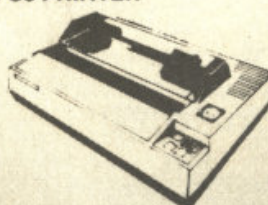
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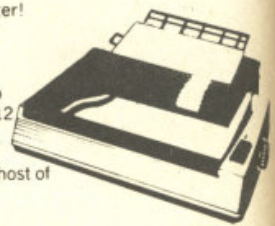
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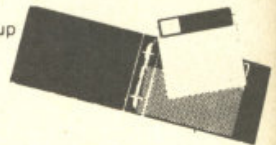
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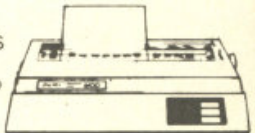


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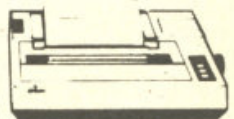
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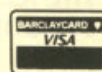


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THE ILLUSTRATOR: A graphics design package which can be used in a graphics Modes 1 or 2 to generate full colour illustrations on the screen of your micro. This package allows graphics and text to be mixed on screen and saved on tape for later use.

MAD MONTY: A fast and furious version of the snake in the garden game for the MODEL B BBC MICRO. Monty — the well known python — lives in a garden inhabited by juicy flowers. Help him munch his lunch but mind those rocks and walls!

BBC GAMES AND UTILITIES

MAD MONTY: This version of the snake game has 7 screen layouts and five speeds from sublime to ridiculous. Monty munches frogs for lunch and is partial to the odd mouse for afters.

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SCREENPLAY SOFTWARE MORE FUN THAN GAMES

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THE ILLUSTRATOR turns your TV screen into an electronic canvas. The only limit is your imagination. **DRAGON** users are you bored with other people's games? Let **THE ANIMATOR** help you create your own.

LIBERATE YOUR MICRO WITH SCREENPLAY SOFTWARE

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PIRATES	<input type="checkbox"/>	£7.95
THE ILLUSTRATOR	<input type="checkbox"/>	£9.95
MAD MONTY	<input type="checkbox"/>	£7.95
DRAGON 32	<input type="checkbox"/>	
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Please send me the products I have marked.

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I enclose Cheque/P.O. to the value of £
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SCREENPLAY, 134 St. Vincent St., Glasgow G2
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COMPUTER CROZZLE — WIN £15!

PROGRAMMING

This month's Crozzle is a word-search—the names of six high-level languages are hidden across, down or diagonally in the grid of letters. Each name is four letters or more (no Cs please!), and none of the languages are obscure.

A short program will generate the grid of letters from the grid of numbers given below, and PRINT it on the screen for you to search for the hidden languages.

Here are the instructions: each number will give the letter to go in the corresponding position in the grid. To get each letter, subtract 247 from the number; take the square root of the difference so obtained, and subtract this from an integer, I, whose value lies between 84 and $96 < I < 96$. This final result is the ASCII code for the letter (from A-Z, the codes run from 65-90).

Here is a dry run using the first number, (416), as an example, and trying 90 as the value of I:

○ $416 - 247 = 169$.

○ The square root of 169 is 13.

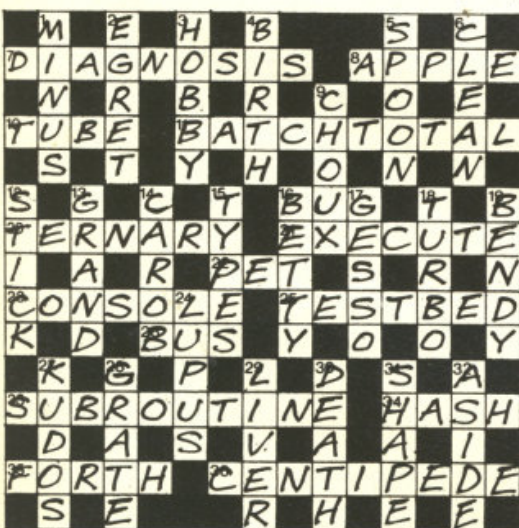
LAST MONTH'S CROZZLE

In last month's Crozzle, the required value for x was 5, and y 200.5 must have been the most likely candidate, since this would give integer products of the decimal values given.

In the program listing given, the data values are read as strings (line 60), effectively multiplied by 10 (line 70), then divided by 2 (line 80) — (equivalent to multiplying by 5). This is a way of avoiding duff results that can arise from mixing integers and non-integers.

No totals were given, but with the right values for x and y, any errors in typing in the numbers should have been easily traceable in bizarre words! (If you are not a touch typist, getting someone to dictate the data to you makes all of the difference.)

Crossword buffs could have cracked some of the clues across (which were by no means user-friendly), and then deduced x and y; alternatively, grinding out the solutions down first with a program would have taken the sting out of the cryptic clues.



The lucky winner of the
February Crozzle was Alan
Clayton of Nantwich, Cheshire.
Congratulations Alan — £15 is on
its way to you.

○ $90 - 13 = 77$, which is the ASCII value for M.

... So if 90 is the correct value of I, then the letter M should go in the top left hand corner of the grid. Since there are 10 possible values of I, there are 10 possible grids, but only one contains the hidden names of the high-level languages.

Once you have found the names, fill them in on the blank grid provided in their correct places, and send the attached form off to enter the competition.

```
DATA 416,608,263,272,472,416,391,571,443,503
DATA 688,823,503,443,872,571,328,923,311,503
DATA 391,503,731,416,347,311,347,976,443,536
DATA 923,503,923,823,823,328,571,328,608,263
DATA 311,416,328,391,283,823,688,608,311,283
DATA 503,688,311,976,503,472,347,872,688,647
DATA 776,416,283,328,571,347,731,347,311,443
DATA 472,872,688,872,391,311,536,347,776,503
DATA 416,347,923,976,872,472,416,311,872,731
DATA 688,688,472,503,263,731,347,311,416,571
```

Total=53510

>L.

```
10 PRINT "Input a number,
195<number<205"
20 INPUT Y%
30 FOR A%=1 TO 22
40 Word$=""
50 FOR B%=1 TO 5
60 READ X%
70 LET R%=VAL(LEFT$(X%,2)
+RIGHT$(X%,1))
80 Word$=Word$+CHR$(Y%-R%DIV2)
90 NEXT B%
100 PRINT Word$
110 NEXT A%
120 END
130 DATA 24.6,25.4,24.4,23.0,23.4
140 DATA 26.2,25.8,23.6,26.2,23.2
150 DATA 25.6,24.2,26.8,26.8,22.2
160 DATA 26.8,25.4,23.6,23.2,25.6
170 DATA 23.4,24.0,24.2,24.2,24.4
180 DATA 26.6,24.8,26.2,27.0,24.4
190 DATA 26.6,25.6,24.2,23.0,22.4
200 DATA 23.4,23.2,25.4,26.6,25.0
210 DATA 25.8,23.6,27.0,24.4,26.4
220 DATA 26.6,27.0,23.6,24.2,26.8
230 DATA 23.2,22.2,24.0,26.2,23.4
240 DATA 26.8,26.2,23.2,23.2,22.2
250 DATA 25.8,26.2,23.4,23.4,24.2
260 DATA 23.2,23.0,23.6,26.8,24.2
270 DATA 26.8,26.2,24.4,26.4,22.2
280 DATA 24.8,23.0,24.0,23.0,23.4
290 DATA 25.0,23.0,26.4,24.2,23.4
300 DATA 25.8,23.6,27.0,23.2,26.2
310 DATA 24.8,25.4,22.8,26.2,23.6
320 DATA 26.4,26.2,27.0,23.2,25.6
330 DATA 23.4,25.6,27.0,24.0,26.2
340 DATA 27.0,23.4,25.4,26.4,26.2
```

>RUN

```
Input a number,
195<number<205
?200
MINUS
EGRET
HOBBY
BIRTH
SPOON
CLEAN
CHOUX
STICK
GRAND
CAROB
TYPES
BETTY
GESSO
TURBO
BENDY
LUPUS
KUDOS
GRATE
LIVER
DEATH
SHAPE
ASIDE
```

LANGUAGES: _____

NAME: _____

ADDRESS: _____

Send to:

Computer Answers
editorial,
Computer 'Crozzle',
62 Oxford Street,
London W1A 2H6

The winner will be the first
correct entry drawn from a hat.
The Editor's decision is final.
Closing date: 1 April 1984.
The solution will appear in the
May issue, and we'll announce
the winners in the June issue.

COMPUTER HOUSING UNITS



REF. CC100
£79.95



REF. DLC200
£185.00



REF. BHU300
£46.95



REF. BHU400
£39.99

Ref. CC.100 — Especially designed for your home computer system whilst also giving plenty of storage space for software, magazines or perhaps a video recorder. Keeps your equipment **dust free**.

Standard Features!

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2. The computer shelf has been designed to allow adequate 'Knee room' for you to sit comfortably, and will avoid 'programmers back-ache'.
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Ref. BHU 400 — Similar to BHU 300 but without the storage shelf. Measurements — 32" wide x 27" high x 18" depth plus VDU bridging unit 21" x 6" x 12"

PRICE only £39.99 incl. VAT.

Ref. BU.500 — Bridging Unit only — Price £12.50 incl. VAT

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Please supply me with the following cabinets:—

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Ref. No.	Qty.	Colour	Price	Total
.....	£ each	£ each
.....	£ each	£ each
			Delivery Charge	£ 5.00
			Grand Total	£

Access/Barclaycard No.

Name

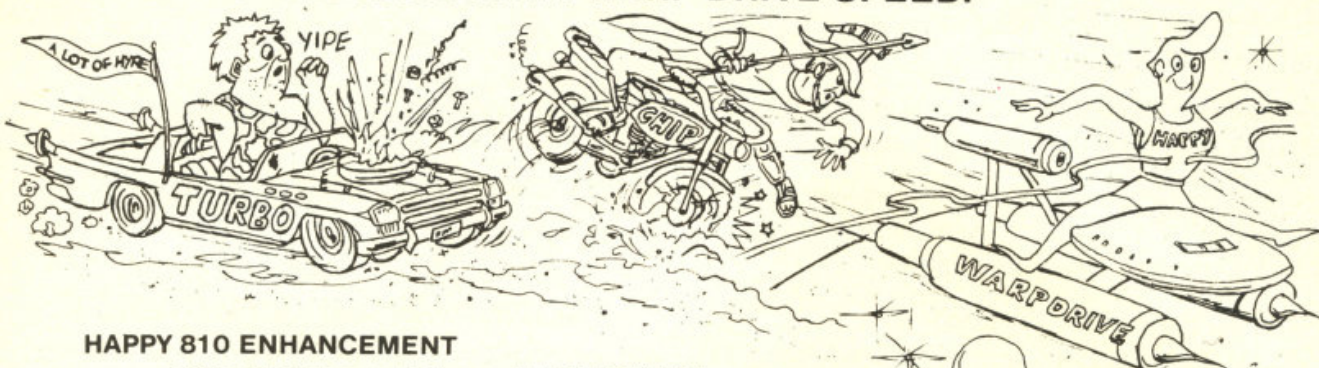
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- Format write and verify 3 complete disks in less than 3 minutes

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- Compacted disks run only on an ENHANCED drive
- Pays for itself by saving on disks
- Single or dual ENHANCED drive operation

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- Use all features of BASIC, PILOT, FMS, and DUP at top warp speed
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REVIEWED IN POPULAR MAGAZINES

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ANTIC—July 1983 "The difference between a normal ATARI 810 disk drive and one equipped with Happy is like the contrast between mass transit and the automobile. A car costs you more initially, but improves the quality of your life. Similarly, if you use your disk drive a lot, installing Happy will markedly enhance your programming life."

SPECIAL SUGGESTED RETAIL PRICE BEFORE FEBRUARY 28, 1984: Get the HAPPY 810 ENHANCEMENT with the single and multi drive HAPPY BACKUP PROGRAM, plus the HAPPY COMPACTOR PROGRAM, plus the HAPPY DRIVE DOS, plus the HAPPY SECTOR COPY, all with WARP DRIVE speed, including our diagnostic for \$249.95. Existing registered ENHANCEMENT owners may upgrade to WARP DRIVE speed for \$15.00 with no hardware changes!

Price includes shipping by air mail to U.S.A. and Canada. Foreign orders add \$10.00 and send an international money order payable through a U.S.A. bank. California orders add \$16.25 state sales tax. Cashiers check or money order for immediate shipment from stock. Personal checks require 2-3 weeks to clear. Cash COD available by phone order and charges will be added. No credit card orders accepted. ENHANCEMENTS for other ATARI compatible drives coming soon, call for information. Please specify -H model for all drives purchased new after February 1982, call for help in ENHANCEMENT model selection. Dealers now throughout the world, call for the number of the dealer closest to you.

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An X-Y plotter is a graphic output unit that plots and tabulates according to instructions from a computer. Up until now, X-Y plotters have often been used in specialised fields due to their high cost. The Roland DG DXY-100R sells at an astonishingly low price for popular use, yet includes an array of functions, superb performance, and ease of operation.

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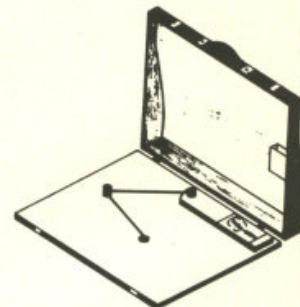
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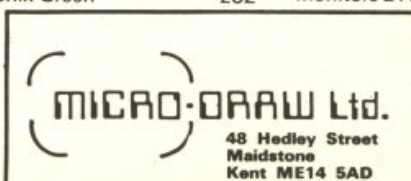


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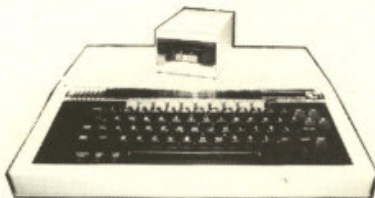
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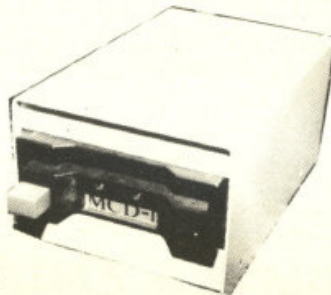
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3" Micro Disc
£129.95 (inc VAT)

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The Micro disc drive offers a method of low cost quick access to programs. The drive is essentially a small version of a 5 1/4 inch disc drive and offers similar features to the larger drive.

The data is stored on a 3 inch disc, this is enclosed in a protective hard plastic cassette which features a write protect switch.

The micro drive requires the standard Acorn disc interface, but a new disc filing system rom. Acorn DFS may be exchanged for the micro DFS for £12.00. The new micro disc filing system allows 60 files per disc surface and it can read and write to Acorn DFS discs. Thus if a 5 1/4 inch and a micro floppy were connected on the same cable files could be transferred between them.

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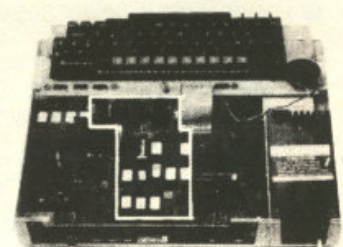
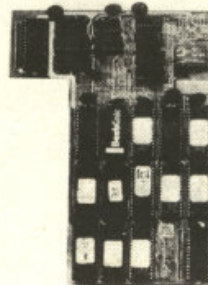
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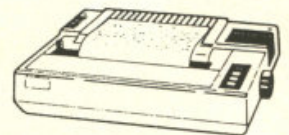
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BBC

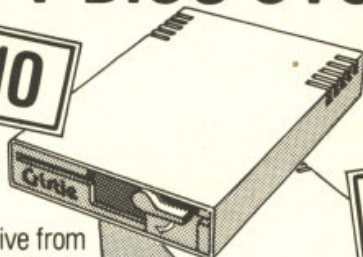


BBC NEWS FROM DPL

BBC COMPATIBLE FLOPPY DISC SYSTEMS AND DRIVES

- Case to hold one drive
- Ribbon cable to connect one drive to BBC Micro
- Power cable to power one drive from BBC Micro
- Switch on rear of case to select 40 or 80 TPI operation when using FD55E or FD55F.

£10



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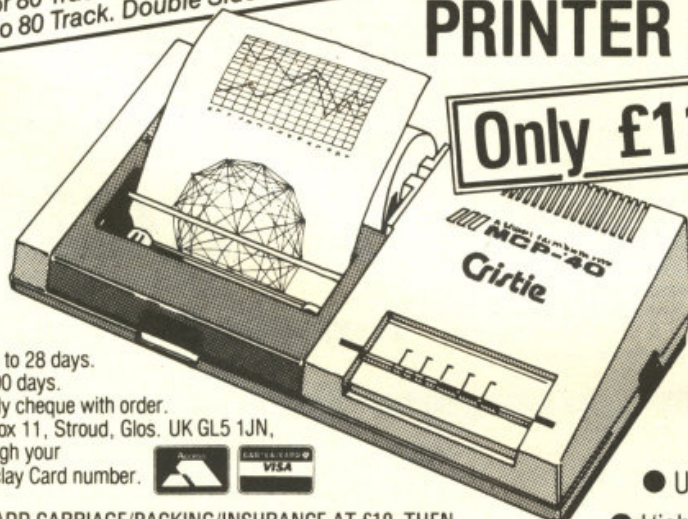
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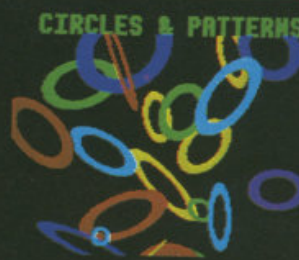
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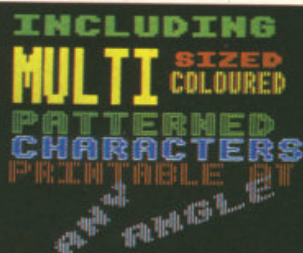
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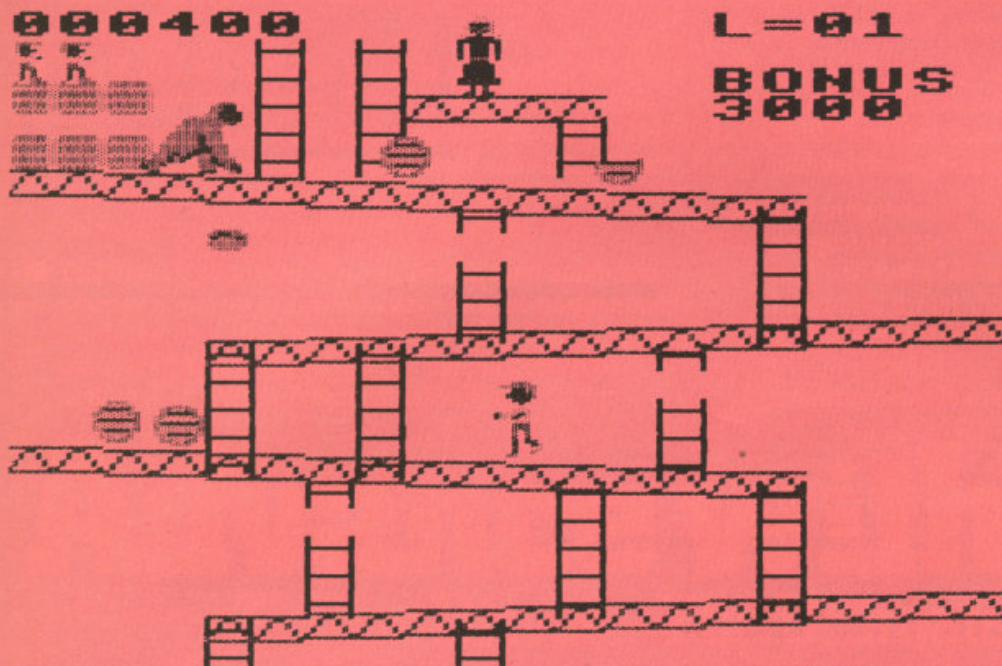
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SCREEN DUMPING



How can I obtain screen dumps for some of my machine code software? (I am thinking particularly of the Acornsoft range of programs.) Can you help?

John Webb, New Romney.

The first thing that we decided when we were trying to work out an answer to your question

was that it would be a mistake to try and keep a screen dump program in memory at the same time as the game.

Many games relocate themselves in memory, especially those that have been patched to run on disc systems, and so any printer dump program would be unlikely to survive. A better idea would be to try and introduce a much shorter

piece of code that would *SAVE the screen contents onto disk, or more likely, cassette. This could then be loaded back at any time, and dumped onto the printer. Beebug's Toolkit ROM happens to contain a command *SCREEN which was just what we wanted; *SCREEN 'filename' saves the screen contents, adjusting automatically

CLINIC

for any mode, and stops any messages appearing on the screen that would spoil the display. So a simple call to OSCLI, the command line interpreter, would perform what we required.

The next problem was how to achieve the OSCLI call. Initially we tried altering the contents of RDCHV, the keyboard read character vector, to point to our piece of code. We soon found out that this didn't work, as the programs we were trying out didn't use it in the right places. We then decided to try intercepting the 'character entering input buffer event' interrupt. This was the approach that worked (eventually!). Every time a key is pressed, an interrupt is caused, and the ASCII value of the key is stored in the keyboard buffer, from &3E0. This is what allows the very useful 'type ahead' feature on the BBC Micro. Fig. 1 contains the program that we used in conjunction with the Toolkit ROM.

Line 50 contains the command that OSCLI will perform, *SCREEN A'. The screen contents will be saved as a file called 'A'. The machine code is assembled into a fairly safe area in zero page, but the command itself has to be higher in memory, as the BBC does not allow reading or writing of strings in zero page. The screen will be saved when @ is pressed.

The *SCREEN command beeps, and then starts saving when any key is pressed. Unless you have very fast reactions, your @ keypress will probably be scanned a second time, and taken as the start saving key, so it is probably best to start the recorder before pressing @.

We then went on to produce the program in Fig. 2, which does not require the Toolkit ROM.

This program uses an OSFILE call to save the screen, but we now have to stop any messages appearing, and also insert a carriage return into the keyboard buffer so that OSFILE starts saving. The entire block of code can be moved to a different location by altering the value of START in line 10. It is set up to save a Mode 4 or 5 screen, and the control block values in lines 470 and 490 would have to be altered to

FIG. 1
OSCLI
CALL

```

10REM Interrupt routine to dump a screen.
20REM to tape or disc, using the BEEBUG
30REM Toolkit ROM routine, *SCREEN
40COMLINE=&B00
50*COMLINE="SCREEN A"
60EVENTV=&220
70OSCLI=&FFF7
80FORIX=0TO3STEP3
90PX=&B9
100OPTIX
110PHP          \Preserve flags
120CPY #64      \ "@" pressed?
130BNE EXIT
140LDX #COMLINE MOD 256
150LDY #COMLINE DIV 256
160JSR OSCLI    \Perform *SCREEN A
170.EXIT
180PLP
190RTS
200
210NEXT
220?EVENTV=&B9
230EVENTV?1=0
240*FX14,2
250REM Enable character entering input
260REM buffer event.
270REM Now run your program, and keep
280REM your fingers crossed!

```


- The complete AMS disc drive package, tailored to your BBC micro, is compatible with all disc interfaces and includes cables, a comprehensive manual and utilities on disc and EPROM. Housed in a steel case, matching the BBC micro, these reliable and robust Hitachi 3" disc drives are the ultimate for home, office and classroom.
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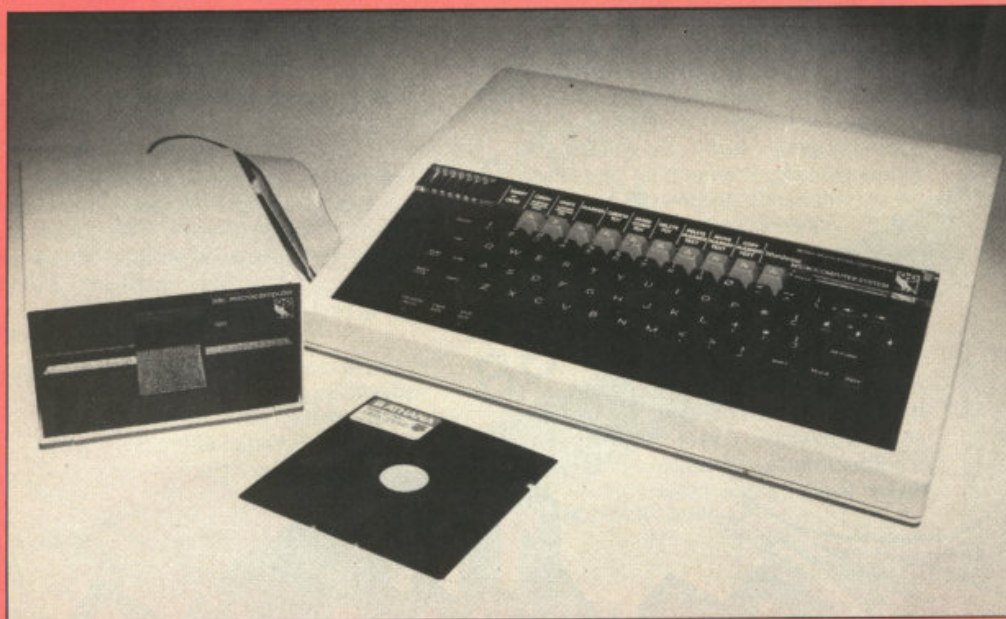
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WHICH DATABASE?



Is there any program which stores data to be randomly accessed, not just to draw the key word string, but maybe a sentence string associated with it? A sort of lexicon program? Also, is there any way to get colour into the View package on an ordinary TV?

John D Stettaford, Herts.

There are several database programs on the market which could be used in the way you describe. When you set up

your database, each record would represent a historical event. Each record could be made up of, say, three fields, such as date, description of the event, and book reference.

You could then search your database and retrieve all the events that took place in a certain year, or you could search all the event descriptions looking for the word 'treaty' and so retrieve information that way.

Some programs to consider are Psion's *VU-File* at £14.95, Gemini's *Database* at £19.95, or you could go for a plug in

ROM with GCC's *BeeBASE* at £45.94.

The problem with *View* is that as soon as you enter the program, the screen is cleared and reverts to white on black. All the Basic colour commands are no longer available, so you cannot use VDU or COLOUR. It would have been quite easy to have included colour commands in the *View* ROM, but unfortunately Acornsoft didn't. It is, in fact, possible to change the screen colour, but since it involves directly programming the video ULA via *FX calls, it is

CLINIC

not particularly easy. The following is the sequence of commands to produce the famous Mode 6 white lettering on blue lines display:

```
*FX155,4
*FX155,20
*FX155,36
*FX155,52
*FX155,68
*FX155,84
*FX155,100
*FX155,116
```

If you have a disk system, then you could *BUILD a file with those commands in it. It could then be *EXEC'd after entering *View*. Tape users could write a program such as:

```
10 *SPOOL "BLUE"
20 PRINT "*"FX155,4"
30 PRINT "*"FX155,20"
```

— and then *EXEC that instead. If you change mode after entering *View*, the default black-and-white will return. For further information on *FX155, look in chapter 19 of the 'Advanced User Guide'.

Psion,

2 Huntsworth Mews,
Gloucester Place,
London NW1 6DD.

Gemini Marketing,

18A Littleham Rd, Exmouth,
Devon EX8 2QG.

Tel: (0395) 265165.

GCC (Cambridge),

66 High St, Sawston,
Cambridge CB2 4BG.

Tel: (0223) 835330.

'TAPE-WORM' CURE

I am unable to load my own programmes successfully recorded on tape – at all volume settings the word DATA? appears, which the manual states means a cyclic redundancy check error – and that means nothing to a beginner such as me. Can you help?

KWJ Wood, Crickhowell.

A cyclic redundancy check is similar to a parity bit, except in the case of the BBC computer it is a two byte number based on a whole block of data rather than one byte.

Like a parity bit, or a checksum, it is an extra piece of information stored on the tape to help check that programs have been correctly recorded.

When the program is loaded, the two byte number is recalculated, and if it is not the same as the one read in, an error has occurred. In other words, a cassette CRC error means that what has been loaded into memory doesn't exactly match what was saved.

The fact that you get any message at all confirms that the wiring of your connecting lead is correct, so the problem lies with the tape recorder. Commercially produced tapes such as the 'Welcome' tape tend to be recorded at a much higher level than normal, in order to overcome recorder differences.

However, your recorder probably has an automatic recording level, and as the

BBC puts out a very powerful signal the recording level is set very low. This means that on playback you will have to set the volume control higher than with pre-recorded tapes.

Most computers, including the BBC, require a good treble sound from the tape, but if you have no tone control then all you can do is ensure that the heads are clean. As regards tapes, our experience is that a good quality music recording tape such as TDK may give better results. In the final analysis you may be faced with buying a 'computer compatible' tape recorder, which should cure your problems, or even invest in a disk system, which will definitely solve your difficulty!

IS THE MODEL A AROUND?

I have been thinking about purchasing a BBC Model A, and I am wondering if Acorn will be continuing to support it. What's the position?

J. Harding, Middlesbrough, Cleveland.

Acorn have now confirmed that they are no longer to manufacture the BBC model A computer. With its limited 16K memory, the Model A had been overtaken by most new home micros, including Acorn's own Electron. The Model A has never been offered on the overseas market. Acorn have promised to continue to support existing Model A owners.

The Hobbit. Now the best is a

"After a very short time I found that 'The Hobbit' was becoming almost a way of life rather than a game, and so when I finished it for the first time I was partly sad because I felt that all the fun and adventure had ended, but I was wrong. Even now I am discovering new things about the game and feel that it will be some time until all of its secrets are revealed to me."

MR. J. STERN, Herts

"I have at last received your 'Hobbit' program and would like to congratulate you on its excellence. After four days of sweat and tears I have completed only 37.5 per cent of the adventure. The program has lived up completely to expectations, and there is no doubt about it being the best production for the Spectrum to date. You have surpassed all others with this program."

"A lot of fun."

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"The excellent graphics. The exciting difference is that it is possible to converse with all the characters, meet and ask their names, and recommend this game to Tolkien, or novel authors."

POPULAR COMP

"I am writing to compliment 'The Hobbit'. I think it is one of the most ingenious programs I have had the pleasure to use. It has kept me stumped for months. I think the effort that has gone into writing a program like this must have been enormous. The effects are brilliant to say the least."

JEREMY CHESTER

"The Hobbit takes first place in the new category of quality and value for money."

SINCLAIR USER

"The locations in the Adventure are superb. The excellent graphics. We have completed 7.5 per cent of the adventure."

"The graphics. The excellent plot. The game is superior to any other for the Spectrum."

COMPUTER

"The Misty Mountains. The game is great to play and is No. 1 for fun and excitement."

GORDON DEMPSTER, Scotland

"Thanks again for an excellent game in 'The Hobbit'. I feel I have really got my money's worth out of playing time. Congratulations!"

MR. P. RUSHTON, Leeds

"The most powerful computer game yet invented."

COMPUTER WEEKLY

"Within my circle of friends this game has become something of an obsession. We meet every Friday night at someone's house and spend 3-4 hours on 'The Hobbit'. Friday night would not be the same without 'The Hobbit'."

CHRISTINE VERCHILD, Wilts

"One new Adventure game stands head and shoulders above the rest. It alone almost provides you with a good enough reason to buy a 48K Sinclair Spectrum. Not only does The Hobbit produce drawings of the main scenes, but it also understands proper sentences rather than pairs of words for its commands. It comes with a copy of J.R.R. Tolkien's classic book of the same name. It is the program with the most detailed and best written documentation ever."

WHAT MICRO

"This is an impressively packaged Adventure game which makes good use of the Spectrum's colour graphics. They have not only produced one of the best games for the Spectrum, but given everyone else a lesson in good game design."

PRACTICAL COM

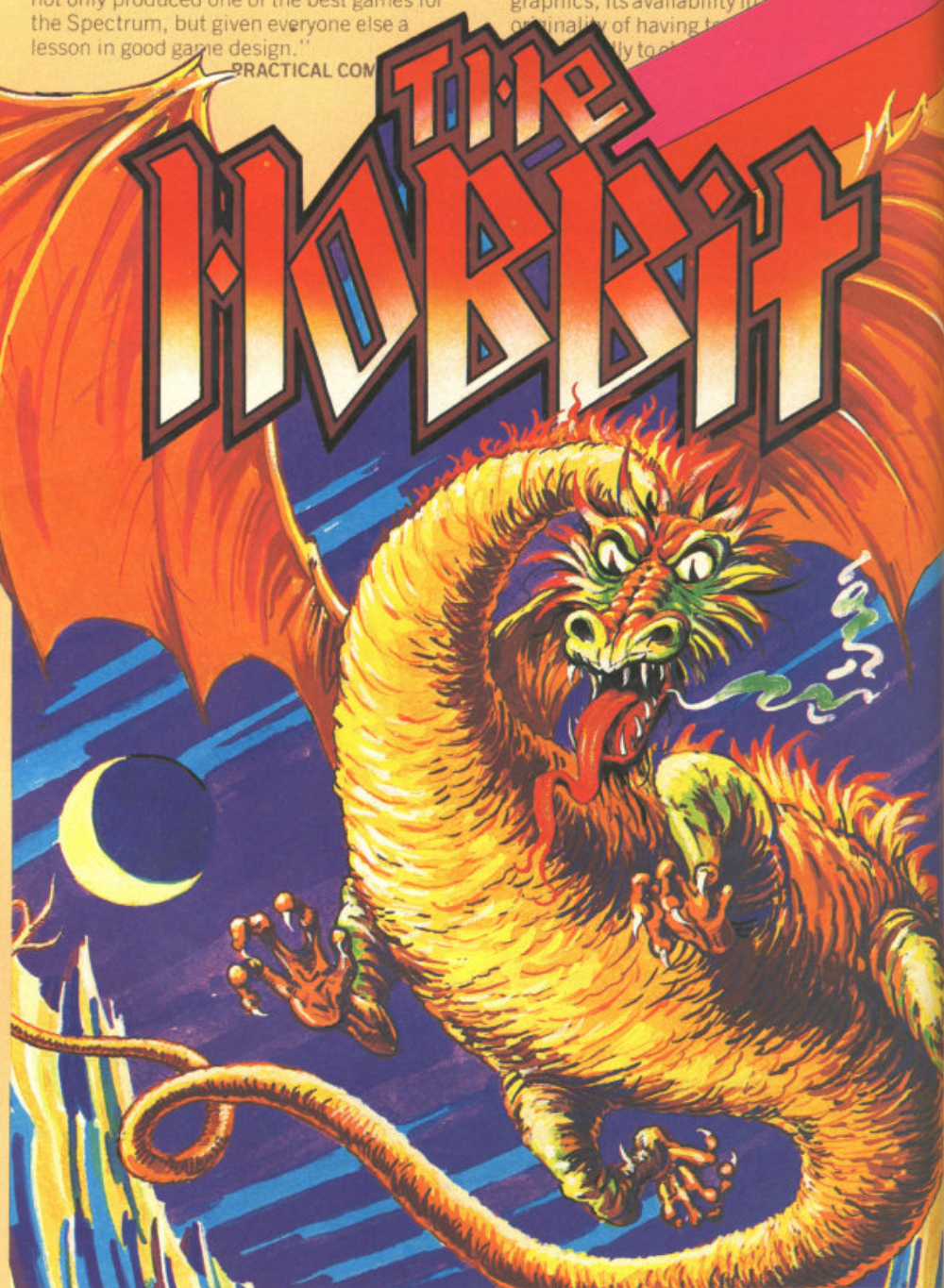
"I am the owner of a copy of 'The Hobbit' which is wonderful entertainment, and very challenging. I have other tapes and publications of yours, all of which are excellent."

MR. D.J. BURGH, Kent

"Having received the most excellent piece of programming I have ever seen, we have had no social life whatsoever. 'The Hobbit' has been dominating our lives since January and many nights have been spent until 3 o'clock trying to conquer it."

SIMON ROGERS, Avon

"I have recently purchased your excellent adventure game 'The Hobbit'. This game is greatly enhanced by the use of excellent graphics, its availability in the originality of having the game on a cassette tape."



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DAVID MAXWELL, London

"I am the proud owner of your excellent program 'The Hobbit' and have already had many happy, restful, relaxing hours trying to solve its puzzles."

SPECTRUM
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BBC

"I congratulate you on a program which I have enjoyed immensely. I must thank you for producing such a clever product, it was worth every penny of the purchase price."

MRS. J. RYCRAFT, Northampton

“

'The Hobbit' is a beautifully constructed, frantically-maddening, tortuous, gloriously inconsistent, thoroughly spooky adventure — far better than I could have hoped for and certainly the finest of the dozen or so adventure programs I have. In short, I congratulate the four who sweated for a year and a half."

MR. PETER JONES, South Glam

“

Nothing is certain in this Adventure, but uncertainty! Add to this the brilliant graphics that are used to describe many of the locations and we have an Adventure that is going to become a classic for the Spectrum."

POPULAR COMPUTING WEEKLY

“

...we are not eating food...we are losing sleep...and it's great! We are lost, in the Hobbit program."

MR. JOHN HARRIS, Kuwait

“

The children were immediately enthusiastic about the program (even dedicated footballers gave up some playtimes to use it!). Many children borrowed copies of 'The Hobbit' from the library to read for themselves."

JUNIOR EDUCATION MAGAZINE

“

'The Hobbit' arrived and single-handedly set the standard for adventure games to come, with its sophisticated mixture of advanced language analysis and beautifully detailed graphics."

MICRO ADVENTURER

"I bought for my ZX Spectrum the program you supply called 'The Hobbit'. It is an excellent program and I find it very realistic. The graphics are accurate. It sticks to the book, which is a very compelling feature."

JOHN CASSIDY, Essex

"Having recently purchased a Sinclair Spectrum I decided to buy 'The Hobbit' since I have been doing a literature project based on 'The Hobbit' with my class of 10 and 11 year old children. Over the last 10 weeks the children, having read the book, have been attempting the program with my assistance. Let me congratulate you on a most entertaining program."

MR. K. REID AND CLASS 7, Nottingham

"... more of a challenge than a program."

POPULAR COMPUTING WEEKLY

"The most unique factor of this program is that the user instructs the computer in completely ordinary English sentences. The Hobbit program is capable of very sophisticated communications."

COMPUTER

"I purchased 'The Hobbit' not long ago and since then I have been engrossed in the game, and I'm beginning to think I don't want to talk to me again! I've about 100 adventures in 'The Hobbit'."

DAVID ROWLEY, South-on-Trent

"The use of graphics is one of the features which makes 'The Hobbit' special. The addition of graphics as good as these adds a whole new dimension to the Adventure. It is certainly a marvellous game, which should set the standard for future Spectrum adventures."

ZX COMPUTING

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All versions of "The Hobbit" are identical with regard to the adventure program. Due to memory limitations, BBC cassette version does not include graphics.

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UPGRADES COMING?

I have heard a lot about the half-priced BBC, the Electron, but have not been able to find any expansions which will be available for the Electron in the near future. Will you be able to upgrade the Electron to a BBC specification, to use all BBC software?

M Aleem Siddique, London.

BBC software that doesn't POKE the video ULA, nor make use of the Teletext mode 7, should be able to be run

without modification on the Electron, which perhaps explains why there seems to be more Electron software than Electrons.

In many ways, the Electron is very different to the BBC, and the cost of upgrading it fully will probably exceed the cost of a BBC. The Electron can play only one sound channel, compared to the BBC's three, it does not have 'paged ROM' sockets, nor printer, user, and joystick interfaces. The Electron is slower than

the BBC, especially in the hires modes, and no upgrade will be able to overcome this.

Solidisk Technology has produced a General Purpose Interface for the Electron. This has a Centronics interface, Atari-type joystick port, three sideways ROM sockets, and other features. It costs £39.90.

Solidisk Technology,

17 Swayne Avenue, Southend-on-Sea, Essex, SS2 7JQ.

Tel: (0702) 354674.

MODE METHOD

I have been trying to create a new mode of 80x32 two colour text only, so that it would only take 80x32 bytes or about 2.5 to 3K bytes of memory to 'map' the screen. In other words, it is a mode 7 with 80x32 text. I have tried typing in mode 7: VDU 23 with the appropriate parameters, but it did not work. Any ideas?

Bao Binh Tran, Birmingham.

It's a good idea, but unfortunately, it won't work. The mode 7 Teletext display is created entirely differently to all the other modes. If you look in the appendix to the *BBC User Guide*, you will see that mode 7 has its own character set compared to the others. The VDU23 command allows the BBC's 6845 cathode ray tube controller chip to be programmed, and can in fact be used to create new modes. The *Advanced User Guide* contains a program to create a 'mode 8', which allows 16 colours to be used, but only requires 10K of RAM, enabling it to be used on a Model A. The catch is that you can only have 10 characters across the screen!

JOYSTICK SHORT-CUT?

I recently bought a Quickshot programmable joystick which was very tedious to use due to the need to load the joystick utility program into the BBC. I would like to know if it is possible to change the current programmable interface to a non-programmable one which fits into the user port of the BBC? If so where can I get it? I would also like to know which is a good BBC word-processor to buy - any recommendations?

Wai Chung Wong, Glasgow.

We haven't been able to find anyone supplying just a joystick interface for the BBC. Since the standard Acorn joysticks are so unsatisfactory for using with arcade games (even with the addition of rubber bands!), it is surprising that

no-one has yet come up with an interface to allow Atari-type self-centring joysticks to be used.

With regard to word-processors, as a general guide the more you pay, the more features you get. Computer Concept's *Wordwise* (£39 exc. VAT) is excellent for short pieces such as letters, and is very easy for the complete beginner to get to grips with. Text and formatting commands are entered in Teletext mode, which allows a very clear display, with good use of colour. If memory allows, your text can be previewed in mode 0, formatted as it will appear on paper. Special printer commands (for example to do underlining) are entered as an embedded command with numbers. This allows direct access to all your printer's functions, at the cost of having the printer manual

handy.

Acornsoft's *View* (£59.80 inc. VAT) displays the text on the screen as it will appear on the paper. You can select any mode you like to enter text, and this will affect the amount that can be held in memory. If you are going to do any large amount of typing in an 80 column mode, then you may need to invest in a monitor for the sake of your eyesight.

View allows text files larger than memory to be edited, although it is not as transparent as the famous CP/M editor *WordStar*. The ROM comes with a very thorough and well-written introductory booklet, and has a separate flip-over reference manual.

Underlining and double strike is done by entering special codes, which in turn refer to whichever printer driving program you have in memory. These routines have

to be bought separately.

Braintech's *BeebPen* uses a Mode 3 green-on-black screen to enter text, which may not be very clear on some televisions. Unlike the previous two ROMs, commands are entered with the text still displayed.

We suggest you go either for *View* or *Wordwise*.

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16 Wayside, Chipperfield, Herts WD4 9JJ.

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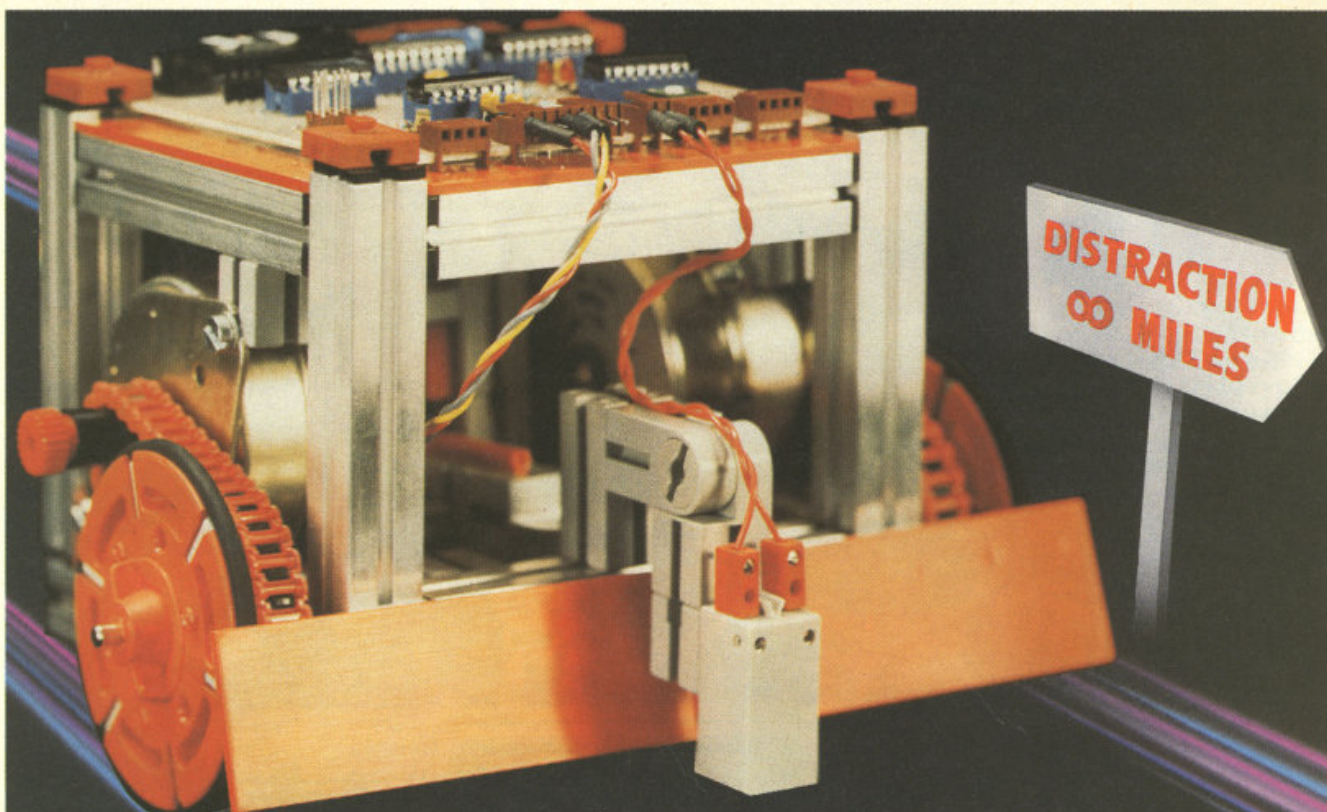
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THE SUPER-DOODLER

CLINIC

The difference between art and a mess is more a function of the artist than of the tools they use. Nevertheless, making a mess can be just as much fun. So with these fundamental principles of graphics in mind, we investigated the new graphics tablet for the BBC Micro from British Micro, called the Graphpad.

The pad itself is about A4 size, quite light and transportable, and attached to the BBC's user port with a ribbon. A 'pen' is used to move around the surface of the pad, a cursor cross appearing on the equivalent place on the screen. The resolution of the pad is 320 x 256 pixels, exactly that of the BBC's mode 1. The pen has two positions, up and down, depending on whether a 'nib' is depressed or not. The surface of the pad is covered in a thin sheet of perspex, which we found to be rather necessary as the pen has the habit of scratching.

The position of the pen is calculated and three values are constantly sent to the Beeb;

these are simply X co-ordinate, Y co-ordinate and pen up or down. The pad also includes a menu, off the main drawing area, with the letters A to Z and numbers 1 to 4. If the position of the pen is outside the main pad area, the software tests to see if it is covering one of these letters or numbers.

Two pieces of software come with this pad, called imaginatively, Prog1 and Prog2. Prog1 is mainly for use within a user's own package, it simply returns the X and Y, co-ordinates, the state of the pen (up or down) and the menu letter or number.

Prog2 is a basic graphics drawing package. It allows the user to draw circles, triangles, lines, rectangles, freehand and change colours. It is also possible to erase certain lines, fill an area with colour, save drawings to disk or tape, and dump the screen to an Epson FX80 printer (no other at the moment). Again this program is listed in the manual, which is generally well laid out and easy to follow.

In addition to the software coming with the pad, other



packages are under development. One is a CAD package, allowing the user to define symbols and shapes, and store them in directories of 16 symbols each. These can then be placed on the screen, and connected with lines, coloured in or whatever. As yet, fancy things like rotation, magnification and so on are not implemented.

Generally we found the pad quite fun, but we were concerned with a few things, in particular the scratching of the pen on the perspex and the fact that sometimes the cursor was

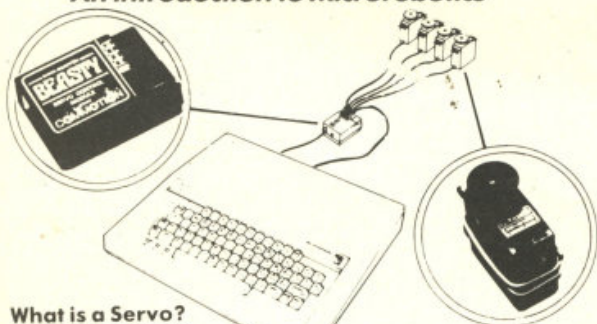
a bit unstable and appeared to jump on the screen. The software is also unsophisticated in comparison with some other graphics systems (for example, the Bitstik), but having full listings will help the knowledgeable user develop their own systems.

By Dr Peter Turcan,
technical editor of
Computer Answers.

Graphpad (£143 inc. VAT) and CAD program (£18 inc. VAT) from **British Micro**, Penfold Works, Imperial Way, Watford, Herts. Tel: (0923) 48222.

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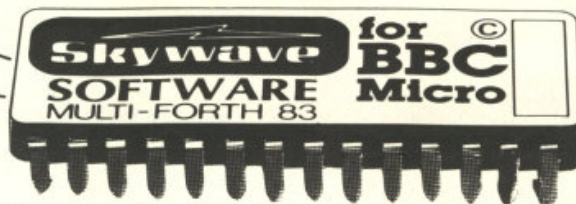
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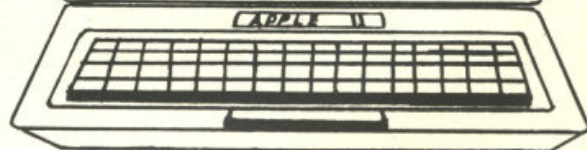


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Excellent graphics facilities are one of the BBC Micro's main attributes – but even on this machine there are things missing (apart from memory) that are vital to good, creative design. FILL and CIRCLE commands would have been useful, but the designers have seen fit to leave them out.

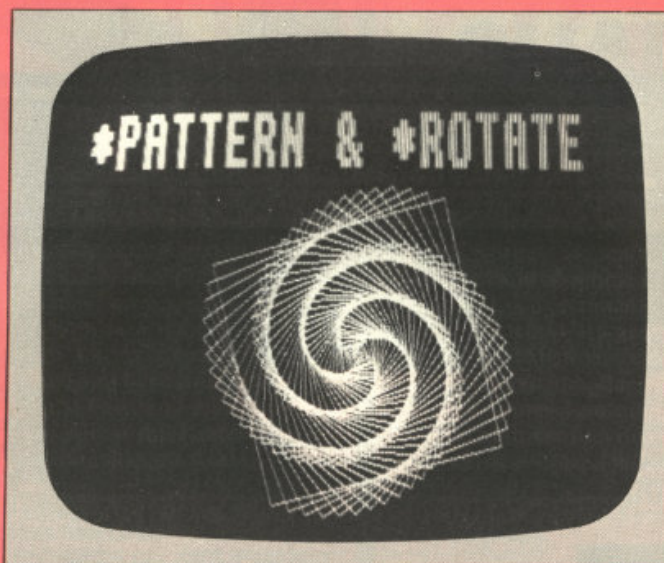
To close the gap some way, Computer Concepts (designer of *Wordwise*) has developed the Graphics ROM that gives the user the ability to go further, with more ease, than Acorn has so far allowed.

We looked at sprite generator programs that create easily manoeuvrable graphics characters in the January issue of *Computer Answers*. Machines such as the Commodore 64 have sprites as standard, and control them through hardware; but others, such as the BBC, can only manipulate pseudo-sprites through software. This method usually means a cassette or disk has to be loaded each time the user wants to design a sprite. However, all the routines for designing up to 32 different sprites are held in the Graphics ROM, so there's no need to continually load programs.

Before defining a sprite, an area of memory must be set aside in which the character can be stored. The command *RESERVE (address one) to (address two) saves the space (this will depend on the mode that's being used – 0, 1, or 2 only); all addresses have to be given in hex, but to help those who have not got a good knowledge of the notation, the manual gives two locations that should provide enough space for most users' needs. The manual certainly wins out in the way it helps the less knowledgeable user, but unfortunately there are some places where important commas or colons have been left out, so some debugging has to be done.

As sprites are useful for animation, Computer Concepts has included a command, *FILM, that makes easier than on most machines. If *FILM is followed by the numbers of the sprites (between 0 and 31 inclusive), it can be called from within a Basic program and made to execute each character one by one, giving the impression of movement. As there are 32 sprites available, some very complex sequences can be built up. Although not quite up to Disney standard,

GRAPHICS ROM



PHOTOGRAPH BY BEL

**WANT TO MAKE MORE OF YOUR
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they are quite good: a man walking across the screen for instance, moves rather slowly and with a constant flash that is more like a character being erased and over-printed than a sprite. This, however, is more the fault of the Beeb's screen handling than the ROM.

Whereas sprites are excellent for creating animated figures, the Logo commands present in the ROM are great for producing abstract line designs. Just like the Papert original, Computer Concepts' Logo has simple functions such as *LEFT, *RIGHT, *FOR-

**THE GRAPHICS ROM ADDS TO THE ALREADY
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SOME COMMANDS INCLUDED IN THE GRAPHICS ROM:

ART draws an arc in the foreground colour.
CIRCLE draws a circle of specified centre, radius and colour.
DESIGN forms a grid of specified size, on which a sprite character is defined.
FILL colours in a given area.
FILM makes an animation sequence using sprites.
GFX gives the user information about the several graphics routines and stores the results in the resident integer variables A%, B%, C%, D% and E.
MODE 8 is an extra mode that takes up 10K of memory, uses 16 colours and has a resolution of 10 x 32 characters and 80 x 256 graphics.
PATTERN enables multi-sized circles, spirographs or patterns to be drawn on the screen in different colours.
PIXEL plots multi-sized pixels anywhere on the screen.
PLOT plots a point in three dimensions.
ROTATE causes the position of a point plotted to be rotated about the screen co-ordinate (x,y) through a positive angle.
SCALE changes the positions of the origin and the top right hand corner, scaling the rest of the display to the same relative size.

CLINIC

WARD, and so on. When used in a simple program, the Logo commands can produce some very complex pictures.

Sprites and Logo are two ways of producing some very acceptable graphics, but of course there is another – the good old print and plot method. Unlike PRINT in Basic, that implemented in the Graphics ROM can only be used in graphics mode. There are three parameters after the command that allow the user to place multi-patterned, multi-sized and multi-coloured characters anywhere on the screen. *PRINT is a good way of helping to design a page layout – and because it is possible to dump a screen straight to a printer, running off letters could be made less of a hassle.

In addition to an enhanced PRINT function, Computer Concepts has also changed, to rather good effect, the PLOT command. Instead of working in the usual two dimensions, an extra parameter gives any plotted position a pseudo third. When a point is plotted its position, in relation to the screen, is seen in terms of a plane going into the display, as well as the other two going across and up. With a function such as this, there are obvious advantages for the 3D games designer.

To complement the commands in the ROM, Computer Concepts has included a series of error messages that not only inform you that there is not enough room in memory, but also give the whole syntax for a command. We found if you misplace the manual, it's still possible to use virtually all the commands from just the syntax messages and the help menu.

From our impressions of the Graphics extension ROM, we think Computer Concepts has another winner on its hands. Yet again the carpet has been pulled from under Acorn's feet, and a small company has managed to beat them to a product that they should have had on the market months ago.

By Steve Applebaum, staff-writer on *Computer Answers*.

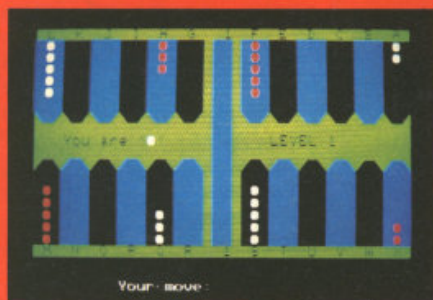
The Graphics Rom costs £33.20 (inc. VAT) from: Computer Concepts, 16 Wayside, Chipperfield, Herts WD4 9JJ. Tel: (09277) 69727.

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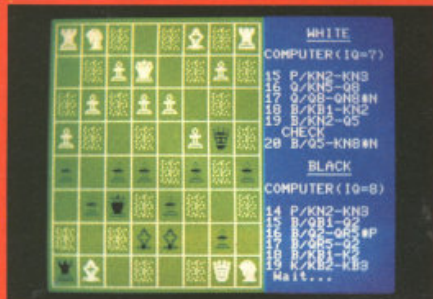
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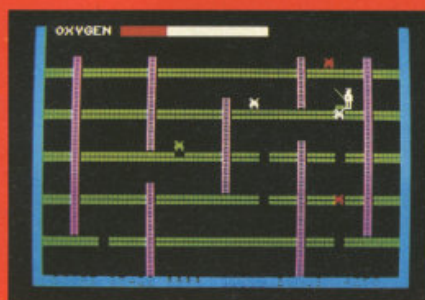
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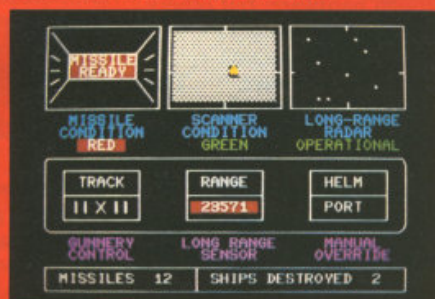
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ADE TO BEEB ASSEMBLY

Despite its ubiquitous-sounding name, ADE is not some anti-social blight, but a new 6502 Assembly language development for the BBC Micro. It contains most of the features missing from the Beeb's built-in assembler, and comes on EPROM from the System Software company.

On the whole, we found the package to be excellent, give or take one or two points, for serious assembly program development.

The EPROM contains three distinct pieces of software all of which are essential for developing programs: an editor, assembler and debugger. The editor can be used for creating text files, as well as assembly source files. The assembler generates machine code from the source file, and the debugger is used when the machine code program is run, to help find bugs and check all is OK.

In addition to the EPROM, the package includes a disk containing a 'librarian' utility which allows macro libraries to be scanned and maintained, a system library providing general purpose macros, a formatter (used when printing), and a demonstration program which shows how ADE can be used.

The text editor is semi-screen based with the screen split into three parts; the editing, information and command areas. It sensibly uses the Teletext screen of the Beeb. There are two editing modes; screen and command edit. The former allows the cursor to be moved within the screen by using the cursor keys; editing commands are provided using the Beeb's function keys, such as F1 (next page) and F2 (delete char), and so on.

In command mode all the editing is done by entering commands in the command area of the screen (the three bottom lines). Commands are entered and terminated by two escape key strokes, which show up as small solid blocks. This mode is powerful (but also dangerous) as it allows sequences of commands to be used which can be executed repeatedly, such as globally replacing one string with another. This mode also has facilities to merge complete or partial programs.

The editor can be invoked to

automatically back-up the file being edited. Alternatively files can be explicitly saved with the same or a different name. An interesting feature is that the editor can handle any file size, so for large files only a portion of the file resides in main memory. The editor could well prove to be useful for applications other than assembly development work.

As well as recognising the full 6502 instruction set, the assembler will act on the following pseudo-ops:

LABEL1 ASC "TEXT STRING"; with no terminator.

so far into the specified library. LABEL22 GET LIBRARY-FILENAME, macro, , - retrieves the macros where they are specified in code.

LABEL2 CHN FILENAME - chains in the FILENAME for assembly. Chains must be locally specified. It is not possible to create a central file consisting of CHN operations.

ORG and EXEC: - These allow the assembly origin and the code execution address to be specified (and therefore can be different). ADE does not provide a linker which could help pprogram development im-

STOP - aborts assembly.

The SPY debugging utility is a macro debugging utility which shows the status of the registers and displays a block of code in ASCII, hex or as a disassembled listing. The instruction to be executed next is highlighted. Debugging is carried out in one of three ways: single stepping through the code using the 'Z' key; by compiling breakpoints in the code using the 'BRK' instruction; or by explicitly inserting a breakpoint in the code by overtyping an instruction in memory.

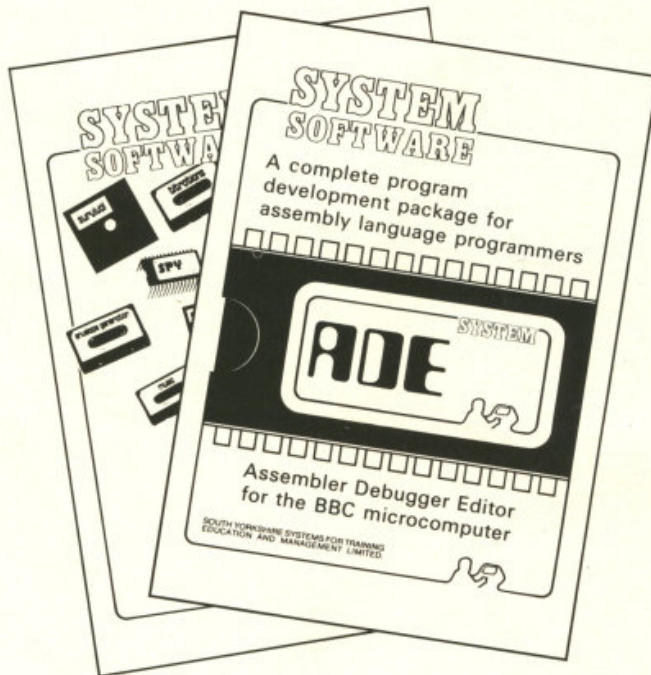
The first is slow for large programs and is mostly used for stepping through modules. The second restricts the user to pre-defined breakpoints. The third method is cumbersome, but most used as breakpoints are normally set up once the code is loaded in memory, and can be set at specific points without re-editing and re-compiling the code.

However, there are difficulties with this current version of the software because on encountering a breakpoint the software puts three bytes on the stack and the PC points past the breakpoint. This means that not only the inserted breakpoint has to be reset to the instruction which it overwrote, but the stack has to be de-queued by three bytes and the PC back-stepped by one location.

We have been informed that in subsequent versions of the software, three bytes will not be pushed on to the stack when a breakpoint is encountered. An implementation which allows breakpoints to be defined and removed, without having to change memory contents and resetting registers, would make this utility more like those available on mini-computers.

On the whole this software is a must for assembler programmers who wish to produce machine code systems.

By Dipak Lakshman, a computer consultant.



LABEL2 STR "TEXT STRING"; - with hex 00 as a terminator.

LABEL DFB NN - initialise byte.

LABEL DW NNNN - initialise word.

LABEL4 DDW NNNM - initialise double byte.

LABEL5 DS XX - reserve XX bytes in store.

LABEL6 DESC - defines an area of memory (start).

LABEL7 DEND - end of definition.

LABEL8 MSW - defines the high order address 00.

LABEL9 QUERY "TEXT STRING" equates the entry to LABELS.

IF / ELSE / FI - allows conditional statements to be assembled. Nesting to 8 IFs is supported.

LABEL20 MACRO

ENDM - defines a macro called LABEL20, the key words MACRO & ENDM are essential.

LABEL21 PUT LIBRARY-FILENAME - puts all macros defined

mensely. The only way to achieve communications between modules when a linker is not available, and the absolute subroutine addresses are not known, is to define jump in and out tables for each module.

TTL - allows a title to be printed when the module is assembled and listed. The assembler produces listings comparable with those produced by an assembler on a minicomputer. SYSVDU - allows VDU commands to be sent to the OS and are the same as the Basic VDU codes.

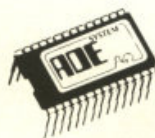
SYSFX - allows *FX commands to be sent to the OS.

INFO - allows messages to be sent to the printer during assembly giving an indication of how the assembly is progressing.

SKP - skips one or a specified number of lines.

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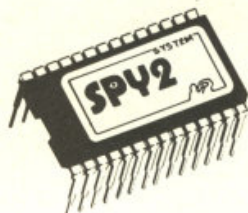
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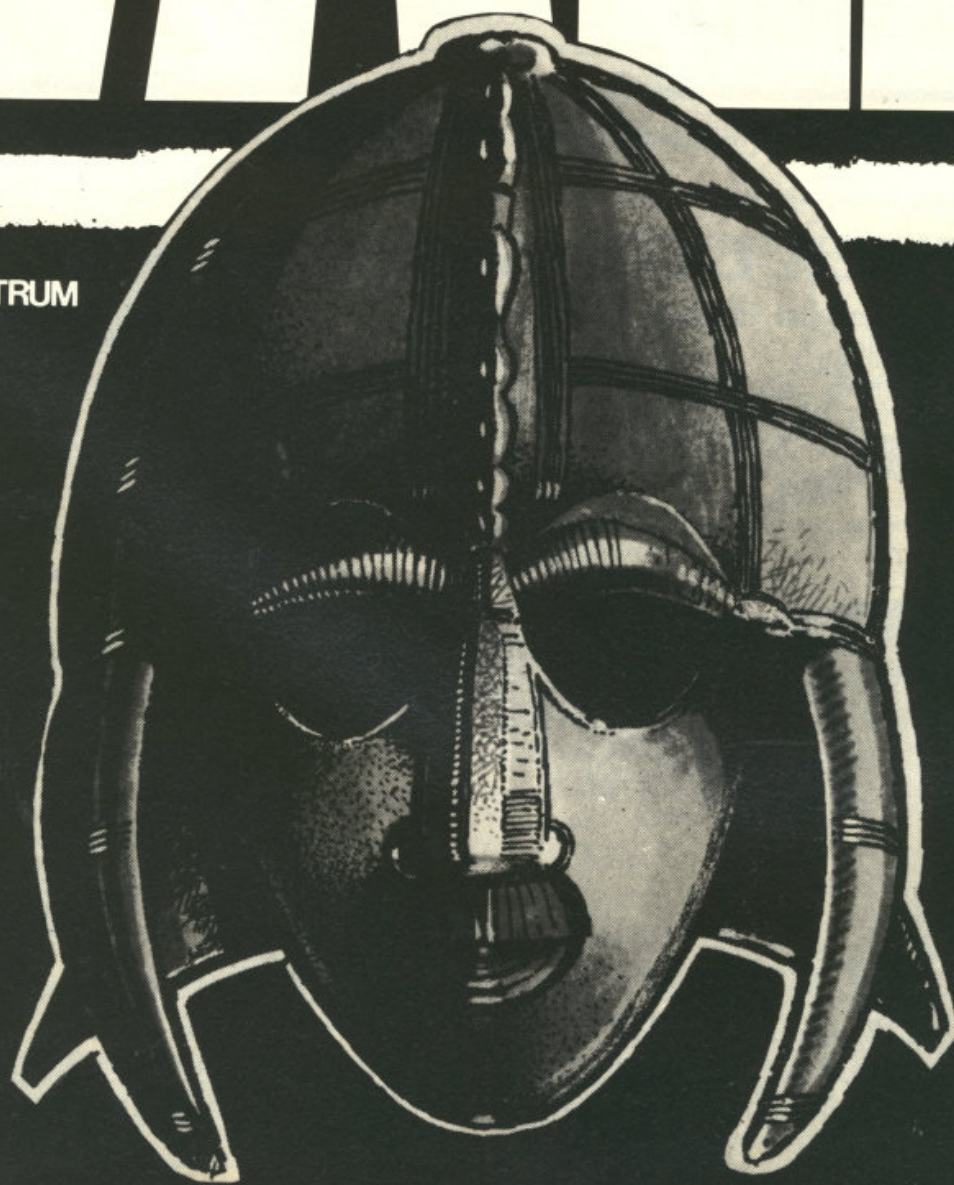
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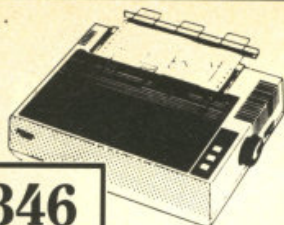
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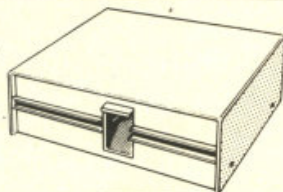
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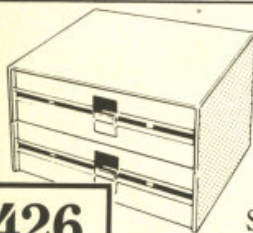
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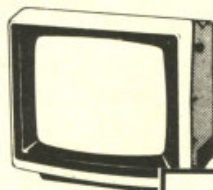
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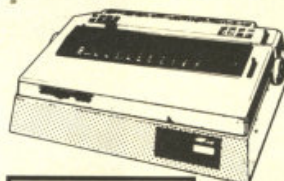
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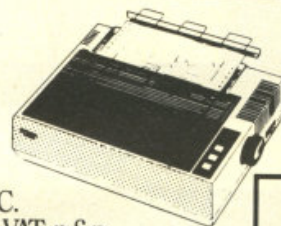
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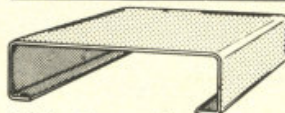
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FURTHER INFO SOURCES

Despite obtaining the Commodore 64 *Programmers Reference Guide*, the use of the special function keys is still unclear. Can you give me more details or recommend further literature?

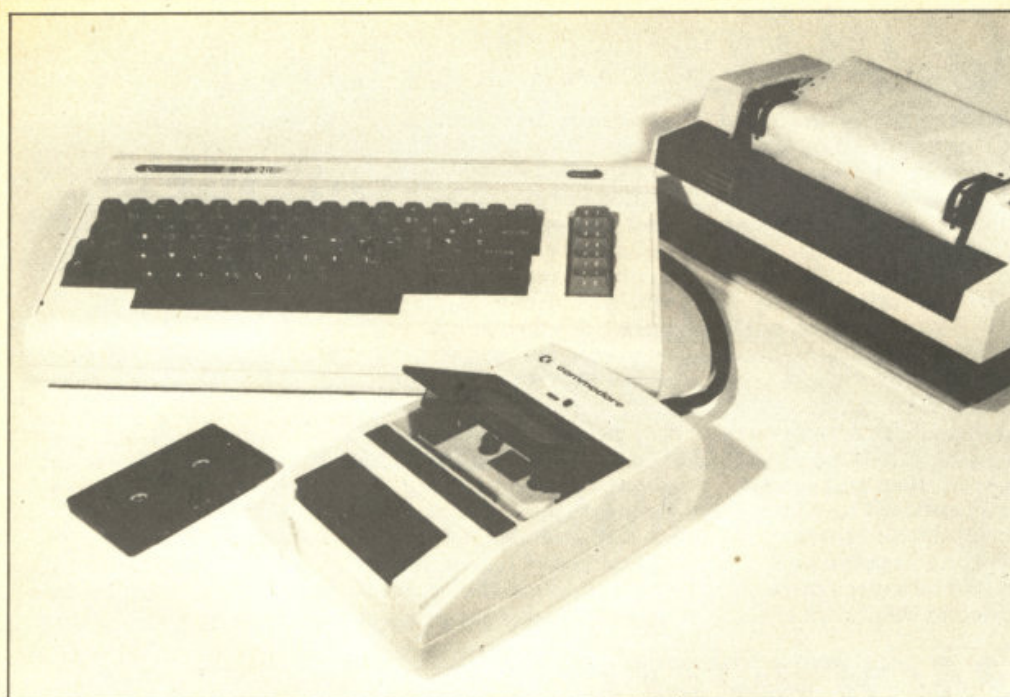
Can any other disk drive be used apart from Commodore units? And which printers can be connected directly without an expensive interface?

A T Campbell, Co Antrim.

The 64's function keys are not really programmable function keys at all; they simply generate the ASCII codes 133-140, and can consequently be recognised by inserting GETs at strategic places in your program. Their use is dealt with in detail in *Easy Programming for the Commodore 64* by Ian Stewart and Robin Jones (published by Shiva at £6.95).

Other disk drives than those from Commodore are possible to use via IEEE488 interface. However, this represents an expensive route to disk storage, although access times are likely to be better than those available from the Commodore units.

The storage available on the Commodore disks is quite good, about 170K, but the operating system is rather a pain to use. Nevertheless, you will probably do better to stick with Commodore. They also do two printers that interface directly with the serial port of this machine. The 1526 printer, although more expensive, being noticeably better than the 1525.



PRINTER CONTROL

I am having difficulty in using my Commodore 1525 printer under program control. While it is easy to get hard copies of program listings, as usual, the Commodore printer manual is not forthcoming in showing the user how to include instructions within a program to print output, file contents and screen dump. Can you help?

Colin F Moon, Sheffield.

Outputting to a printer on the Commodore 64 requires that

you see the printer as a file. The first job is to define a channel number for the printer; this can be any number you aren't using for some other file (such as the datasette). So you could write:

10 PTR=2

20 OPEN PRT,4

— because 4 (or 5) is the printer device number. Now to print a message: 30 PRINT # PRT, "Hello World" which sends the symbols 'Hello World' to channel 2. What it doesn't necessarily do is print them, because the Commodore 64 has a buffered file system, and, at the moment the data has been

passed to the buffer, not to the printer. If the buffer is to be flushed to the printer, we have to tell the computer to do so by closing the file: 40 CLOSE PTR.

It may be this that has been confusing you, because often nothing appears to happen until the CLOSE command is encountered.

So far as copying a file is concerned, it is only necessary to read strings from the file, and print them to the printer as shown above. A screen dump can be achieved by PEEKing each of the screen locations in turn and printing the equivalent character. For example, the top left hand corner of the screen is at 55296 so print # PTR, CHR\$(PEEK(55296)) will output its contents. Obviously, to get a complete screen dump you simply place a statement like this in a double FOR loop, the outer one for every row, and the inner one for every column in the row. PS: (You may find the Q&A below, 'Interfacing', of interest.)

'SIMON' SNAGS

I recently purchased a *Simon's Basic*, and both the cartridge and manual were faulty. Commodore has replaced the cartridge, but ignored my request for a printed list of errors for the manual. I see no difference between a faulty device and a faulty instruction book — does the warranty cover both? What can one do?

G S Dutton, Essex.

I own a Commodore 64 equipped with a *Simon's Basic* cartridge. The problem is that it won't load with

the cartridge plugged in.

SP Wyatt, Oxon.

We have had several queries which suggest that some *Simon's Basic* cartridges may be faulty, so the answer to the loading problem is to return the cartridge to Commodore explaining the difficulty, and they will replace it.

We sympathise over errors in manuals, having suffered from this problem on numerous occasions ourselves. Manufacturers generally do try very hard to get it right, but you must realise that they cannot guarantee to do so every time. After all, when they make a device, it can be tested to ensure that it works — how do you test a manual?

INTERFACING

What would be the cost of an interface to connect an Electron to a disk drive/printer?

Also, can I connect a Commodore 64 to a printer without an interface?

Matthew Laycock, Northumberland.

The obvious interface for this purpose would be an IEEE488, but as far as we know one is not yet available for the Electron.

A Commodore 1525 or 1526 printer connects directly to the serial port of the Commodore 64, so should be pretty simple and is probably your best bet.

POKES PLEASE

Simple question: what is the POKE to disable the break key?

G Mills, Stoke.

There is no simple POKE to disable the BREAK key on the Spectrum; this can only be done in machine code and then not with complete success.

You can, however, cause the program to crash if it stops with an error or for an INPUT statement by POKE 23659,0. This is because when the program is running no room is left for messages at the bottom of the screen, so when an error message is attempted after "BREAK" the ZX Spectrum crashes.

KNOW A GOOD MODEM?

Is there any software available at the moment which will enable me to use a 300 baud modem with a ZX Spectrum (with RS232 interface)? If not, what elements would be required to show up and down loading of programs, as well as straight forward communication with TBBS systems and Prestel?

B J Knox, London.

Spectrum Communications/Teletype program from JWV Software will allow a ZX Spectrum to communicate with both Prestel and TBBS (including our own CABB). It can be set to 300 or 1200/75 baud operation.

While it will allow straight forward communications and file transfer it does not have Xmodem error checking protocols. Specterm by Andrew Glaister (published in the March issue of *Computer Answers*) has Xmodem, but currently is not configured for 1200/75 Prestel use. Both use the Micro Mania interface (also available from JWV Software).

JWV Software,
139 Allington Drive,
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LOAD PROBLEMS

I wrote a program to aid the selection of hymns for church services and print 30 choir hymn lists and have had consistent loading problems.

Program has about 1200 lines, including many multi-statements, with large (if/or/if/etc/then) section for hymn search with character codes. Takes about 5.5 minutes to load. When loading, screen lines and sound are confused until near the end when lines become regular and sound becomes pure tone. At this point the

program mis-loads four times out of five, with an error in loading report. Other programs load and save with total reliability. This problem has persisted while about 50 lines have been added to program, so memory limit does not seem to be the cause. Can you help?

C M Stacey, Dartmouth, Devon.

The screen lines around the screen (the border) will be confused - that is the data you are seeing coming in from the tape recorder! It sounds as if your system variables are corrupted, and that the program

is loading in more data than it should. Try CLEAR and then RUN before starting the program. This should reset the system variables. It also clears any data you may have stored.

It is also possible that due to the long loading time that noise from the mains power supply may be upsetting the program. To test for this, try making up another long tape by using a large DIM statement in a program, so that inserting another program line gives an 'Out of memory error'. SAVE this, and then try to VERIFY it.

This should determine whether you're having mains noise problems.

MODIFIED MONITOR

Where can I obtain a suitable interface to connect my Spectrum to a US-made APF mono monitor? The monitor has two inputs 75 and 'high impedance'. I would like to retain the Spectrum's compatibility with the domestic CTV.

T Barrett, Northants.

The US monitor works on a synchronisation frequency of 60 HZ, and the Spectrum works on a frequency of 50 HZ. This may cause some picture rolling.

The 75 ohms impedance

input is the one to use, and should be obtained from the expansion interface via an edge connector after connecting the VID strap inside the Spectrum (on Models 1 and 2 only). This is near the video modulator (the large metal box); the connections on the expansion interface are detailed in the manual under I/O as VIDEO and O VOLTS.

Model 3's have the video output connected direct to the edge connector. You can operate both at the same time, but expect some degrading of the TV signal.

SPECTRUM ON-LINE POSSIBLE?

Is there any equipment available to access Ceefax and Oracle on the Spectrum?

L F Over, Edmonton.

No, there isn't. As it is a one way device (from the TV to the user), Sinclair seems to have no intention of providing one.

DECIMAL SPREAD

Is there a spreadsheet package for the Spectrum which gives answers correct to decimal places, with automatic rounding up and down?

Notice that the Psion VuCalc program uses only integer arithmetic on the Spectrum version, whereas on the illustration of the ZX81 version it shows answers to two decimal places.

J N Kirkland, Blackheath.

When you first load Psion's VuCalc from tape, the default format for the cells is integers.

However, the program can handle real numbers with two decimal places. The command to convert the entire table to real numbers is 'E,f,a,\$r', or else you can set individual cells to display integers, reals, or general format for both types.

When making a calculation with an integer result, VuCalc automatically rounds down.

BOARDING UP

I have bought a Bi-pak ZONX81 sound board, which is now being advertised for the Spectrum, and wondered if it could be used on the Spectrum without connecting an interface.

I have also bought a Kempston Competition joystick for my ZX Spectrum, and wondered if it is compatible with my ZX81 by using the machine code instruction IN (PORT)?

B A Kitchen, Uxbridge.

The Bi-Pak sound board will work directly on the ZX Spec-

trum as long as the Interface 1 is not used, but will be noisy as it uses the clock signal from the computer to generate the tones. The add-on board provides a clear crystal clock and sounds better.

The Kempston joystick is compatible with the ZX81. Using IN A, (32) will read in the value of the joystick. Each direction adds a different number to the total when used. The total is zero when the stick is in the central position. Do not forget that the Competition-Pro joystick can produce two numbers, if used on the diagonal directions, and a check for these must be made in the program.

At last, the first joystick that puts the firing button where it should have been in the first place.

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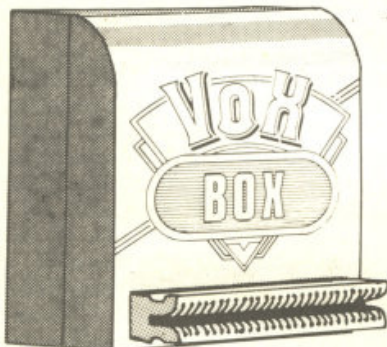
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DIRECTIONS EXPLAINED

Could you explain the assembler directions FCB, FDB, FCC, and give examples of how they might work?

G Smith, Warwickshire.

The directives FCB (Fixed Constant Byte), FDB (Fixed Double Byte) and FCC (Fixed Constant Character) allow you to store numeric and string data in your assembly language programs. FCB will let you label an address containing a byte value between 0 and 255, for example @LABEL FCB 127.

FDB is used for 16-bit values between 0 and 65535, for example @LABEL FDB 32767, and FCC is used for strings for example @LABEL FCC "THIS IS A STRING".

FCC will poke the ASCII values of the characters in the string into memory locations starting at @LABEL.

These commands are only used from assembler programs, and, in effect replace variables in a Basic program.

AUTO-REPEAT POSSIBLE?

Is it possible to use software to make the keyboard of the Dragon 32 'auto repeat'? Also is it possible to disable the 'break' key, and can a program be made to 'auto run' on loading?

Brian Adams, Co Antrim.

You can simulate an auto-repeat function in your programs by repeatedly PEEKing

location &H87. This holds the ASCII value of the last key pressed.

Dragon Data say that the BREAK key can be disabled by incrementing the return address of the 'read next statement' ROM subroutine by 4. This can be done by putting a jump instruction at location &H19A, which should point to a routine of your own which

should pull the most recent return address from the system stack, add four to it and then push it back onto the system stack. Your routine should finish with an RTS instruction and this will bypass the BREAK checking routine.

Programs can be made to auto-run with a little software assistance, but once again, this will involve you in some non-trivial low-level programming (we recommend that you invest in a good assembler/debugging package). Before your main program on tape you will need to have a machine code program which will poke the start address of Basic's RUN routine into locations &H9D/E, CLOADM your main program and then call the EXEC routine in ROM. This program will need to be in memory protected by a CLEAR statement.

In the January issue of *Computer Answers* there was a full article on editor/assemblers, giving details of suppliers.

DUMP CODES

Can you supply code for dumping from screen to printer and end of program?

T A Judd, Kent.

The following code will (very slowly) dump a hi-res screen from the Dragon to a Seikosha GP100A printer. (It would benefit greatly from translation into machine code.)

```
10 PMODE 4,1:SCREEN 1,0
20 PRINT #2,CHR$(8)
30 FOR X=0 TO 191 STEP 7
40 FOR Y=0 TO 255
50 A=PPOINT(Y,X)+PPOINT
(Y,X+1)*2+PPOINT
```

```
(Y,X+2)*4+PPOINT
(Y,X+3)*8+PPOINT
(Y,X+4)*16+PPOINT
(Y,X+5)*32+PPOINT
(Y,X+6)*64+128
60 PRINT #2,CHR$(A)
70 NEXT Y
80 PRINT #2,CHR$(13)
90 NEXT X
100 PRINT #2,CHR$(15)
```

To use the program, draw your picture in PMODE 4, return to text mode and Basic (your picture will still be in memory) and load and run the dump program.

MACHINE CODE LOAD

How does the Atari 400 load machine code programs? I ask this because although most games load on my Atari, some won't.

K Brookes, Hartlepool.

The Atari loads machine code programs the same as it does Basic programs. Most machine code programs are booted in. To do this, put the tape in the recorder, press 'play', then switch on the computer while holding down the

start key. The computer will then beep once. When it has done this press the 'return' key.

If programs still refuse to load, try cleaning and demagnetising the heads. Most department stores sell a special tape that will do both in one pass. Don't forget that the Basic cartridge must be removed when loading some programs. Cassettes must not be stored near the TV set or other source of magnetism; the

TV is powerful enough to erase parts of the tape and make it impossible to load. If you have bought programs that do not load, take them right back to the shop and get them exchanged.

If all this fails, try using your friend's recorder with your computer, and vice versa. If the problem still persists, then we recommend taking the recorder back to the retailer or better still returning it to your local Atari service centre.

PIN CONNECTIONS

Why do Atari computers have a non-standard 13 pin I/O port instead of a standard 5 pin DIN, as others have? Where can I obtain leads with 13 pin plug? Can I obtain an adaptor to convert the Atari for use with a 5 pin DIN plug? Can a printer be used with a 400? If so, how, and which are the cheapest

suitable using plain paper?

J Constable, Middlesex.

You don't say why you require a 5-pin DIN outlet Mr Constable, which makes life awkward as we could have found a way round your problem. Unfortunately, we know of no adaptor of the type you mention. The only source of 13 pin plugs we can think of is Atari themselves. Try ringing their Customer Relations Department

on (0753) 24561 for assistance.

A printer can be used with the 400 in the same way it is used with an 800. You will have to buy some sort of interface adaptor like the 850 produced by Atari, or one of the many on the market which plug into the joystick port.

Most printers will hook up to the Atari, and we suggest you visit your local computer dealer for more information.

ATARI

ATARI 'JOYSTICK BUTCHER' RESTRAINED

Can I butcher my Atari 2600 games machine to work on a Spectrum 48K? If so, will it work with joysticks and Atari cartridges (the ideal situation would be to end up with the Atari module plug in to the rear of the Spectrum Interfaces 1 and 2)?

D J Meekins, Herts.

The answer is a big no: butchering your Atari machine will only result in a butchered Atari machine. Atari cartridges won't work with the Spectrum, but you can get an adaptor that will allow Atari joysticks to be used. There was a full feature on joysticks in the February 1984 issue of *Computer Answers*.

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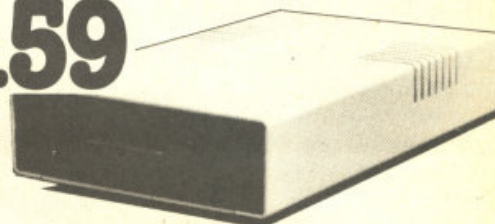
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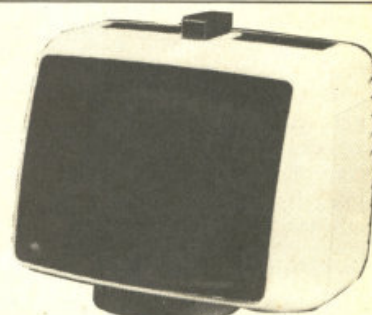
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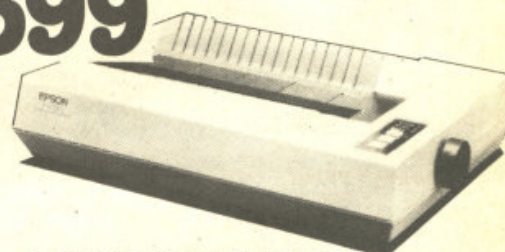
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MODEL HARDWARE

Is additional hardware available to enable me to interface the Oric 1 to my model railway control, so I can program timetable connected movements, and so on?

C A Shill, Crediton, Devon.

Nothing seems to be currently available to interface the Oric 1 to the real world, although Tevward Microtech Ltd are currently advertising an I/O board as 'out soon'. Apparently the board will have a 6522A VIA chip to give sixteen I/O lines, plus a serial port two timers and more. Besides giving a capability to control model railways and the like, it should provide for intermachine communication.

Tevward Microtech Ltd,
403 Dallow Road,
Luton LU1 1UL.
Tel: (0582) 418906.

APPLE

I see from the May issue of Computer Answers that the CPS 11 lightpen costs £249. In October 1980 U-Microcomputers were advertising a lightpen for the Apple II at £34; however, they are now unable to supply this item. What is the reason behind this enormous difference in price? Surely if Eltec computers can advertise a light pen for the BBC micro at £34.50 it should be possible to do the same for the Apple.

R S Ridout, Haywards Heath, West Sussex.

The differences between the lightpens from an operational point of view are mainly concerned with their resolution and capabilities. The cheap version connects to the Apple via the games I/O socket on the motherboard, and Basic subroutines are published to operate it, which can be incorporated into your programs.

The LPS II (Gibsons Laboratories), however, is a true light pen system, with its own interface card containing

SAVING LINE NUMBERS/ AQUARIUS COMPARE

Would an Oric save data which had been written with line numbers? Also how does the Oric 1 compare to the Aquarius?

Philip Rhodes, W Sussex.

If an Oric program containing DATA statements is saved onto cassette, then clearly when the program is loaded again the DATA statements will appear with line-numbers. However, if a section of memory containing data is saved, then no line-numbers will appear, because program and data areas are separate on the Oric. In fact, the data area follows immediately after the program in memory, its start address being held in bytes 156 and 157.

Single-valued variables are stored first in the data area, followed by arrays; however, string variables do not store their character contents explicitly in this data area: a pointer is held after each string data-name showing where its actual

contents is found. This can make the storing of Oric data on cassette an irksome task.

The Aquarius and the Oric are in different price bands, and naturally the facilities provided correspond to their price. Aquarius Basic is limited, and if, as the first part of your question suggests, you want a data retrieval system, the Aquarius is not suitable. Oric on the other hand, with the release of the new Atmos, might be a reasonable choice.

The Oric 1's cumbersome approach to data storage and recall has been improved on the Atmos—two new keywords have been introduced to provide these facilities. The STORE instruction can be used to save an array on tape, and the array's memory organisation is totally transparent to the user. The format of the instruction is where the array can be real, integer or string. An optional S can be added for storage at 300 bauds rather than the normal 2400 bauds.

RECALL can be used to load an array from tape, and has a similar format to STORE.

For a sophisticated information retrieval system on the Oric, a good choice is *Oric-Base* by Tansoft, which works with a 48K Oric/Oric Atmos and provides file storage, updating and reporting facilities.

The Aquarius is not a computer we'd recommend. Mattel who originally marketed it, has pulled-out and left it in the hands of its manufacturer. It is very basic (with a teeny 4K of RAM) and not suitable for serious work.

More information on the Oric Atmos is available from:

Oric Products International,
Coworth Park, London Road,
Ascot, Berkshire SL5 7SE.

Oric-Base is available from:

Tansoft,
Units 1/2, Cambridge
Techno Park,
Newmarket Road, Cambridge.
Tel: (02205) 2261.

LIGHTPEN PRICES

all the operational software for its many capabilities. A software driver is hooked into the computer's video signal, ensuring the exact axial position of the scanning dot is known. This allows accurately tracking the pen across the screen and real-time drawing.

There are four complete hires drawing systems available, allowing all the required

graphics operations together with a hi-res text generator.

U-Microcomputers no longer stock the cheap lightpen, but say they should be able to get hold of one if you ask them. For an alternative graphics input device for the Apple, the Bit Stick from Robocom is highly recommended.

The Gibson lightpen (£281.75

inc. VAT) is available from:

PACE,
92 New Cross St,
Bradford BD5 8BS.
Tel: (0274) 575973.

U-Microcomputers,
Winstanley Industrial Estate,
Long Lane, Warrington,
Cheshire. Tel: (0925) 54117.

Robocom,
Tel: (01) 263 3388.

STUNG BY THE HUNG

**I boot my system Master diskette into my Apple II and type:
RUN RENUMBER
(RETURN) (RETURN)
LOAD COPY A (RETURN)
& F1000 (RETURN)
& H (RETURN)
LOAD COPY A (RETURN)
& M (RETURN),
and the computer 'hangs'. How can I avoid this?**

Marcel Mane, Spain.

We have tried the operations you quote on several Apples

and did not find any which 'hung'. This could suggest a fault with one of the memory chips in your Apple. We suggest you list the relevant memory contents after each of the quoted operations to see if any fault is readily apparent. The program disk *Master Diagnostics* from Nikrom may prove very useful, as it will test the memory and much more, of your Apple.

However, we fail to see why you are carrying out these operations as stated, unless it

was to illustrate a fault, as they will result in two identical segments of program in the computer memory, one starting at line 10 and the other at line 1000. Normally this facility is used to combine different sections of program, stored on disk, into a single program. Care should be taken when using this that duplicate line numbers do not occur in any of the sections to be combined, as both sets of statements at these line numbers will result. We hope these points are of use.

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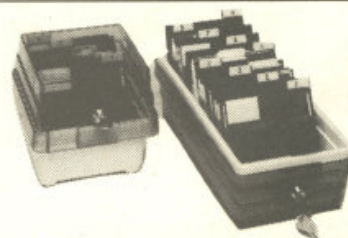
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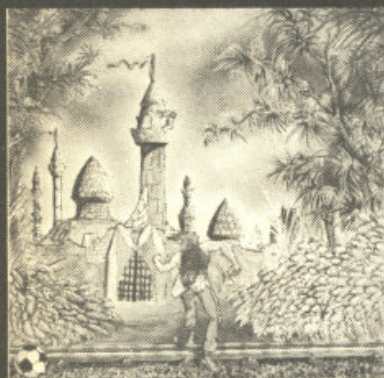
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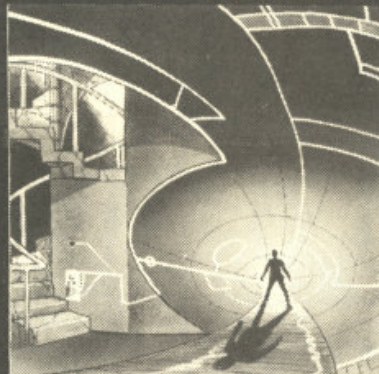
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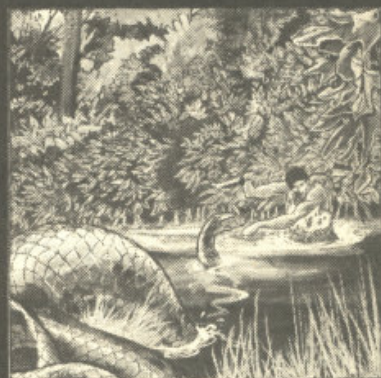
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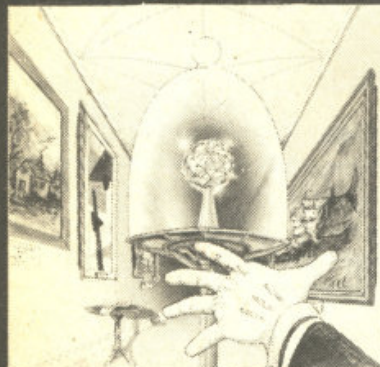
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UP-MARKET CHOICE

As a newcomer to the world of micros, I would appreciate some ideas as to which model would be the best for me — I can program in Pascal and Cobol, on a prime 750!

Stuart Griggs, Lancs.

Where should we start? There are so many machines on the market, with so many individual foibles and pros and cons that we could fill a year's worth of *Computer Answers* answering this question (as almost we have).

However, we can narrow the field, given your final comment that you are used to using a powerful professional system, and would therefore find the more primitive machines rather frustrating. So we'll start by ignoring those computers with a poor

version of Basic, limited memory capacity, poor displays, and expensive or poor quality peripherals. The Dragon and Vic 20, for example, have by current standards, inadequate displays and rather primitive implementations of Basic.

The Spectrum has a good Basic (and a Pascal compiler is available from Hisoft) and a nice steady display. Some people find the idiosyncratic keyboard annoying, although given a little practice, it can be mastered to an adequate degree. The Commodore 64 is a technically competent machine and has a number of useful features, but its Basic is poor, and peripherals (such as disk drives) are somewhat slow and not cheap.

On cost, the Spectrum scores here, with a pair of ZX

Microdrives (with the appropriate interface) costing only about £130 for about 180K of on line storage.

The BBC Model B has an excellent Basic and a number of other languages available (such as Forth and Logo), but, in the current market climate, is overpriced at £399.

The Sinclair QL, with its impressive specification, can be regarded as a best buy for someone in your position. After all, a 48K Spectrum with dual Microdrives could cost you around £260, for an extra £140 you would be getting an extra 80K, a 68008 processor, slightly improved Microdrives, an extra RS232 interface, and the facilities for an extra 0.5 MB of RAM and Winchester disks.

So there you go — hope you find our suggestions useful.

PRICE COMPROMISE

I am thinking of buying a micro computer, and would like some advice as to the programming potential of the Spectrum and Commodore 64. I understand that micros under £300 have considerable disadvantages in their programming abilities; however, I do not wish to buy one for which peripherals will cost hundreds of pounds. So is the Spectrum a good compromise or is the Commodore 64 the best bet? (I do not want to spend over £130).

Andrew Grannell, Near Norwich.

Both the ZX Spectrum and the Commodore 64 represent good value for money and, in many respects, offer similar features, although there are significant differences. We assume from the tone of your letter that you are a newcomer to computing, so will deal with the pros and cons from the standpoint of the beginner.

The most immediately obvious difference is in the keyboards. Some people find the 'dead' feel of the Spectrum's keys disconcerting, although you can alleviate this by making the machine beep reassuringly when a key has been depressed. Also, the

single key entry system on the Spectrum takes a little getting used to. In contrast, the Commodore 64's keyboard is conventional and has a nice, professional feel.

So far as programming is concerned, both machines offer a built-in version of Basic. The Commodore 64 Basic can most kindly be described as primitive. It is an implementation of Microsoft Basic which has not been upgraded for almost a decade, so there are no built in facilities for handling colour, hi-res graphics or sound. In particular it is not at all easy to draw hi-res displays. In contrast, Spectrum Basic is among the nicest available. It is not fast, but that doesn't usually matter. It has powerful graphics commands, excellent error checking (the 64 will allow you to make the same error in typing a program dozens of times; only when you run the program does it tell you about it; then you must do numerous edits. The Spectrum simply won't allow you to enter a faulty statement), and allows the user to edit a program without losing all the values already entered — a very useful and uncommon feature.

The Commodore 64 has one of the most sophisticated sound chips available, capable

of acting as a passable synthesizer. The Spectrum, on the other hand, has only a single tone channel, although it is very easy to use.

As far as peripherals are concerned, the advent of Sinclair's Microdrives has put the Spectrum streets ahead of the opposition in terms of low cost mass storage. The Microdrives really are an acceptable alternative to disks, and for most uses, are not significantly slower.

On balance, these considerations tend to point to the Spectrum, particularly as you mention a top price of £130, for which you can buy a 48K Spectrum, whereas the lowest offer we have yet seen on a Commodore 64 is £165. You must add to the latter figure about £40 for the special cassette recorder which the Commodore requires.

DOES DISK CONNECT

Is it possible to connect a Cyborg disk drive to a Sharp MZ80A?

E Williams, St Thomas.

Sharp's own disk drives run 70 track disks, which is not a standard format. This makes it highly unlikely that any other disk drive can be operated by Sharp's operating system.

ANSWERS

ALLSORTS

HOW CAN I CONVERT MY 'LIFE'?

Could you please tell me how I could convert your 6502 assembly listing of 'Life' (Computer Answers October issue) into a Z80 assembly listing, suitable for the Newbrain.

David Scott, Scotland.

A full translation from Z80 to 6502 code would take a considerable amount of time and effort. It would probably be slightly easier to hand-translate the Basic listing of Life given in the previous issue to the one that the 6502 listing was published in (that is, the September rather than the October issue). What would be a lot easier would be to translate this Basic listing into Pascal and then use the Newbrain's Pascal compiler to produce a binary file that should run at an acceptable speed.

MUSIC TO LOAD BY

I have read that it is possible to record a computer program and an aural sound track at the same time, so that when the program is loading you hear the aural sound track, not the squeaks of the program. How is this done? (I have an Atari 800.)

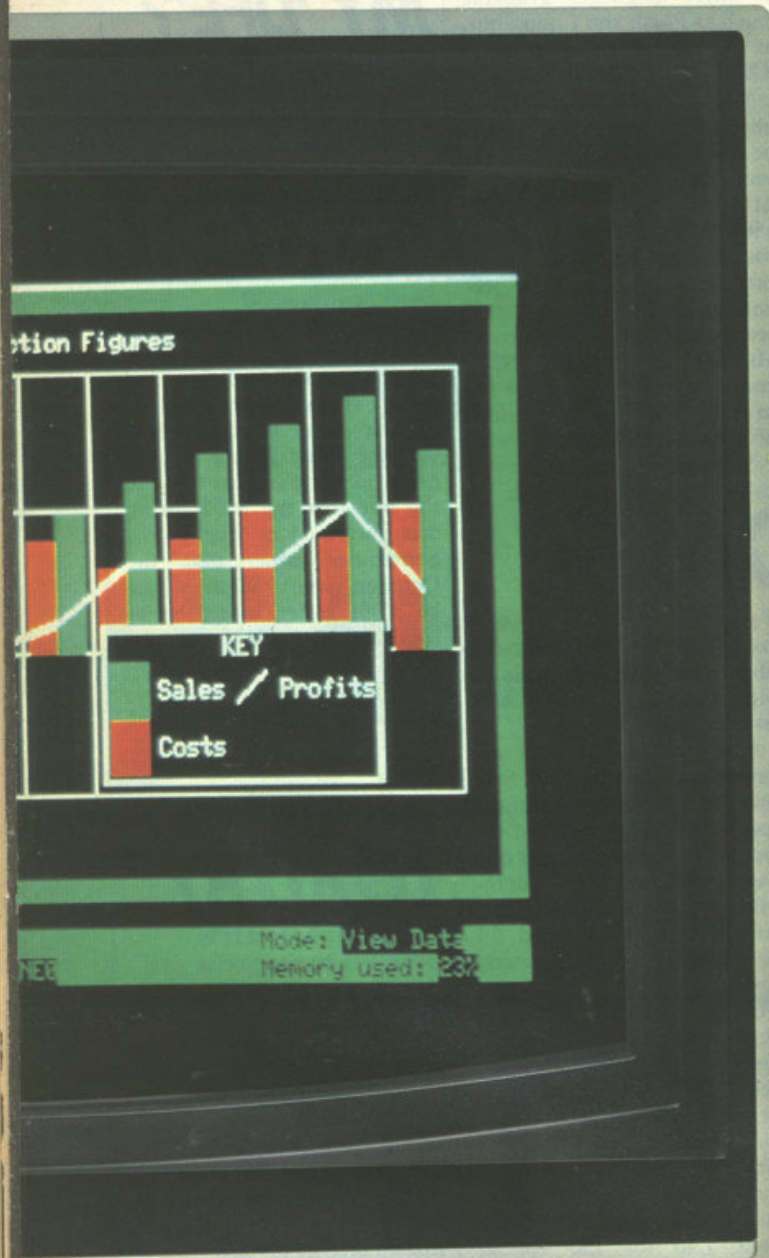
Richard Breese, Felbridge.

The easiest way is simply to record a sound track onto the host cassette first (you will need a stereo recorder), on to the left track only. The computer will record the program track on the right. You may have to play around a bit to get volume levels right. You may find it easier to record the program onto the tape first.

If you want to play music through the TV speaker while you program then POKE 54018,52 to start the 410 or 1010 Atari recorders. POKE 54018,60 will turn it off.

New-Sinclair QL

There's no comparison chart, be



The Sinclair QL is a new computer.

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If you do agree, there's only one course of action you can take... get yourself a Sinclair QL at the earliest possible moment.

The Sinclair QL has 128K RAM. Big deal?

Several micros offer 128K RAM, or more, as standard. The 'What Micro?' table for December 1983 lists over 50 of them – but 40 of the 50 micros listed cost over £2,500!

The Sinclair QL offers you 128K RAM for under £400, and an option to expand to 640K. That's a lot of bytes to the pound!

The Sinclair QL has a 32-bit processor. Who else?

Under £2,700, nobody. Even the new generation of business computers, such as the IBM PC, are only now beginning to use 16-bit processors.

At prices like this, the Motorola 68000 family – widely regarded as the most powerful microprocessors available – will remain a luxury.

Yet with the Sinclair QL, the 32-bit Motorola 68008 is available for less than £400.

You can also be sure that the QL will not become outdated. 32-bit architecture is future-proof.

32-bit processor architecture, 128K RAM, and QDOS combine to give the QL the performance of a mini-computer for the price of a micro.

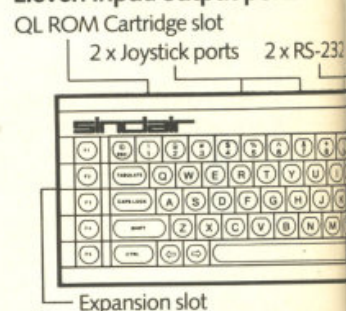
Exclusive: new QDOS operating system

No competition! QDOS sets a new standard in operating systems for the 68000 family of processors, and may well become the industry standard.

QDOS is a single-user, multi-tasking, time-sliced system using Sinclair's new SuperBASIC as a command language.

One of its most significant features is its very powerful multi-tasking capability – the ability to run several programs individually and simultaneously. It can also display the results simultaneously in different portions of the screen. These are features not normally available on computers costing less than £7,000.

Eleven input/output ports

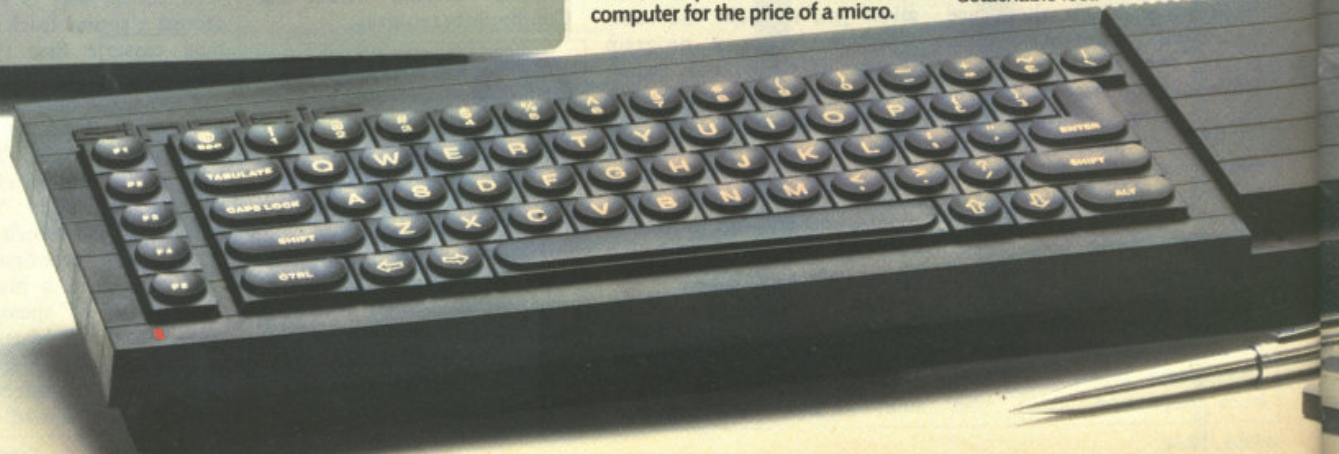


New professional keyboard

The QL keyboard is designed for fast input of data and programs.

It is a full-size QWERTY keyboard, with 65 keys, including a space bar; left and right-hand shift keys; five function keys; and four separate cursor-control keys – key action is positive and precise.

A membrane beneath the keyboard protects the machine from dust (and coffee!), and for users who find an angled keyboard more comfortable, the computer can be raised slightly at the back by small detachable feet.



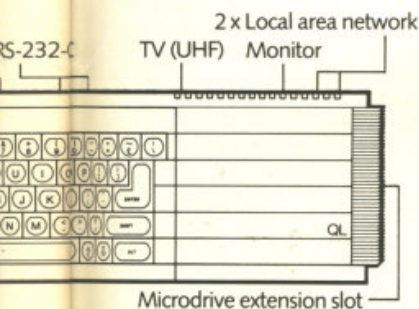
£399

because there's no comparison!

Advanced new friendly language – Sinclair SuperBASIC

The new Sinclair SuperBASIC combines the familiarity of BASIC with a number of major developments which allow the QL's full power to be exploited.

Unlike conventional BASIC, its procedure facility allows code to be written in clearly-defined blocks; extendability allows new procedures to be added which will work in exactly the same way as the command procedures built into the ROM; and its constant execution speed means that SuperBASIC does not get slower as programs get larger.



Two 100K microdrives built in

The Microdrives for the Sinclair QL are identical in principle to the popular and proven ZX Microdrives, but give increased capacity (at least 100K bytes each) and a faster data-transfer rate. Typical access speed is 3.5 seconds, and loading is at up to 15K bytes per second. The Sinclair QL has two built-in Microdrives. If required, a further six units can be connected.

Four blank cartridges are supplied with the machine.



© Quill, Easel, Archive and Abacus are trade marks of Psion Ltd.

Included – superb professional software

The suite of four programs is written by Psion specially for the QL and incorporates many major developments. All programs use full colour, and data is transportable from one to another. (For example, figures can be transferred from spreadsheet to graphics for an instant visual presentation.)

Word-processing



Certain to set a new standard of excellence, QL Quill uses the power of the QL to show on the screen exactly what you key in, and to print out exactly what you see on the screen.

A beginner can be using QL Quill for word-processing within minutes.

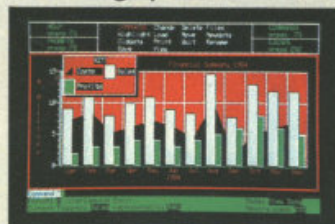
QL Quill brings you all the facilities of a very advanced word-processing package.

Spreadsheet



QL Abacus makes simultaneous calculations and 'what if' model-construction easier than they've ever been. Sample applications are provided, including budget-planning and cash-flow analysis. QL Abacus allows you to refer to rows, columns and cells by names, not just letters and numbers. Function keys can be assigned to change a variable and carry out a complete 'what if' calculation with a single key-stroke.

Business graphics



QL Easel is a high-resolution colour program so easy to use you probably won't refer to the manual! It handles anything from lines, shaded curves or histograms to overlapping or stacked bars or pie charts. QL Easel does not require you to format your display before entering data; it handles design and scaling automatically or under your control. Text can be added and altered as simply as data.

Database management



QL Archive is a very powerful filing system which sets new standards, using a language even simpler than BASIC. It combines ease of use for simple applications – such as card indices – with huge power as a multi-file data processor.

An easy-to-use labelling facility means that you don't have to ask for your file by its full name – a few letters are enough.

New – the Sinclair QLUB

The QLUB is the QL Users Bureau. Membership is open to all QL owners. For an annual subscription of £35, QLUB members receive one free update to each of the four programs supplied with the QL, and six bi-monthly newsletters. Sinclair has also made exclusive arrangements for QLUB members to obtain software assistance on QL Quill, Abacus, Archive or Easel by writing to Psion.

The Sinclair QL challenge

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Phone Camberley (0276) 686100, or use the coupon to get a QL brochure. Due to demand, delivery may take more than 28 days. Your order will be acknowledged immediately with an expected shipment date. Remember that Sinclair offers a 14-day money-back undertaking.

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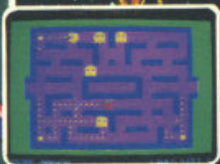
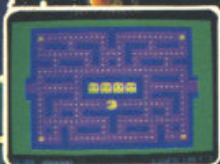
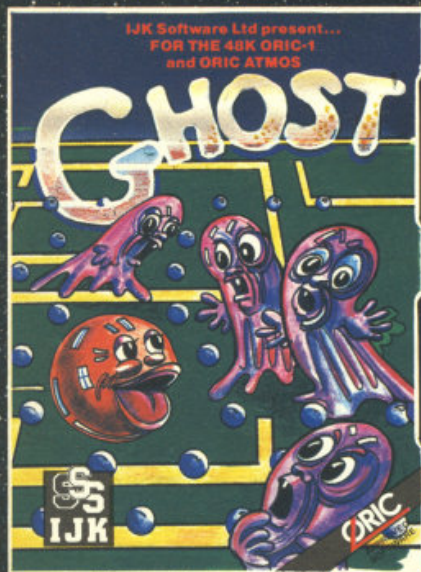
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In this superb version of the record breaking arcade game,

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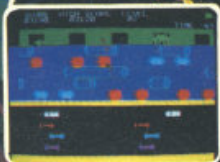
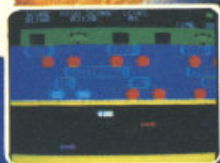
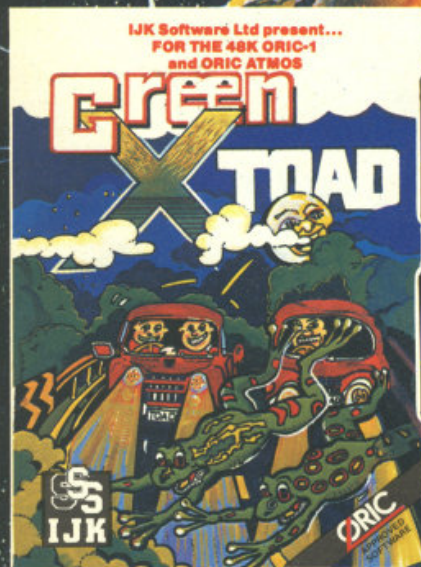
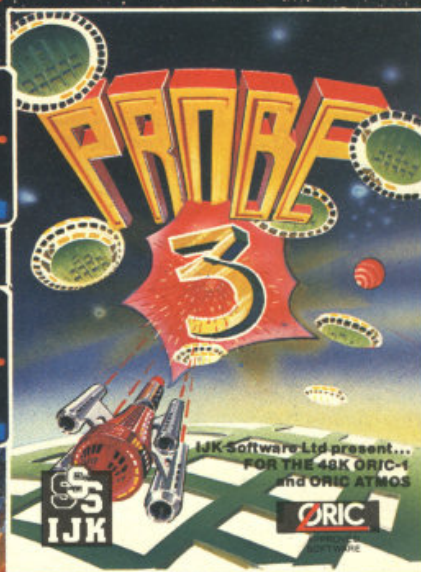
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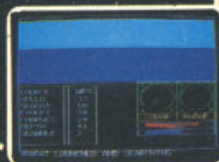


GREEN CROSS TOAD

Help the toad across the road avoiding the traffic, then

help him cross the river on the logs and turtles, to reach the safety of the lily pads. This machine code version of the popular arcade game features lanes of traffic, logs, diving turtles, jumping toad, snakes, flies, tunes, hall of fame, etc., etc.

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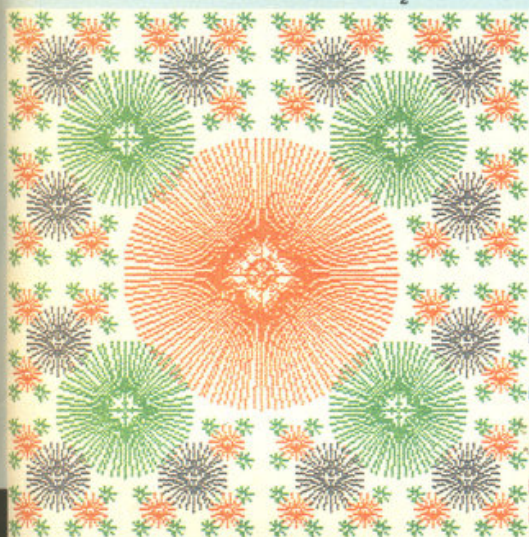
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ACORNSOFT

Ever bought a game that's not as good as its box?

Everybody has seen the home computer game packs that sparkle with imaginative colour and graphics, and lure buyers into the store.

Sadly, some who have bought have found that the game sparkled less than the box. For, as more and more companies jump on the home computer bandwagon, it becomes ever more likely that most of the imagination and excitement is concentrated in the pack. Instead of playing a fast game, you lose a fast buck. Or, more likely, several.

Yet games have become increasingly sophisticated. Scenarios are more varied, levels of play have been increased, and high resolution colour graphics capabilities are being used together with

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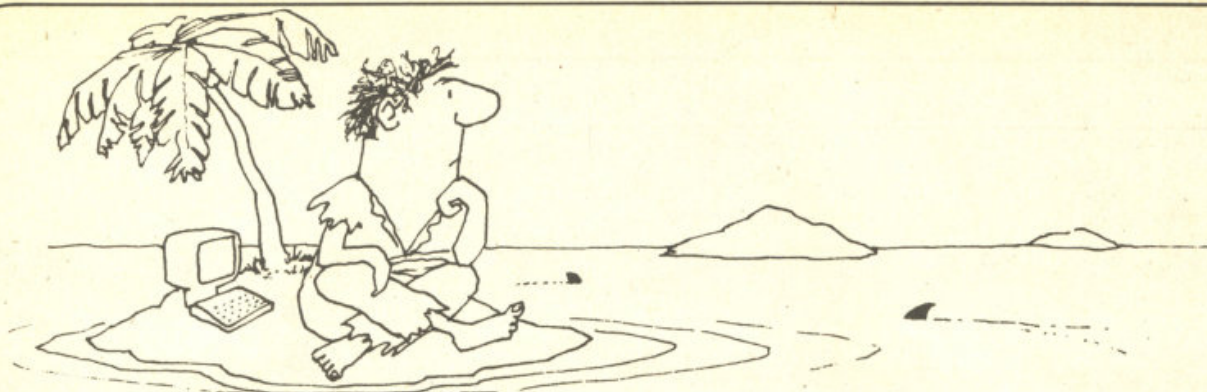


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Feel like you're marooned?

The micro world has several islands that are good to live on for a while. The 8-bit CP/M island is well-established and comfortable, but plenty of people are now realising that the 16-bit islands called CP/M-86 and MS-DOS offer greater prospects. But moving from 8- to 16-bit can be hazardous - and which 16-bit destination do you choose?

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OPERATING SYSTEMS

THE SECOND PART TAKES AN OVERVIEW OF THE OS MARKET, SHOWING JUST WHAT IS AVAILABLE AND WHAT YOU SHOULD LOOK FOR.

When wondering 'which is the best operating system', the question 'for whom?', must be asked. The programmer and the end user will be impressed by very different things.

Simplicity of use, a good range of packages and an error-proof robust environment are of prime importance to the business user. The computer expert, on the other hand, will expect a vast range of sophisticated functions, a wide variety of languages and many system utilities. Both will want, in a multi-user application, password protection and proper file and record locking.

These will be some of the areas we'll be looking at in this, the second part of our overview of operating systems—delineating between the most common systems, the old favourites, and those tipped for future success, finally closing on the battle for middle ground.

All OSs will provide the basic disk file functions of copy, erase, directory listing and format, but the more sophisticated systems will incorporate many others. The larger systems now appearing on micros (Unix and Pick, for example) are here not because they have been trimmed down to fit, but because the micro has grown to encompass them.

The greatest jump in power comes when the move is made from single to multi-user. To have a 'safe' environment a whole range of guards then have to be incorporated. Password protection is needed, preferably with a number of access levels and, going still further, separate control over read, write and execute. Locking the protection against two users accessing the same information, also needs to be at a number of levels. To allow two or more users to work on the same file will require protection at record lock level, some only allow file lock or worse still disk lock.

OS HISTORY

Apple, Commodore and Tandy dominated the early years of the UK micro business. The micro started life in just the same way as the mainframes are at present—very manufacturer dependent. However, to the surprise of many people, especially the powerful manufacturers, portability seems to have superseded the 'tied' approach.

This obviously can have many benefits for the humble user, but it does force the buyer into having to decide which operating system to go for. Some machines offer very many operating systems; the IBM PC can run at least nine (at the last count!).

Of the three early manufacturer-specific systems, only TRSDOS from Tandy looked something like an operating system of today. The Commodore DOS (disk operating system) and Apple DOS 3.3, for example, both incorporated the file handling that you would normally expect to find in the programming language interpreter or compiler.

DOS 3.3 is the present version on the Apple II, and is a simple system. In addition to the basic commands, there is a facility to auto-load programs and some simple directing of output and file protection against deletion, but not password controlled. Faci-

lities for loading, saving and executing machine code programs are provided. The SOS (Sophisticated Operating System), provided with the Apple III, improves on a number of facilities, but still falls far short of the claims its name suggests. It is device independent, and offers some input and output routing and it can also emulate DOS 3.3, which enables it to run all your old favourite Apple II programs (including the graphic games).

The latest in line, the Lisa, is so different that comparisons are difficult. The seven main applications (LISA-calc, list, project, write, graph, draw and terminal) are intimately linked with the operating system to such an extent that applications and operating software totally blur together; this is no surprise, as it was the original design intention. For a discussion on the concept see the section on Smalltalk (Canon), the system on which the Lisa was based. At present only one suite of accounts packages exist for the machine in the UK.

The first Commodore Pet computer, the 2001, was a cassette-based system and therefore had no need for a DOS. Later versions (3000, 4000 and 8000 series) all included a steadily-improving operating system. Commodore DOS is part of the BASIC stored on ROM, and hence it does not have the same 'feel' as the more conventional disk based systems that have separate command languages of their own. Despite this point, it has all the facilities associated with a simple operating system.

Tandy's TRSDOS has fallen from favour, which is a shame because compared to some of its rivals it was far more user-friendly. The system had help levels, both short and long error messages and on screen clock.

All the above manufacturers are attempting, in varying degrees, to re-join the evolutionary main stream of micro computing and avoid extinction. Apple has been able to support (although not from Apple sources) CP/M for many years, but the use of a Z80 card, and Lisa is soon to have Unix and CP/M 68. Commodore is reputed to soon be offering CP/M and Unix on its new series machines. Tandy's Model 4, an improved version of the Model III, now supports both CP/M and TRSDOS, and the Model 16 Unix.

The Digital Research family is probably the largest of the operating system families. It consists of the following units: CP/M 80, CP/M PLUS (3), CP/M 86, Concurrent CP/M, MP/M, MP/M 86, CP/NET, PERSONAL CP/M.

It all started in 1977 with Gary Kildall writing his own operating system for a simple disk system he was building for fun. The result was CP/M (Control Program for Microcomputers) which was written in 8080 assembler. This was capable of running on just three 8-bit chips, 8080, 8085 and the Z80, and although it had many faults it became the *de facto* standard. It is still with us today, after a number of revisions, but tends to be known as CP/M 80 (the '80' in 8080) to differentiate it from the 16-bit version, CP/M 86 (the '86' in 8086). The first version of the multi-user system MP/M for 8-bit

The Osborne 1 (left) portable business micro uses Digital Research's CP/M 80 – although it had some faults it became the de facto standard for future operating systems.



micros was far from perfect, but we have heard good things about the 16-bit version, MP/M II. At the opposite end of the spectrum, Personal CP/M is about to be released for the 'home' computer on ROM. This is to be a little brother to the disk system, allowing greater interchange of software (for more details see *Computer Answers* Jan '84 issue). There is also a networking system, CP/NET, but we have never seen this installed. On the 8-bit side, CP/M plus (or CP/M 3.0) has been released, which offers a number of improvements, bringing it in line with CP/M 86 – whilst still maintaining CP/M 2.2 compatibility.

THE MICROSOFT FAMILY

Just when Digital Research was happy to sit back on its laurels virtually free from competition, MSDOS appeared and all hell broke loose. IBM, instead of developing its own operating system for the PC, went to Microsoft, world famous for its Mbasic interpreter. The end result of this competition has been a quantum leap in the quality of documentation from Digital Research and rapid development (and improvement) of both systems.

Rather than concentrate on the systems in isolation, we are going to try and produce a compare and contrast section, using the top offerings from each company: MSDOS 2 and Concurrent CP/M.

Both systems have time and date stamping in the disk directories, background printing (to a spooled disk file), automatic program loading and sophisticated disk handling using cache and hashed directories. Concurrent CP/M has a full range of passwording, good help levels and erase with query (eraq). MSDOS 2 has many similarities to the multi-user system Unix, but it is not yet directly compatible. It has root directories, a sophisticated

batch system, with utilities to sort out and find as well as conditionals.

In addition, the Unix-like 'Pipe' system to redirect input and output is also provided. The big difference though is concurrency. CCP/M can run four 'terminals' at the same time: one is real, in the foreground, and up to three are virtual and in the background. Therefore the user can switch from one task to another at the press of a key.

UNIX FAMILY

Unix appears to be an operating system that arouses strong views, but not all good. Whilst scanning the texts we have come across wide ranging opinions from people who think it is the best thing since sliced bread, and others who would not give it house room. It first appeared on a PDP-7 at Bell labs (a subsidiary of the AT & T company) in 1969. We heard that at a Unix conference it was originally called 'Eunuchs', as it was a castrated version of the time sharing system!

It has only recently appeared on the commercial scene, as US anti-trust laws prohibited AT & T until 1980 from making profits from the system. Prior to then universities and similar institutions had been receiving it virtually free. The system is large and requires a powerful 16-bit (usually 68000) machine with at least a 5Mb Winchester.

Unix has helped to spread the popularity of the language it was written in, C, and Digital Research is re-writing all the CP/M systems in the language for portability. The system has many complex facilities ideally suited to the programmer and these will be covered more deeply in the next article.

Briefly, the system is very hardware independent; it has a directory tree structure, and many input and output routing facilities. Its passwording is particularly good, with many options for access control. Its critics highlight the inconsistency of the command structure, its large size and lack of user friendliness. To some extent the latter point has been overcome by 'friendly front ends', such as Viewnix supplied by Redwood, or the menu on the ►

The Microsoft family has many useful prodigies to its credit; Unix is an operating system that is very hardware dependent.

Fortune system. Another early criticism was the lack of packages. Two years ago there were very few – a glance to the end of this article will show that this too has been remedied.

BOS

Business Operating System was conceived by CAP (Computer Analysts and Programmers), one of the larger mini and mainframe computer consultancies in the country. CAP was probably the first of the 'old' school to take micros seriously and view them as business computers with a future potential. The system was developed complete with its own language, MicroCobol (still the only one available), helped by approximately £1 million of government money from the NEB.

The product was a professional operating system with a number of packages all designed for the 'office' environment, using traditional DP techniques. This was not an immediate success, probably because they were too early and the market was not mature enough to appreciate many of its virtues. MPSL Micro Products Software was formed in 1981 as an off-shoot of CAP to support and exclusively market BOS. This has proved to be a success and the system is expanding quite rapidly.

Portability is one of its main features, and it is available on over 50 machines, from the humble Apple II to powerful minis (such as the PDP 11 and the Data General Nova). This is possible because each machine has its own specially-written BOS interpreter, which then runs the portable BOS intermediate code produced by MicroCobol. A similar principle is used with P-code (of more anon).

The strong points of the system for the user are hardware portability, networking, multi or single user, a range of basic applications from the suppliers (database, key word system, word-processing, full accounts and a calc), and a good number of quality vertical market software (for GPs, Insurance brokers and so on) from independent dealers.

For the programmer, the system has many utilities (including library, sorting and menu design), three file access types, and print spooling. The systems hardware interface is set up on the initial installation, and therefore programs do not have to be individually configured for screens, and such-like.

DPC/OS

A number of systems in the market place such as DPC/OS (BRIDOS and MMMOST and others) are very generous; rather than share a processor amongst a number of users, like Unix would, they give users one each. The situation historically was that 8 bits did not really have enough power to drive a number of users, hence the more powerful 16 and 16/32 bit chips. The other tack, which resulted in the multi-processor systems such as DPC/OS, was if an 8-bit can only drive one user, then provide one processor for each user.

In actual installations each user has a processor and 64K RAM, which for all intents and purposes is their own computer. Within the system itself are one or two other processors controlling the common resources such as disks and printers; therefore, until the disk is accessed the individual processors will be running at full speed and additional users on the system do not degrade performance. The extent at which disk usage effects the system depends upon the applications being run: systems such as word-processing have low access requirements, but an on-line enquiry system will make big demands.

One advantage can be the ability to use some of the popular single user software (in single user mode of course), and many of these systems offer CP/M compatibility. Taking the concept to its full conclusion, a number of systems are providing the more powerful 16 and 16/32 bit chips in addition to the 8-bit options for even more power, and for maximum flexibility a mix of operating systems within the same machine is also possible.

P-SYSTEM

Another system which has wide portability like BOS, and for the same reasons, is the P-System. Both operate by having a resident machine specific interpreter, which is capable of directly executing an intermediate code – in this case P-code, the product of a variety of compilers.

P-System was developed in 1974 at the University of California in the midst of 'Pascal fever' – around that time, the Pascal language, according to the pundits, was going to sweep all languages away (Cobol, Basic and Fortran included) and be the dominant language, especially on micros.

The first installation was on the ubiquitous PDP/11 and then the Apple II, hence the system's greater popularity in the US, where the Apple had its largest sales. The system has now spread to virtually all the popular machines, and the P-Code can be produced from Basic and Fortran compilers in addition to Pascal. The system itself is quite easy to operate, as all the commands are via menu driven options. Additionally, Turtle graphics, one of the first portable graphics systems, is available with the P-System.

PICK

An operating system that is hitting the news at the moment is Pick – developed by one Richard Pick while at CMC, to run on a Reality mini. It is designed around a database language and many of the commands are involved with these functions. Its nearest equivalent on a micro would probably be dBase II. We apologize to any Pick enthusiast at present ripping their hair out after reading that comparison, but most people have not studied database theory at university: Pick can interact with the stored data in the way that dBase commands can be directly typed to produce, for example, a sorted report. The language is known by a number of names, but usually English or Access, and the commands can be customised by the user to any key words they require.

Facilities to list, sort, count, sum and simple statistics are all included and this is supplemented by a greatly extended (Dartmouth) Basic. Down from the mini it runs on a number of powerful 68000-based micros and Pick is working on an IBM XT version, running under MSDOS and linked to the 8087 maths co-processor. Pick has few packages as such, but according to the manufacturer, this is owing to the fact that applications can be built with great ease (using the database facilities directly) to the user's requirements. To facilitate this for non-computer users, a type of program generator called System Builder is available.

SMALLTALK

We have included Smalltalk here not because it is a mainstream operating system, but because it spawned a way of thinking which may well change the very design of operating systems.

Its first offspring was the Apple Lisa, and its relatives are the various window systems that are at present being heavily promoted. It started life at the Xerox research centre at Palo Alto in the US and the first 'product' we were aware of was a press

BOS's strongpoints are portability, networking, multi/single user, and a good range of basic applications; DPC/OS has the advantage of being able to use some of the popular single user software and CP/M compatibility; P-System has wide portability, and Pick is based on a database concept.

release on the Xerox Star in mid-1981. This, like the Lisa (with which most of you will be more familiar) had a mouse and icons. An icon is a screen representation of a real world object, such as a waste bin. Files to be killed are 'pointed at' with the mouse and then moved over to the bin for storage; this can then be 'emptied' removing the files forever. The file can be retrieved before you empty the bin, just as in real life.

THE BATTLE

In the NCC Microsystems Centre software directory, a monthly publication, which lists over 3,000 disk-based packages, lists the UK operating system shares as:

Apple II	-	503
BOS	-	51
CP/M 80 and 86	-	1653
Lisa	-	16
MSDOS/PCDOS	-	952
P-Code	-	86
Pet	-	252
TRSDOS	-	90
Unix	-	246
Rest	-	300

The total is over 3,000 because many systems run on a range of operating systems. The number in the 'rest' section consists of dozens of the less common manufacturer dependent and other systems.

These figures give an indication of the battle the operating systems are having for a place on your machines. The war is being fought for the middle ground - the popular market; there will always be a place for the specialist system, offering unusual (or little demanded) facilities to small numbers of users, but these have their own territories and are not 'enemies'.

Punditry can go wrong, so take all comments about the rosy future of one system and the death of another with a pinch of salt. Magazine articles can have a self-perpetuating effect: a couple of pieces on system 'X' will produce interest in that area, and readers will want to find out more - hence more articles. This continues until the 'fashion' changes.

Perhaps a better guide to what is actually happening are the job ads. During the start of the Unix fad, as time went by more and more positions appeared for Unix and C programmers - this time they were right. The trend has swung away from manufacture-specific systems, and there does not appear to be any sign of it reversing soon.

However, the main reason for the success of MSDOS is the IBM PC, which has (arguably) just become the most popular small business micro in the UK. In the US, in terms of numbers sold, it is head and shoulders above its rivals. IBM therefore has the power and the user base to change the face of micro computing as we know it, if it chooses to do so. We are left at present, if we wish to select between the two front runners, with a difficult decision. Both are 'good' operating systems, so a selection must be made on the facilities offered. At present concurrency offers great advantages - but who knows what Microsoft has waiting in the wings. (Also keep your eyes open for Pick!)

The best route is first to opt, where possible, for suppliers who have provided in the past upgrade paths. Second, there is safety in numbers, a large user base will keep software suppliers interested for longer. If you are thinking of moving up to multi-user it would be wise to select even at the single user stage systems capable of an easy transfer.

By Eric Bagshaw of the NCC.

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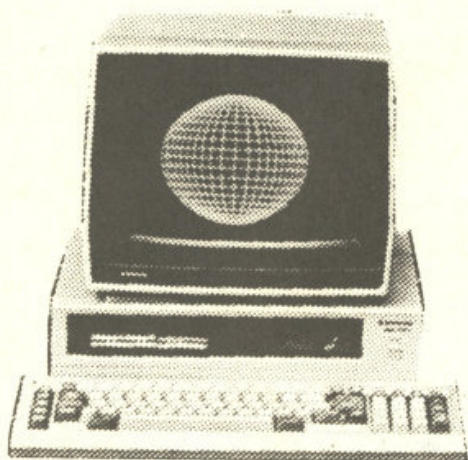
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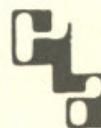
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PEOPLE TO THE POWER

HOW DOES THE ENTREPRENEURIAL NATURE OF THE SOFTWARE MARKET AFFECT THE END-USER? AND HOW COULD YOU EXPLOIT IT?

The meeting of the New Technology with a plentiful supply of risk capital has, during the last few years, inspired more new business 'start-ups' than ever before in this most entrepreneurial of industries.

Many people who have micros in their homes or on their desk tops, are consequently looking for ways in which to use the computer in a new side business (anything that has the potential of adding to one's income should be thoroughly explored). Obviously, not everyone who starts up an in-house business will be successful, but if you already have a micro, and a desire to usefully employ it, then such a venture merits serious attention.

The first question is, of course, *what kind of business?* The answer is really only limited by one's ingenuity and creativity. To be successful you need a good idea, a little talent, a modicum of aggression, a lot of persistence – and a good deal of luck.

There are two basic directions you can take: the first is to offer a service to local organisations along traditional lines (databases for clubs, mail shots, word-processing services, teaching, statistical analysis) – or you can create something new.

If you know something about programming, then consider programming commercially viable original products or offering a service adapting existing products. Alternatively, without any knowledge of programming, you could take an existing software package and provide a specific application for it.

To make this commercially viable, you should look for an application where there is a sizeable market. Give your mind a free rein; a database for a newsagent's delivery round ... a database for an independent dairy ... for a vet ... in fact, customized databases are the primary area if you have a good knowledge of how a business operates.

You need to do your homework, researching narrow market niches and designing specialised products and services to fill any promising gap in the market. The justification for the market research is clear and provides this month's Mandelin's *Mandatory Maxim: over the next few years, as the computer industry explodes today's narrow niches will turn into major markets.*

A computer on every desk top, kitchen table and work bench, means (eventually) that managers, housewives, and professionals – not data processing personnel – will have to use them. Consequently, the opportunity to build businesses, as well as freelance software writing, will grow as the years progress. Although entrepreneurs now have to react quickly to the needs of the market place, the pay-off is bigger and faster than anyone could have imagined.

The key to exploiting the micro software market is making programs genuinely user-friendly, and the most exciting thing that is happening is that it will not be the computer 'establishment' which leads, it will be 'the people', the ordinary users.

Last year someone quipped that US innovators could start up business in their garages because everyone had garages and they were prepared to leave their cars in the street; however, in the UK, people only had potting sheds, and could only use them when the plants were not there – thus if a project did not come to fruition before the plants needed to be potted, out went the project.

Looking at some of the innovative ideas I have seen recently, that quip does not really hold up in this country's micro community. But it is a grass roots revolution. In 1983, the UK computer establishment was still way behind the UK market place.

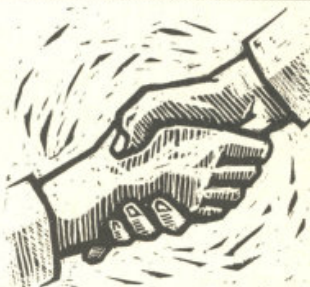
For example, the Economist Intelligence Unit published *Financial Modelling with Computers*. The paper is aimed at management, and it is not only

rather boring, but also skims over in a couple of pages the programs used on micros – the biggest volume market for financial modelling!

The financial wizards in the City might also get it very wrong too, by providing expansion capital for the software company that has marketing expertise rather than a good product. With the software marketplace still in its relative infancy, absolute rubbish can be sold successfully if promoted aggressively enough – and the City is already helping some 'cowboys' become almost household names.

Although the quick-money boys were always with us (and always will be), putting profit quantity before product quality can only do damage to the entire industry in the long run. **By Stephen Mandelin, a computer consultant.**

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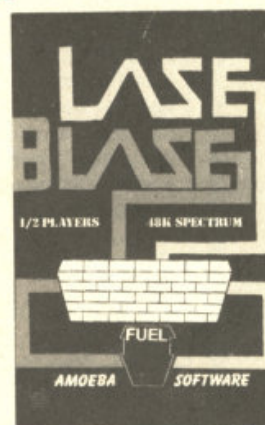
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COMPUTER ANSWERS

ALL IN THE HEAD?

IS CAXTON'S BRAINSTORM 'IDEAS PROCESSOR', DESPITE ITS ASPIRATIONS, ALL THEORY AND NO PRACTICE? WE FIND OUT.

Who will write the program that every serious micro user will feel they need, along with their word-processor, database and spreadsheet? Many software developers are conducting a feverish search for the answer to this question. Caxton thinks it has an answer, with the *Brainstorm* 'ideas processor'.

Caxton is an imaginative software publisher: its programs aren't pioneering, but they always sound as if they are. For example, Caxton's *Cardbox* package was never sold as a database, but rather as an electronic cardbox (however, hidden beneath the name was a very simple, well written file handling package, offering only basic facilities, and by no means setting new standards in data processing). Caxton has showed that a good program is as much about imaginative marketing as advanced software technology.

Brainstorm is much the same, only more. In fact, it is probably too much. It is effectively a simple database, which holds data in a tree structure with links between the branches. Caxton says it's an ideas processor, which takes your ideas and keeps them in some sort of order.

'Ideas processor' is an appealing though slightly appalling idea, conjuring promises of turning everyday ideas into strokes of genius. Caxton indulges this expectation with relish, claiming in the package's documentation that 'creative thinking processes are necessarily of a random, disjointed nature, and *Brainstorm* is able to capture your ideas in this form while internally structuring and relating them so that they can be re-presented in a more organised way'.

That *Brainstorm* can gather in your random ideas and turn them into some sort of order, and by implication into something more useful, is misleading. It can do nothing of the sort. Such claims come perilously close to matching the techniques used for selling body-building equipment. You have to do the modelling – *Brainstorm* is merely a tool for creating the model.

These claims succeeded in generating much excitement at the launch of the package, something of a *Brainstorm* in a teacup. This, sadly, seemed to obscure some of the virtues. It is a very neat and simple little program; a very helpful planning aid.

It allows you to enter headings, or blocks of text, and put them into hierarchical order. Each heading can have subheadings (or 'dependants') beneath it, and 'superheadings' above it. So, for example, if you were wanting to write a do-list (a list of things to do, for those of you who don't), you could enter the heading 'Tuesday', promote it to a superheading, and then write a batch of subheadings, like 'Ring Jim', 'Write article' and so on. Each of the subheadings could be promoted. So 'Write article' could be promoted to a superheading, and then the proposed sections of the article entered as subheadings ('Intro', 'Descriptions'). You could even have the whole article itself as a set of subheadings. The package includes text editing facilities, like word wrap, insertion and deletion.

Your only restriction is memory. There's an indicator for free memory, so you can carry on until it says you're full up, in which case you'll have to save something to disk.

The links between the branches of this growing

Fig. 1 (right) shows *Brainstorm*'s Master Menu, which is divided into four sections: following the title in the top sections, the next section displays the commands available, and below that is the display areas for all or part of the disk directory. The bottom section prompts the user, accepts commands and displays the current status of *Brainstorm*.

FIG. 1
MAIN MENU

BrainStorm Master Menu

U se	L ist	P rint	I d.drive
C lear	S ave	W rite	D irectory
X it	M erge		K ill

Directory of B: ???????? ?? Page 2

STAT	.COM	BRAIN	.COM	MIKE	.DOC	DAVID	.BRN
BILL	.DOC	WOODY	.BRN	VIV	.DOC		

Make selection by pressing one of: U C X L S M P W I D K

Drive: B Model name: Status:

tree of super and subheadings (known as a 'model') are similarly simple. Every time you enter a heading the program looks for 'namesakes', which means that if an entry matches another, the program will give both the same descendants (subheadings, sub-subheadings and so on). And if an entry is ammended, so will its namesake (if one exists).

Other facilities for moving between branches include a 'Hunt facility, which will hunt for a string of characters amongst the entries in the model, and 'Jump', which will jump to a marker (the '@' character) placed by the user next to an entry.

Caxton has put a lot of effort into the print/write facilities, which are designed to save the model in the form of a text file on disk (which can then be word-processed) or send it to a printer. You can specify the format of the text file/printout, altering the line spacing and indents to show the structure of the model (for example, with subheadings indented once, sub-subheadings indented twice and so on). You can print selectively, according to entry or from the '@' marker. You can also suppress various levels of the model (say, all the subheadings) which can be very useful for applications like program development (see Fig. 2).

The other major feature is the merge command, which enables you to read text files into the model at specified positions. This could be used to read paragraphs from a word processed text file into appropriate positions in the model. *Brainstorm* will recognise namesakes in the merged file.

Brainstorm's uses are many and varied. It could be applied to all sorts of applications, and most people would find it useful. The manual has a whole chapter devoted to example applications, which is very useful and emphasises how this package offers wide scope for the imagination.

The first example application is an electronic diary and address book. You have dates and names as the headings, and details as the dependants. You could have both diary and address book combined, with two headings for diary and address. The diary would have month names as the subheadings, days of the month as sub-subheadings, times of the day as sub-sub-subheadings, what you're doing at that time as sub-sub-sub-subheadings and so on.

The 'hunt' command would be used to hunt for a month, or day, or activity. The current day could be marked with the '@' marker.

More ambitious would be to use *Brainstorm* in program development, with the program name as the main heading, module names as sub-headings, procedures as sub-subheadings and the actual listing as their dependants. Procedures could be repeated at various stages in the program simply by typing in their names at the appropriate position in the program, and all the dependants would follow. When it comes to compiling the source code, the model could be written to a disk file with the levels of the headings and sub-headings which contain comments left out.

The manual includes full details on the structure of the *Brainstorm* disk files used to store the models, so (as demonstrated in one of the examples given) you can write programs that will generate files.

The package includes two useful extras, an installation and recovery program. The installation program allows you to set up the screen, printer and keyboard. If you want to, you can alter almost anything, from the graphics used for the display to the keystrokes needed to execute commands.

The recovery program, called 'Rebrain', is an interesting addition. It consists of precisely nothing, yet you can use it to recover the model if the disk crashes during a save. Rebrain uses a simple recovery technique well known to CP/M

FIG. 2
DIARY

```

1983
Jan-83
Sat 01-Jan-83
    Take Jackie dancing
    Get drinks for tonight
    Carol and Les dinner
Sun 02-Jan-83
    Picnic - Chalfont
Mon 03-Jan-83
    Bill 10:30
    Fiona 12:15
    Bunch 3:00
    Steve 5:00
    NLC 7:00
Tue 04-Jan-83
    Printer 11:00
    Woody & Bill lunch
Wed 05-Jan-83
    Feltham all day
Thu 06-Jan-83
    Breakfast with Chuck
    9:30 Board meeting
    3:00 Auditors
    7:30 Robin scouts
Fri 07-Jan-83
    Daniel school sports 3:00
Sat 08-Jan-83
    Worthing
        Take food and blankets
    
```

Fig. 2 (left) shows an extract from a slightly-used *Brainstorm* diary.

users. CP/M reserves a specific area of the memory, called the transient program area (TPA). Even if you can't save your files on disk and the program crashes as a result, they'll still be there in the TPA. All you have to do is get CP/M to go back to the TPA. This is done simply by saving an empty file (any name, up to eight characters) with a .COM extension under CP/M. Run this program, and CP/M will execute it (with no result, because it's empty) and put you back at the beginning of the TPA. Normally you will then find you are back where you were before the program crashed.

Rebrain uses this simple technique, so you can use it with any CP/M program, not just *Brainstorm*.

Brainstorm is an interesting, simple and useful program, but, despite the boasts, it's not a major innovation. You can (and many people do) use many of its techniques, though not so easily, with a standard word-processing package, using facilities like tabulation, block moves and string search.

Claims that *Brainstorm* enables you to make better use of ideas are difficult to substantiate, principally because the idea of 'ideas processing' is so vague. What's a processed idea look like?

It's well written, well documented, easy to use, useful, fun to experiment with, but, for the money, insubstantial. Some people have suggested that, given its size (14 Kbytes) there should be a cassette version for machines like the Sinclair Spectrum. Perhaps, but it works best with a decent word-processor, and you don't get those on cassette. It would be put to best use as part of a word-processing package. We hope Caxton gets together with a company like MicroPro (who make *Wordstar*), and offers it as an integrated extension. That, or reduce the price.

By Benjamin Woolley, editor of *Computer Answers*.

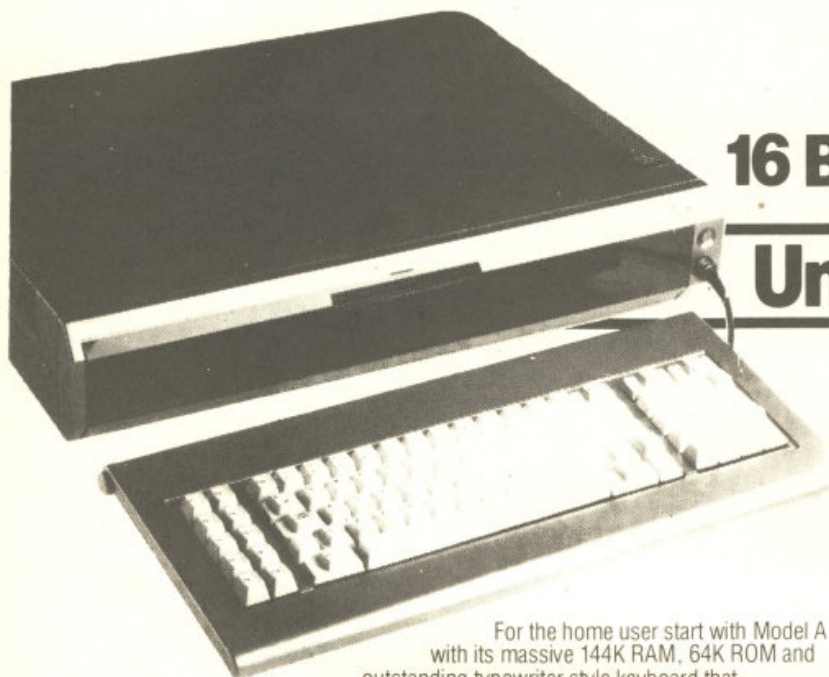
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Display Facilities	Full screen handling, 4 screen paged
Text	80 x 25 or 40 x 25
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Graphics Facilities	Scroll, reverse image
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LOOKING TO THE STARS

WE LOOK AT THE NEW WORDSTAR OPTIONS — STARBURST AND STARINDEX.

MicroPro's word-processing package *WordStar* is the market leader in its field: it already has options for handling repeated text (through the *Mail/Merge* program), and for spelling checking (through *SpellStar*).

The latest *WordStar* releases are on an option called *StarIndex*, which allows the automatic production of indexes, tables of contents and so on, and *StarBurst*, a program which allows computer professionals or experienced users to construct a complete system of menus to cushion operators from the awkwardnesses of micro operating systems. In view of the popularity of the *WordStar*, we decided to examine them in detail.

STARBURST

StarBurst has two main aspects: its use by system builders for constructing systems for users, and its subsequent use by operators. System builders may be micro dealers and software houses, supplying customised systems for clients, or experienced users responsible for providing a helpful image to less experienced users within their own organisation.

At present, *StarBurst* is available only on the IBM PC, but you should be able to buy it for CP/M and MS-DOS systems soon. As a tool for system builders, *StarBurst* allows the construction of what it calls a menu-tree (an example is shown in Fig. 1). This menu-tree has three levels, and consists of the main menu (MAINMENU), two subsidiary menus (CUSTMENU and HSKMENU), for tasks (COPYTASK, ENTTASK, SAVTASK and RESTASK), and two 'Help' screens (MAP and ENTHelp).

StarBurst allows a maximum of twenty levels, consisting of menus, tasks and 'Help' screens. A sub-menu can only be invoked from one superior menu option, while a task may be invoked from several different menu options. Both the building and the use of a menu-tree can be protected by passwords, so that the menu-tree can't be changed except by authorised people (who may be a different group from those who will use the menu-tree to carry out tasks).

Each menu consists of a number of options, each activated by a prompt; the exact form of the prompt is up to the system builder. Menu option lines may not exceed 79 characters, but menus may span more than one screen. You can specify a default option when building a menu, and can also (whether building a system or using one built with *StarBurst*) use the ESC key to get back to the preceding menu level, but you can't get directly back up to the main *StarBurst* building menu, nor could we find any way for a system builder to provide this facility for users.

A task is one or more activities carried out when invoking a particular menu option. These activities are invoked by statements displaying a message to the user, telling the operating system to copy a file or to run a program such as an invoicing program, and so on. A list of the commands which system builders can include in tasks is shown in Fig. 2. You will see that the list includes some commands for repeating commands and for testing results. These facilities are not extensive: they are more like those found ►

FIG. 1
MENU-TREE

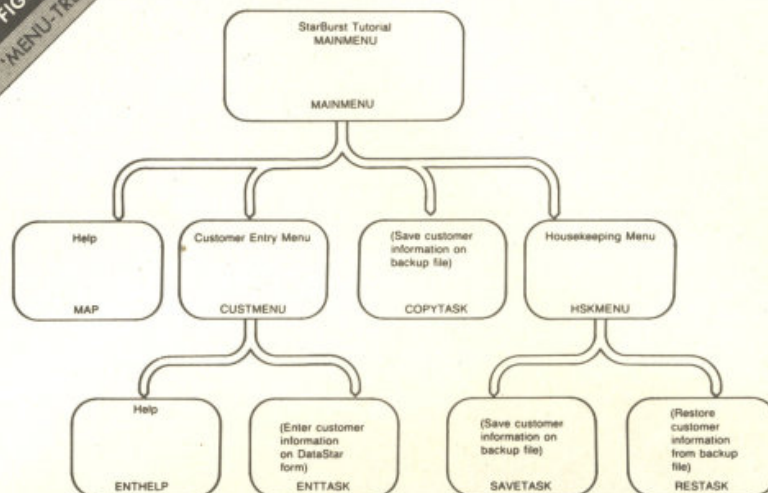


FIG. 2
TASK LIST

ASK	Request information (from the operator) for a variable in the task.
CHECK	Make sure a file is on the proper drive. This statement assigns a new value to the system variable, SBCODE.
CLEAR	Clear the terminal screen.
COPY	Make a copy of a file.
DELETE	Delete (erase) a file.
DISPLAY	Give a message to the operator.
EXIT	Stop the task.
LIST	Show each statement to the operator before the action is performed.
MOUNT	Make sure a disk is on the proper drive.
NOLIST	Stop the showing of statements to the operator (see LIST).
PAUSE	Temporarily stop the task until the operator presses RETURN.
PROMPT	Give a message to the operator before an ASK statement.
REMARK	Display a builder's comment within the task.
RENAME	Change the name of a file.
RESET	Perform a disk reset (used only for CP/M operating systems).
RUN	Start a program.
SET	Change the logged drive.
SETSB CODE	Give a value to the system variable, SBCODE.

Logic Statements

IF	Perform the statement following the IF statement only when a specific condition is true. If the condition is not true, perform the statement following the ELSE statement. The condition specified in the IF statement must reference the value of the system variable, SBCODE. Always end a group of IF-ELSE statements with the statement ENDIF.
ELSE	
ENDIF	
REPEAT	Perform the statements following the REPEAT statement until a STOPREPEAT statement is encountered. Always end a group of statements to be repeated with an ENDREPEAT statement.
STOPREPEAT	
ENDREPEAT	

We would like to thank
Micro Technology of
Tunbridge Wells, and
Richard Ashton in
particular, for lending us
an IBM PC with colour
monitor.

in the 'Job Control Language' on many mainframes than those in a programming language, but should be quite adequate for the purpose.

Help screens (called, rather confusingly, 'Help Menus' by *StarBurst*) may be provided anywhere – indeed, since they are 'the end of the line' they are more like tasks than menus. (You could, of course, construct a tree-structure of help if you wanted to, by calling the upper levels of help 'menus' in *StarBurst* terminology.) They consist simply of a screen of information which the user can read to give more information about the current level of activity.

We used *StarBurst* on an IBM PC with a colour monitor, and, in those circumstances, the package is presented to the system builder in glorious technicolour. The colour is used quite effectively to aid the system builder in delineating the various parts of the screen, and in showing up options. Fig. 3

shows a black-and-white version of the main system building screen, giving 'Help' (which can, in the usual 'Star' package manner, be turned off if you wish), and context information. The commands available to the builder show that *StarBurst* follows the practice of its predecessors in being driven by commands invoked from control keys.

The excellent use of colour in showing *StarBurst* to the system builder does not extend to allowing him or her to use colour when designing screens for the user, and all the user screens we tried had just background and foreground (appearing blue and white on our monitor). This seemed rather a shame, and quite unnecessary – it would be child's play to devise some convention such as the 'bracketing' conventions used in *WordStar* to indicate emboldening or underlining, so that the system builder could give the benefits of colour display to *StarBurst* users.

The exact appearance of the screen to the *StarBurst* user depends almost entirely on the specification of the system builder. Fig. 4 shows how the main menu of the menu-tree shown in Fig. 1 might appear on the user's screen. Users of *WordStar* will recognise most of the basic commands which *StarBurst* provides for cursor movement. An exception is 'B', which allows the system builder to switch between building the menu-tree and using it for test purposes. *StarBurst* can tell whether you have previously carried out building work in this session, and therefore asks you for the building password only if you are entering the build phase for the first time in the current session.

The documentation is in two main parts: a builder's manual, and a workbook for builders which is really a tutorial guide. Given the problems of documenting (something which can only be used effectively in association with programs whose names and natures the manual writers can't predict), the manual is quite effective.

StarBurst is an attractive and powerful system, which should be quite a help to people putting together turnkey systems for less expert users. It is an advance on most previous systems of this type in its provision of several levels of menu, and its ability to carry out several operations within a single task. Most similar systems do not provide an easy way to allow for the first feature, and only permit the second through the use of operating system's 'batch' facility (SUBMIT in CP/M, .BAT in MS-DOS). However, it is more expensive than most of its competitors, at £125.

STAR INDEX

While *StarBurst* is a general-purpose tool for system builders, *StarIndex* will be of interest to a quite specific group of *WordStar* users, namely those who need to process long documents. However, it will interest many people who fall into that group, but who do not need to produce indexes to their documents, since it contains other useful features. These are implemented by a combination of 'dot' commands and embedded control characters, just as in *WordStar* itself. Fig. 6 shows a list of the available commands and control characters, while Fig. 5 shows on the left some sample text including commands and on the right the way in which parts of the text would be printed.

StarIndex allows the user to exercise overall control over the numbering and printing of chapter and section headings (up to four levels deep) and the numbering of figures and tables, but to cope with the details automatically. So if you number section headings successively – using, say, 1, for the first level, 1.1 for the second and so on, you can include 'directives' to *StarIndex* to indicate the level ▶

FIG. 3
BUILDER

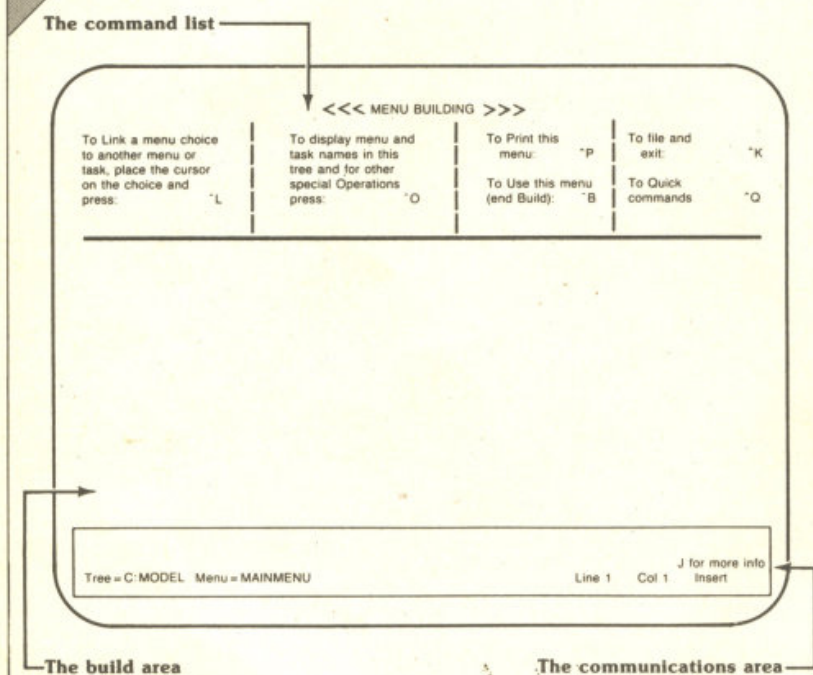
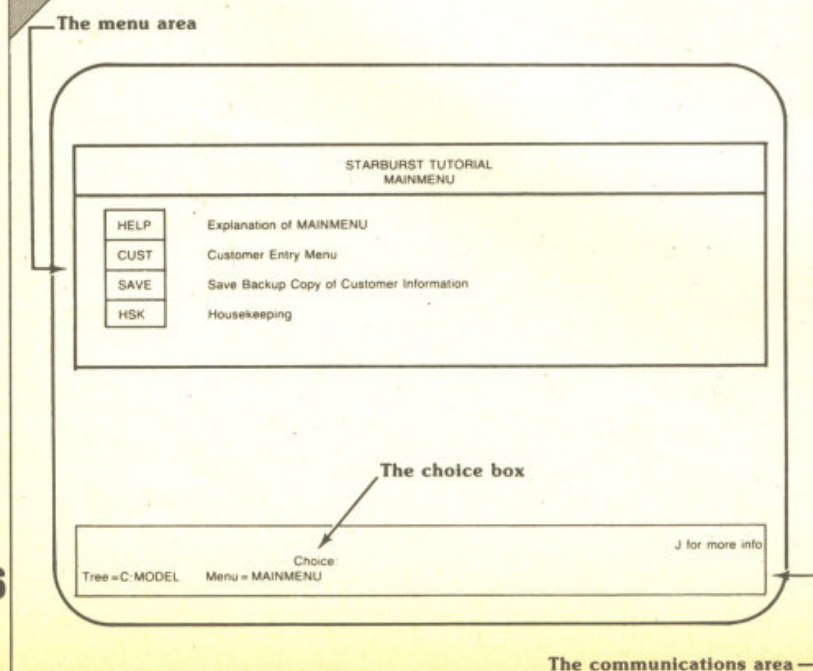


FIG. 4
MENU



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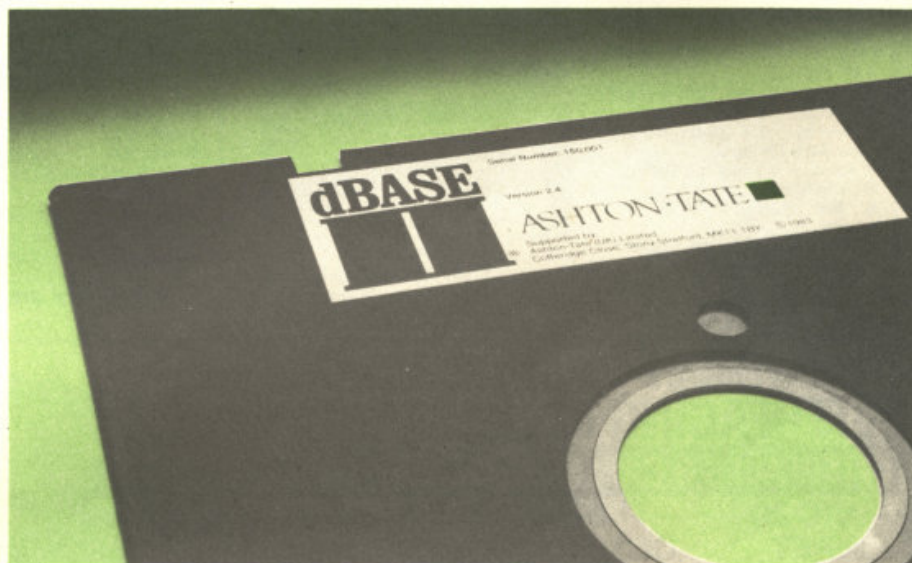
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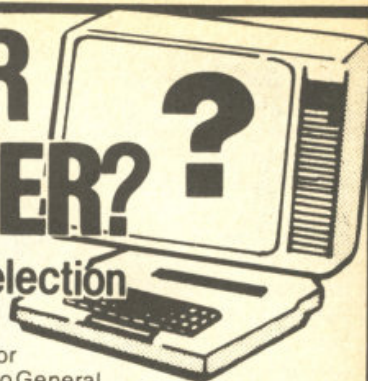
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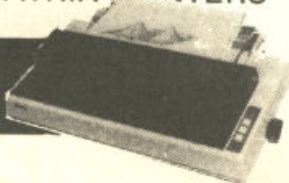


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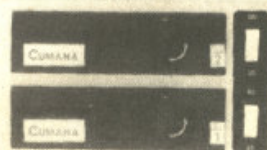
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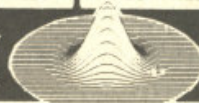
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required, and let *StarIndex* control the actual numbering. Then, if a section is inserted between two others at the same level, you don't have to go through and renumber all the subsequent sections.

The indexing facilities are simple but highly effective. Any index entry may be a master entry or a general entry, with the difference being indicated by emboldening the page number of the master entry. Either type of entry may be a main entry, just a one line entry on its own, such as 'Bow and arrow', or a sub-entry, such as 'Exploration, early', which would be printed with the word 'early' on a new line and indented. Whatever the format of the printed result, the indexed word or phrase may either be embedded in the body of the text, as in the example 'horseless carriage', or what *Star Index* calls a 'supplied entry', that is some text which is

a paraphrase of the text referred to rather than being actually included in the text - as in such phrases as 'Hunting, inventions for'.

The manual is quite helpful, and should pose no problems. The typographical conventions used to print-out the table of contents, index and lists of figures and tables are under the control of the user. *StarIndex* starts with default styles for these, such as emboldening of the page number of a master entry in the index, but you can change these conventions by using the STYLE option to set up format descriptions of your own, thus *StarIndex* provides some powerful features for building tables of contents and indexes, and should be very useful for *WordStar* users who need more extensive facilities for processing long documents.

By Kathy Lang, a computer consultant.

StarIndex is available on all the systems for which WordStar is provided, and costs £116. Both StarBurst and StarIndex are available from Tamsys of Windsor (as given below).

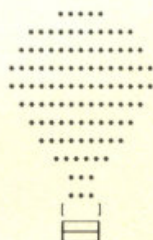
Tamsys,
Pilgrim House,
2-6 Williams St,
Windsor,
Berks SL4 1BA.
Tel: (07535) 56747.

FIG. 5
EXAMPLE
TEXT

```
.IA
PEOPLE AND MACHINES
.IB
  Introduction

  We, as thinkers and creators, have always reached for new
  ways to extend our capabilities, to improve and elevate the ...

.IC
  Extensions of Our Bodies
.II Inventions, 10000 B.C. - 1500 A.D.
.ID
  10000 B.C. - 1500 A.D.
  The "Kbow and arrow"K, early extensions of neolithic
.II Hunting, inventions for
  arms, enhanced our hunting capabilities. The
  "Pwheel"P led to the building of roads and gave us
.II Trade, early
.IM Exploration, early
  mobility for exploration and trade. The use of ...
.pa
.II Inventions, 1500 A.D. - 1880's
.ID
  1500 A.D. - 1880's
  The obsession with flight led to the creation of
.II Flight, hot-air balloon
.II Balloon, hot air
  the hot-air balloon and fantasy became reality.
  The early "Phorseless carriage"P increased our speed ...
```



Hot Air Balloon

*KD

A> STARINDEX inputfile outputfile formatfile

P filename.TOC	P filename.SI	P filename.IDX
----------------	---------------	----------------

TEXT

1. PEOPLE AND MACHINES

1.1. Introduction

We, as thinkers and creators, have always reached for new ways.....
open new paths into the future

1.1.1. Extensions of Our Bodies

1.1.1.1. 10000 B.C. - 1500 A.D.

The bow and arrow, early extensions of neolithic

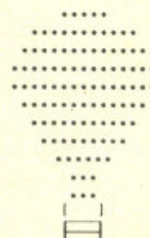


Fig. 1-1: Hot Air Balloon

INDEX

```
B
Balloon
  hot-air, 2
  Bow and arrow, 1
.....
```

```
E
Energy
  steam, 3
  wind, 1
Exploration
  early, 1
.....
```

FIG. 6
AVAILABLE
COMMANDS

Identify Chapter and Section Headings:

- .IA*Level 1 Headings (chapters)
- .IB Level 2 Headings (sections)
- .IC Level 3 Headings (subsections)
- .ID Level 4 Headings (secondary subsections)

* See print and format options

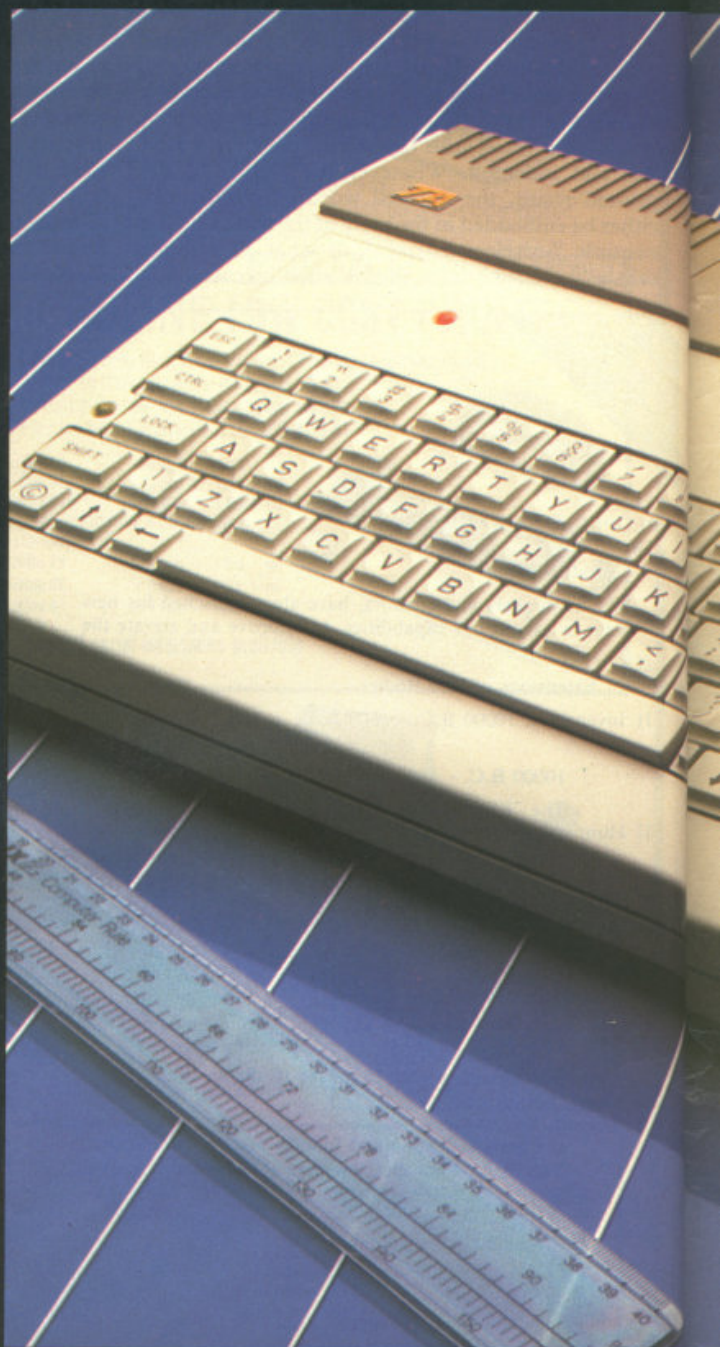
Identify Figures and Tables:

- .IE Figures
- .IT Tables

Identify Index Entries:

- .IM Master Supplied Entry
- .II General Supplied Entry
- "P"Ktext"P"K Master Embedded Entry
- "P"Ptext"P"P General Embedded Entry

The Alphatronic 1



The Alphatronic Personal Computer makes playing, learning and working more fun, more fulfilling, more rewarding. But when you put it to work, then it really means business. In fact it's probably the cheapest way to access business programmes through CP/M software.

The games first though — enough for the most ardent player. Some just plug into a socket at the back, with their own 16K Rom module. Others can be played from virtually any cassette recorder. There are arcade games to sharpen reflexes and test imagination. Educational programmes to increase knowledge, plus chess and other traditional games.

You'll benefit from the learning programs. There are cassette instruction courses on writing programs in BASIC. Other cassettes get you and your family off to a flying start into skills like typing, household budgeting, tax returns and investment management. And of course there's our own

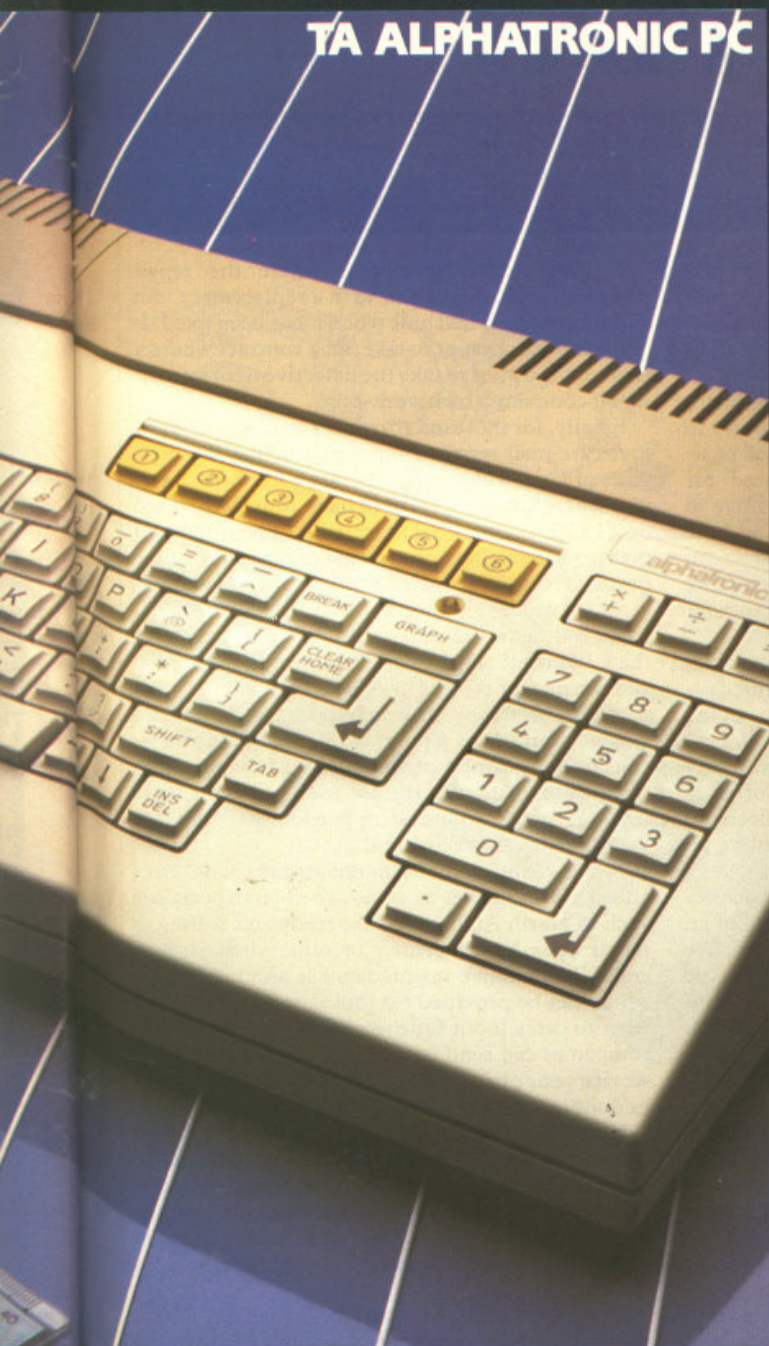
instruction and BASIC interpreter manual.

Now to business. The Alphatronic PC is unusual in giving you low-cost access to a complete version of CP/M, the world's most popular operating system for business software. You just connect up one or two floppy disc drives and a printer, then you can run a whole host of new management programs: office word processing, business accounting packages and financial planning — the choices are tremendous.

The keyboard is a real delight compared with competitive models. There are very few confusing multi-function keys, and a really professional numeric keypad is included. Six separate keys can be programmed and indexed for special routines. And the full alphanumeric keyboard is just like a modern electronic typewriter.

You may recognise the keyboard, because the

PC means business



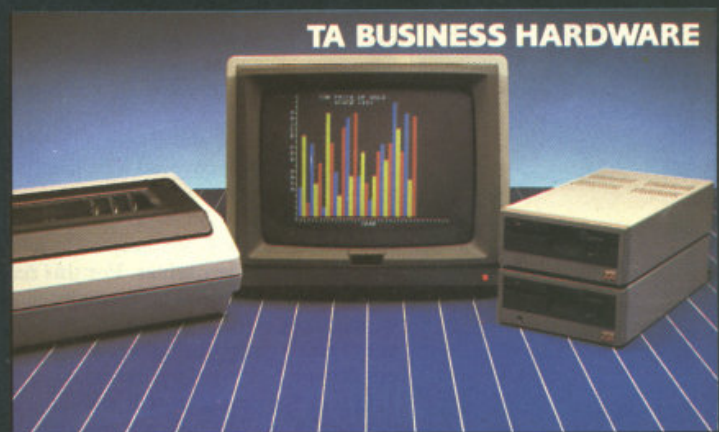
TA ALPHATRONIC PC



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TA EDUCATION HARDWARE



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F.4

LOOKING FOR A FIX?

WHAT SHOULD YOU DO WHEN YOUR MICRO SYSTEM BLOWS A FUSE (OR TWO)? WE LOOK AT WHAT CAN BE REPAIRED, WHERE, AND HOW MUCH IT'LL COST.

Nothing is more frustrating than to be told by a dealer that your broken micro is out of warranty and there's nothing that can be done – or worse, the line that if you didn't buy it from them, they can't help.

However, the good news is that decent micro repair firms are springing up all over the country to cater to this. With an increasing number of businesses using micros; there is also a need for repairers who can fix faulty machines swiftly, so let's look at the kind of services available and the pitfalls to watch out for.

Although the easiest micro to get someone to fix must be the IBM PC, there are people who can cater for Dragons, Orics and Spectrums.

The best way to keep your repairs bill down can be to take out some form of insurance against failure. Prism Microcare operates such a service in the form of a contract which covers the micro for 12 months after the actual manufacturer's warranty has expired. The scheme covers the cost of parts and labour following mechanical or electrical breakdown. It costs £14.99 for micros retailing up to £250, and £24.99 for micros up to £500.

A similar scheme is offered by Computence for owners of business micros. Taking the form of an extended warranty it costs on average around five per cent of the value of the hardware. It is available for most parts of the UK except Northern Ireland and the Channel Islands. Typical machines are the IBM PC, Apricot and Epson QX10, but Commodore 64s could be covered provided you are willing to pay Computence's minimum charge.

While Prism and Computence operate what are in effect insurance policies, neither actually carry out the repairs themselves. For this reason you may wish to take advantage of the maintenance contracts which most repair companies can offer. These can vary from a charge of between four per cent and 12 per cent of the cost of the hardware.

Quest, for example, will start its contracts from day one if you like, since it can offer a service over and above the manufacturer's own warranty. Although no company actually said so, it is implicit that if you actually buy your micro through the maintenance company you could expect some kind of discount on the repair contract. When contacting a repair firm, it is best to establish just what kind of repair service it can provide. There are basically four main types of service, nearly all of them aimed at business users. However, if your Spectrum is vital to the business, it is not just large system owners who could benefit from such contracts.

On-site maintenance is the best – and most expensive – type of repair contract, where the servicing company agrees to send an engineer within a given call-out period and effects the repair on your premises. In such cases, most repairers will leave a replacement item if the engineer has to take the faulty machinery back to base.

A very similar service is where the repair company sends over a van with a replacement unit and returns your machine when it has been fixed. It is sometimes cheaper to take out a contract where it is up to the owner to take the defective item into the repair company's own workshops.

Finally, for those micro owners on a tight budget, there are mail repair companies, such as TV Services of Cambridge, who operate a fixed price service where it costs £11.50 to have your ZX81 fixed or £18.75 to cure your Spectrum. The important proviso here is that you haven't changed the micro beyond recognition with a multitude of add-ons.

So far we have only been considering the micro itself, but figures have been produced to show that the CPU itself is the least likely component to fail and the printer is most likely to go down; after that comes your floppy disk drive, followed by hard disks. Again this is a point to check should you be considering taking out some kind of maintenance contract or insurance. It's not going to be much use if you try to get your system fixed only to find that your floppies aren't covered!

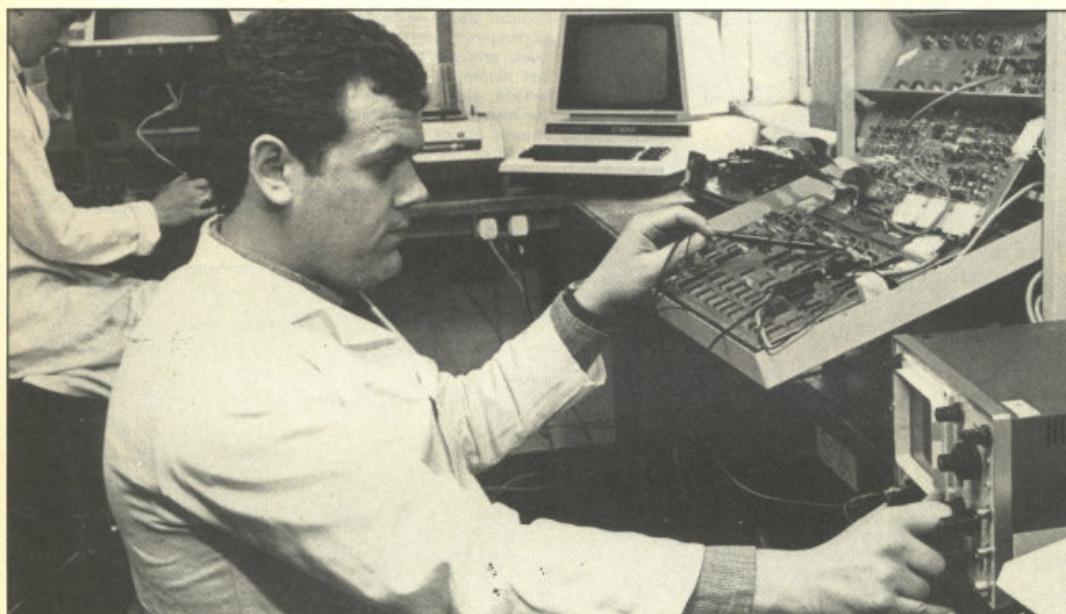
For the impecunious micro owners who can't afford such luxuries as cover, there are specialists such as North Amber who are ready and willing to repair your Epson printer or other such peripherals. Preventative maintenance is another service which can be provided for those owners who don't want to carry it out for themselves. The big repair companies can send engineers to your premises to service your printer or other peripherals, which can be done at a slack period when it suits your work.

Keeping the micro clean can help to prevent failures too, and there are micro 'valet' companies like Screencare: not only will it clean your screen, it will blast the dirt out of your keyboards and clean the heads of the disk drives. DIY enthusiasts are not to be left out, because cleaning kits are available to do the work yourself.

For the business that owns more than one micro, the maintenance companies are more than willing to negotiate a discount for bulk. Another interesting ploy is that the companies which have traditionally been involved in mainframe repairs are now moving into the micro market: thus it is quite possible to persuade a company like Computer Field Maintenance not only to fix the DEC's but to extend their cover to include your IBM PC as well.

Prior to researching this article we'd had the feeling that the cheaper micros were not covered. A look at our repairers guide (Fig. 1) shows this to be untrue – a heartening state of affairs. One final tip – don't worry if there does not seem to be anyone on your doorstep. The addresses given are mostly head offices, and they could very well have a branch near your area, so you shouldn't have too much trouble getting fixed-up.

By Tony Dennis, deputy editor of *Computer Answers*.



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Portsmouth, Hants
PO6 1QW.
Tel: (0705) 3266223.
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Lynx, Oric.)
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Forest Hill,
London SE23 3NJ.
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(Sirius, Superbrain,
Televideo.)
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London SE1.
Tel: (01) 261 1712.
(IBM.)
Computence,
Warwick Chambers,
14 Corporation Street,
Birmingham B2 4RN.
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(Warranties.)
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Ramsden Heath,
Billericay, Essex
CM11 1PU.
Tel: (0268) 710292.
(Apple, IBM, Sirius.)
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Industrial Estate,
Wilbury, Hitchin,
Herts.

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(Apple.)
DTT Maintenance,
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Birmingham B30 1JH.
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(Apple, BBC, IBM,
Osborne, Sirius,
Superbrain.)
Data Type,

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Park, Cwmbran, Gwent.
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(BBC.)
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Hanworth, Feltham,
Middx TW13 6JG.
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(Approved Apple, NEC,
Sage.)
Halls,
Town Road, Stoke-on-
Trent, Staffs.
Tel: (0782) 280251.
(Apple, CBM, IBM,
Sharp.)
Kode,
Station Road,
Calne, Wilts.
Tel: (0249) 813771.
(RML, Winchester Disks.)

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Industrial Estate,
Westlea, Swindon, Wilts.
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Tolworth Close,
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Osborne.)
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Superbrain, Televideo.)
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Ford, Hants SO5 3YY.
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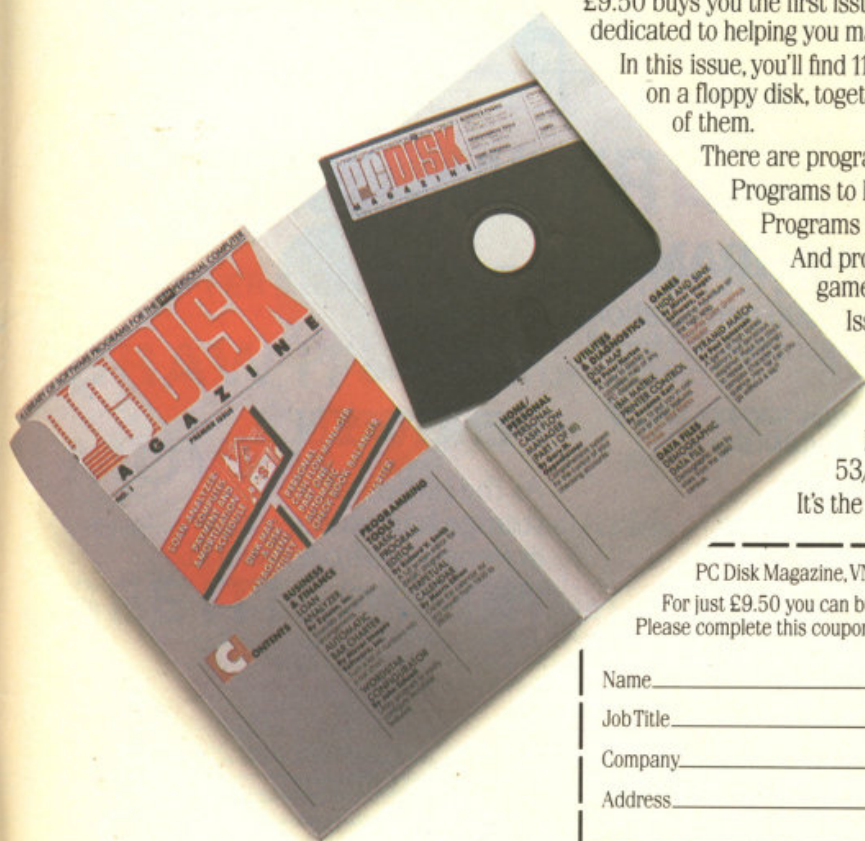
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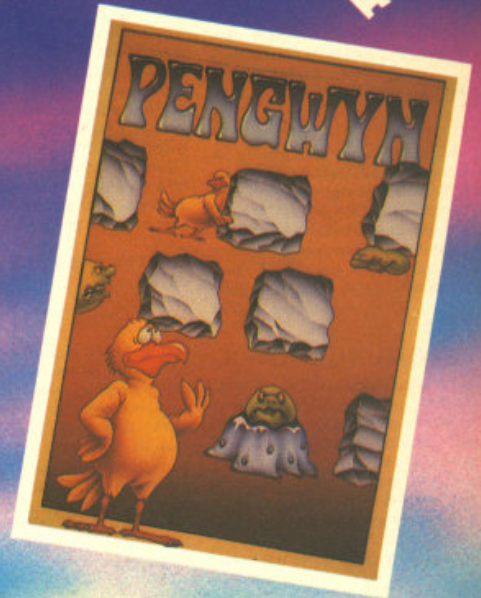
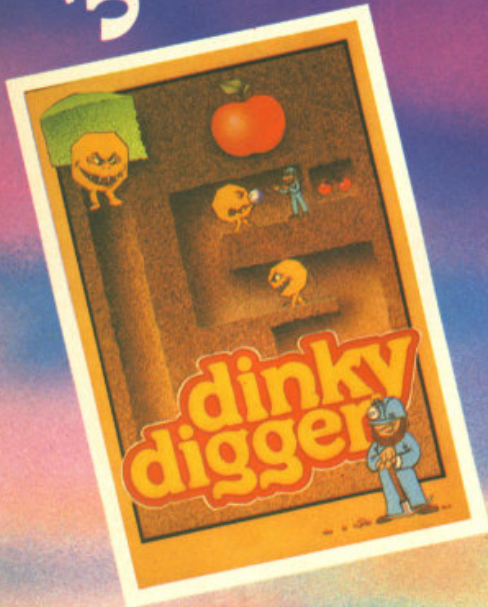
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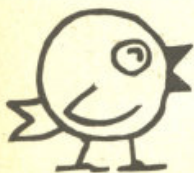
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APRIL, 1984

Advanced Graphics with the Sinclair ZX Spectrum, by IO Angell and BJ Jones.

See yourself as the Miro of micro graphics? Or perhaps you'd just like to present some information pictorially? Whatever your interest in computer-generated pictures, you'll probably find something for you in *Advanced Graphics for the Sinclair ZX Spectrum*.

The first thing that should be pointed out is that the 'advanced' in the title means just that: many of the techniques presented are very complex and require a good knowledge of maths if you're to understand them. The authors' style is rather dry at times, and the book reads rather like a textbook, which is really what it is—the sheer quantity of material covered necessarily leads to a rather compressed treatment.

The book assumes a familiarity with Sinclair Basic, but does start with a look at the graphics-related features of the language which are essential for the rest of the text. Many of these features are illustrated by a game, which is fairly trivial, but fun all the same.



The next chapter turns to more serious matters, looking at the mapping of arbitrary objects in two-dimensional space to pixels on the screen. Our introduction to two-dimensional graphics comes in the form of routines to draw polygons and abstract patterns.

After this relatively innocuous beginning we move on to some pretty heavy co-ordinate geometry. The topics covered include the vector representation of lines in two-dimensions, and a very important little routine which clips any lines we might ask the computer to draw, so that they

don't go off the edge of the screen.

The maths gets even harder in the next chapter, where the use of matrices to perform transformations is introduced, along with the techniques used to draw complicated pictures from simple building blocks. All these techniques are later extended to three-dimensions, where the added complication of projection from three to two dimensions is required. If you don't know the difference between orthographic and perspective projections, you will after reading this book. Hidden-line algorithms, which ensure that lines hidden behind other objects don't get drawn, are also described.

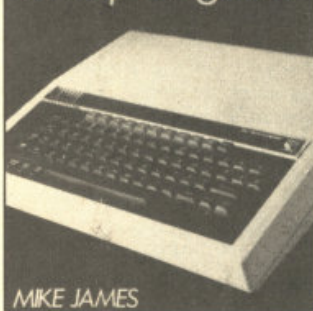
One big advantage of this book is the way the programs are presented. Not only are they very clearly printed, but they are also exceptionally well written. The use of modular techniques means that, even if you don't follow all the maths, you should still get a good overall idea of how the various parts of the programs fit together. Some of the routines are very long, and will only work on a 48K machine; therefore it's something of a relief that a cassette of the programs from the book is available.

If the book contained just the material described so far we could recommend it as an excellent, if necessarily mathematical, introduction to co-ordinate geometry on a computer; but there's more than just this. Also included is a chapter on character graphics which includes a complete utility program to allow you to design your own graphics characters. Examples include a 'Mastermind' program, and one to draw a chessboard.

Then there's a chapter on diagrams and graphs which covers histograms, pie charts and line graphs—all with the relevant programs. Finally there is a chapter on advanced programming techniques which culminates in the design of a fairly complex video game.

The authors are to be congratulated on producing a really excellent book. They cover an enormous range of topics and include a large number of useful programs. Anyone who wants to go into graphics in some depth would do well to look into this book. It contains just about all you need to know to make the most of the Spectrum's graphic abilities.

THE BBC MICRO
an expert guide



The BBC Micro, an expert guide, by Mike James.

Microcomputers are rather more complicated than most domestic appliances. While your toaster, hairdrier or TV set comes with a slim instruction pamphlet, this would hardly be enough for even the simplest micro. When your home computer gets as complex as the BBC Micro, you find that a chunky User Guide of over 500 pages is required.

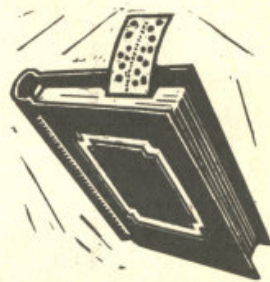
But even this weighty tome doesn't cover everything you might want to know: because it has to start by assuming that you know nothing about computers, there just isn't room to give in-depth coverage of all the features of this excellent machine. For the more experienced user who wants to go beyond the straightforward use of Basic we now have 'The BBC Micro, an expert guide'.

The book aims to cover the more advanced features of the BBC Micro, both the hardware (which is rather neglected in the User Guide), and the software (because of this quite a lot is taken for granted). It is assumed that the reader is already quite familiar with microcomputing. The acronyms, part numbers and hexadecimal fly thick and fast right from the start. There isn't even an introductory section on binary and hex!

Because the author believes, quite correctly, that a proper appreciation of the micro can only come through some understanding of the hardware, that is where he starts. The first chapter gives a fairly detailed overview of the main sections within the computer. As well as the CPU and memory, we find sketches of the video section, the serial interface and the various parallel interface. Even this fairly short treatment gives a valuable insight into the hardware, and makes some of the ►

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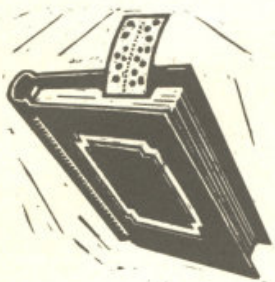
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Advanced Graphics with the Sinclair ZX Spectrum (234 pages), by IO Angell and BJ Jones, is published by MacMillan, and priced £9.95.



The BBC Micro, an Expert Guide (158 pages) by Mike James, is published by Granada, priced £6.95.

behaviour of the system as a whole a bit clearer.

The chapter on Basic does not concentrate much on the details of the language, which it assumes are familiar. Instead it gives interesting and useful information on how Basic uses memory: how statements and variables are stored. This information should help those who want to fiddle about with the insides of their Basic programs and extract the last ounce of performance.

The emphasis on software continues in the next chapter with a look at the Machine Operating System (MOS). The MOS is a collection of subroutines, nearly as large as Basic, which can be called by the user. Because most peripheral handling can be done in a consistent way via the MOS, the user is insulated from future hardware or software changes.

As well as the simple use of these routines, this chapter also looks at the way interrupts are handled. This sort of thing really is for the expert—you have to know what you're doing to use interrupts and not crash the system. Unfortunately there aren't many worked examples to make things easier.

Shifting the emphasis more to hardware, the chapter on the video generator goes into some detail about how the contents of memory determine what you see on the screen. An understanding of this makes it apparent why the display works in just the way it does. It might also serve to increase your respect for the designers and programmers who made the thing in the first place! Although he warns of the dangers of POKEing about with the hardware registers, the author does include some information on them. A lot can be done with the MOS calls provided, but sometimes temptation gets the better of us all.

The discussion of the sound generator covers the use of the sound and envelope commands to generate tunes and noises. There is a program to help you experiment with envelopes. But again there are also hardware details for those of us who can't keep our sticky fingers off internal registers. Similar details of the A to D convertor and user port are provided in the chapter on interfacing. These are the only types mentioned, though.

The last two chapters look at

one of the most remarkable features of BBC Basic—its built-in assembler. Two chapters are hardly enough to provide a full introduction to assembly language programming. Even an experienced Basic programmer might find the going a bit tough. For those already familiar with Assembly, either for the 6502 or some other machine, there should be enough material to get started.

The first of the two chapters looks at the internal details of the 6502 and gives a swift run through the available instructions and addressing modes. The operation of the assembler is demonstrated, with further techniques described in the next chapter.

To help you on your way there are four sample programs which illustrate some of the techniques and show off the power of assembler.

For someone already well-versed in microcomputing, there is plenty of very useful material in this book. It's not the last word on the BBC micro, but experts will find plenty to exercise both themselves and their machines.

By Ron Yorston, a researcher in computational physics.

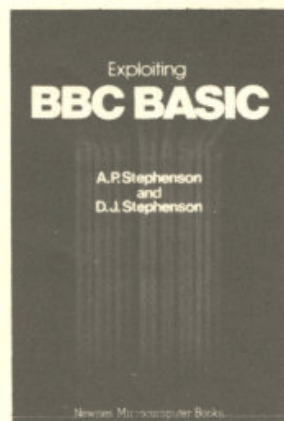
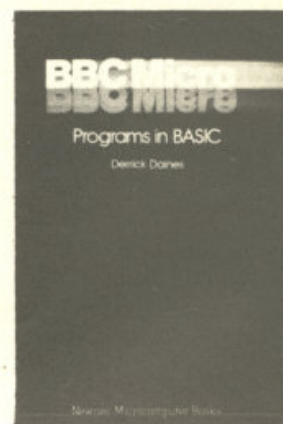
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A P Stephenson and D J Stephenson

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THE BIGGER THEY COME

This month's Legal File features a computer horror story of truly awful dimensions. At the heart of it is a Southsea firm of registered insurance brokers, who last May purchased about £14,000 worth of ICL multi-user computer hardware from a local systems house. It also bought software to look after their client files, unit trust investment activities, motor, general and life assurance work.

Now in terms of the current capabilities of computer systems, there is no reason on earth why such a configuration should not have provided the brokers with a more than adequate service, but unfortunately—in the words of the firm's principal—they 'have had no satisfaction right from the very beginning' and are now in a terrible mess. Here are just some of the problems they have encountered:

○Despite specifying a 10Mb hard disk unit, the brokers firm was initially supplied with a 5Mb system, and then put to the considerable trouble of having to reload all their data when the 10Mb unit eventually arrived.

○The floppy disk drive repeatedly rejected secured disks, and every systems-house engineer who came to examine the problem gave a different and contradictory explanation for the fault.

○On some occasions more than 50 per cent of the client files disappear without a trace into the system and can only be recovered via the firm's secured disks.

○The systems 'house have provided 'the most dreadful service imaginable', sometimes taking up to six days to reply to an urgent telephone call for assistance.

○Despite being sold a life assurance program back in May, seven months later that systems house had still not even got around to writing it.

○On top of all this, the firm now finds itself caught in the middle of a demarcation dispute between ICL and the systems house with regard to the responsibility for the faults.

Needless to say the firm is far from happy and is seriously considering not having anything further to do with new technology/computers. On a more serious note, it has also

reached the conclusion that the time for negotiation is now over and that litigation is possibly the only way to reach a settlement. But this in turn raises a number of further problems.

Should they sue ICL if the system's poor performance is due—as it might appear—to defective ICL hardware? Or should the systems house bear the brunt of the blame? With regard to this, the reply must be sue the systems house, as it is the party with which the broking firm formed its contract. In law this is known as the doctrine of 'privity of contract'. Admittedly the system house may in turn blame ICL, but that is a matter for them to sort out between themselves and need not concern the brokers.



So what sort of action and what sort of remedy should the brokers pursue? Quite simply, when a company contracts to sell you an article designed to perform a specific task and it fails to do so, the supplier is in breach of contract and the buyer is entitled to sue for damages—in other words, financial compensation. In a case like this the measure for damages would probably be the cost of getting the system put right by a third party, plus the cost in terms of the time wasted by the members of the broking firm (since last May) in trying to load data and get the system up and running.

In addition, it may well be that because of the gravity of the case and the total lack of satisfaction they have received, the brokers may also be able to claim the remedy of 'rescission'. This means that the whole contract is scrapped, the systems house get its computer back and the brokers firm get its money returned.

The brokers' allegations that the systems house have consistently provided a poor service is certainly good material in the sense that it stands as evidence of its inefficiency, but it may not provide a separate course of action in itself. If however the brokers have a separate maintenance and service agreement with the systems house, or if the question of service was specifically mentioned in the terms and conditions of the original contract of sale, this may constitute another ground for suing for breach of contract.

Then there is the question of the system house's failure to produce a life assurance program. As this was one of the reasons why the brokers chose this particular system in the first place, it would appear that the systems house are also capable of 'misrepresentation', which means that the brokers were only induced to enter into the contract in the first place on the strengths of promises which were subsequently found to be untrue. One again this legal 'wrong' entitles the brokers to sue for damages and/or rescission.

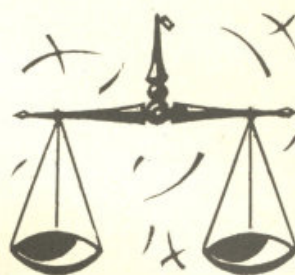
Finally—although given their misfortune it seems hard to believe, so you can only admire their pluck—the brokers firm wants advice on where it might be able to find assistance on selecting a decent computer system for its office (or at least be given advice on what they can do to improve their present system).

Probably the best bet here would be to contact an independent computer consultant on this problem. The Association of Professional Computer Consultants can provide assistance on this score. Some of its members are also qualified to give impartial advice as 'expert witnesses' on the suitability of a system with a view to pending litigation, so too can a commercial organisation called DBA Computer Services.

To sum up then, the brokers would (*prima facie*) certainly seem to have plenty of causes for legal action, for breach of contract and misrepresentation against the systems house. Furthermore, they stand a very good chance of being awarded a substantial amount in damages.

DATA FILE

LEGAL FILE



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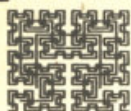
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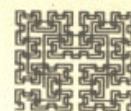
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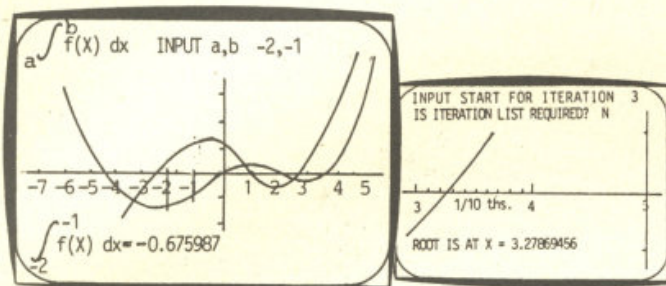
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PRISM NOTES

Despite persistent badgering, Prism still will not say when (and if) they are going to release the necessary software to allow the VTX5000 modem/interface for the Spectrum to be used as a standard 1200/75 modem. Even though we have described elsewhere how to break out of the VTX5000 ROM, it will still generate unwanted Prestel characters. A spokesman for Prism said that it was low on their list of priorities but the software's release was imminent (maybe John Vaughan has done the job for them?).

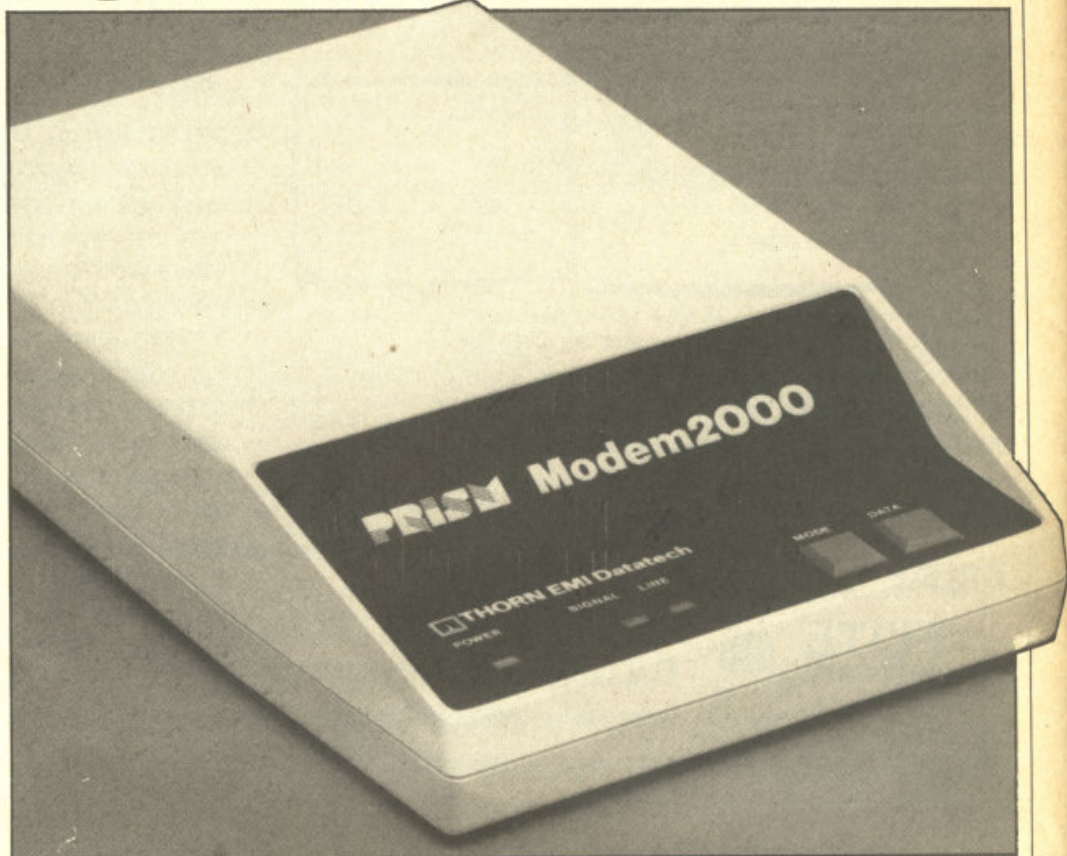
Supplies of the Modem 1000 Micronet adaptor for the BBC are still rare, but we tested one for a short period and it seemed fine. The latest Micronet adapters are intended for the Sirius and IBM PC. Utilising Prism's latest modem, the Modem 2000, the whole package is expected to retail at a staggering £259. It would be well worth the money if both software and modem allowed 300/300 or 1200/1200 full duplex communications—meaning you could access something besides Prestel Viewdata Systems, but sadly they won't.

These packages should be out this month, but later in the year adaptors for the Apple II, Atari range (including the latest XLs) plus both Dragons should be available.

CABB NEWS

By now readers should have been able to take advantage of our dual baud rate bulletin board system, thanks to the use of the DaCom GT intelligent modem. This is something of a world's first since normally systems offering a dual service are run on mainframe computers and use separate telephone numbers. In the US, dual systems have been tried that offered 1200/1200 and 300/300 baud rates but these required the user to send a couple of characters, such as a '#', so that the computer could recognize the baud rate. However, the GT modem senses baud rate automatically and responds accordingly. We firmly believe we are the first bulletin board in the world to offer this twin 1200/75 and 300/300 baud service simultaneously. If your modem can cope, then you can search the board at 1200 and upload at 300!

ALL THE LATEST BULLETINS...



The latest addition to the Prism range of modems is the Modem 2000 above. It will form part of packages for the Sirius and IBM PC. The modem should allow both 1200/75 and 1200/1200 (half duplex) communications.

The next development will be to restrict the board (CABB) to registered users. This will mean that you will be asked for a password before gaining full access. If this happens just <CR> to the password question, fill in the questionnaire and then call back later to see if you have been registered. We stress this is only to keep out time wasters and won't mean you will have to pay for the service.

It also seems appropriate that we should thank all those responsible for getting TBBS going. This includes Tandy, Dacom (micro and modem), Cumana for their superb disk drives, Westrex of London NW2 for the Epson printer, Molimerx for the latest version of LDOS and Ebert Personal Computers for the excellent TBBS software. Our thanks also to Peter Tootill, John Nolan, Leo Knaggs, Trevor Smith, Fred Brown, Andy Hood and all the others too numerous to mention who've

given advice and encouragement.

CALLING ALL PRISM VTX 5000 OWNERS!

Spectrum enthusiast Stephen Gold has at last discovered how to make the Micronet adapter for the Sinclair Spectrum (Prism's VTX5000) work as a 1200/75 baud modem using the existing software in ROM. Power up the Prism as usual. Ensure the mode switch is set to M/Net. Press the appropriate keys until the log-on menu is displayed. Dial up the 1200/75 baud database you wish to access. When the host computer's modem answers, flick down the line switch (green light should come on). Replace telephone handset. Select option 1 (manual log-on) and the title page should appear. If not try send a few '#' characters. We tried it and it worked. Here are a few databases for you to try this on:-

C-view - Tel: (0702) 546373
Password: any OPTEL - Tel:

(0908) 653911 password
0000000000 pub Viewdata
SW - Tel: (0752) 661866 pass-
word 654321 6421

More databases and useful information will appear on the Micronet pages which Stephen edits. Use your Prism to access "Micromouse" on *800651102#. This won't work for CABB as it is not Prestel compatible.

SPECTRUM COMMUNICATIONS SOFTWARE

John Vaughan has sent us in his version of communications software for the Spectrum. It enables the Spectrum to act as a dumb viewdata terminal, or run RS232 communications. The software was designed to work with the ex-Cobra (Micro Mania) RS232 interface at either 1200/75 or 300/300 baud rates. We haven't thoroughly tested it yet, but its main disadvantage is that file transfer is not by Christensen

FIG. 1 AFPAS EXPANSION

Board name:

BASUG
CBBS (R) Surrey
CBBS (R) Cumbria

TBBS Southampton

NBBBS

Telephone:

(0742) 667983
(04862) 25174
(06992) 314

(0703) 437200

(0827) 288810

System operator:

Quentin Reidford
Mike Parker
Roger Drew

Chris Cain

Paul Smith

Hours:

24 hours
Unknown
To schedule. Please check
with CBBS (R) NE for times.
17.00-08.00 hrs Mon-Fri
24 hrs (weekends)
24 hours (ring back)

Whoops Specterm!!

Those of you who keyed in Specterm last month, and couldn't get the correct checksum, may be wondering why? The answer was that the checksum prog was bugged (oops - sorry). It should have read:-

```
1 LET z = 0: For a = 24576 TO 24576 + 1800
2 LET z = z + PEEK a: NEXT a
3 PRINT "checksum = "; z: STOP
4 REM checksum should total 177078
```

The real checksum should have been 177078, since an 'a' was accidentally substituted in line 103 instead of the correct 'z'. To make sure

you've got it exactly right type **CLEAR 24575**, before loading the machine code.

The good news is that we have a slightly revised edition of Specterm all ready for production. As soon as we have found somebody to market it, we'll let you know.

Although the checksum was bugged, the actual program (Specterm) itself was not, as readers who took the time to input it will have discovered. At the time of writing, supplies of the Micro Mania RS232 interface were scarce. For this reason we hope to follow up with slightly amended versions of Specterm for other RS232 interfaces.

(Xmodem) protocols. However, according to Prism, John's software is virtually compatible with the VTX5000, so you could access 1200/75 databases other than Prestel (this means CABB) and use the file transfer facilities. John is selling the viewdata and communications programs separately for £10 each, but software plus the RS232 interface costs £35. Frankly it is rather expensive although available right now. We'd recommend waiting for Andrew Glaister to adapt Spectrum to 1200/75 baud use if you can, as it will have Xmodem.

JWV Software,
139 Allington Drive,
Strood,
Kent ME2 3TA.
Teletype software £10
Viewdata software £10
Complete package £35

OTHER AFPAS NEWS

The Association of Free Public Access Systems (AFPAS), which covers 300 baud bulletin board systems in the UK, is continuing to expand. The

latest additions are given in Fig. 1 above.

RS232 INTERFACE NEWS

The number of micros kept out of bulletin boards through lack of a suitable RS232 interface is rapidly declining. Good news for ZX81 owners is that an interface is now available from Microcomputer Resources. A 16K RAM pack from Sinclair is necessary to use the interface but most owners will already possess this. Called the ZX81 universal modem adaptor, it was originally intended to give ZX81 users access to Prestel at 1200/75 baud. However, it can also be configured for 1200/1200 and 300/300 baud use. We tested an adaptor ourselves and found that there were a few bugs in 300 baud operation; but hopefully its designer, Chris Johnson, will have ironed them out by the time you read this. The good news is that the adaptor - RS232 port and communications software together - are all on the same board costing £29.95 inc VAT.

David Boulton at Micro-

computer Resources also tells us that development of a modem interface for Dragons is nearly completed. Currently it is only configured for 1200/75 baud communications which will enable users to access Micronet but not the AFPAS boards. Expected price will be £49.95 (exc. VAT) which includes software and interface. Details are still scarce, but communications solutions for the Commodore 64 and Lynx micros are imminent.

COMMSTAR

We've had a chance to play around with Commstar, which is a communications ROM for the BBC written by Andy Hood. The feature that impressed us most was the clock feature displaying the elapsed time while using Commstar. This was a great discouragement from spending too much time on the 'phone.

Loading speed is the main advantage with the software on ROM and makes a big difference from the tedium of trying to persuade our own program

BULLETIN

(published in June) to load from tape. Commstar also has the necessary Christensen error-checking protocols which give almost foolproof uploading and downloading with no errors.

Although protocols, such as parity and data bits, can be changed with ease, the version of Commstar we received did not have a built-in facility for changing baud rate. It did have Xon/Xoff, which means that you can download text files from a bulletin with a printer attached without the bulletin board racing ahead.

An uprated version of Commstar will have the Prestel facility as advertised but again wasn't on our test ROM. One word of advice; to ensure Commstar interfaces correctly with a modem the CTS and RTS pins on the Beeb's R423 port (not normally used) must be shorted out.

At £34 (inc. VAT), Commstar may sound pricey but the hassles it removes when compared to cassette based software are well worth the money. Issue the command *COMM, press key C and you are away! The documentation that goes with Commstar is also very worthy. Commstar is available from Pace.

MICRONET

Starting up *Computing Answers* bulletin board does not mean we have abandoned Micronet.

When you are in possession of a suitable Micronet adaptor, to log your questions with *Computer Answers*:-

- Enter page no. *60014141.
- Leave question in form of letters to the editor.

If just browsing:

- Select VNU from Main Clients.
- Select *Computer Answers* from Micro Mags.
- Select *Letters to the Editor*.

Commstar, priced £34 (inc. VAT), is available from:

Pace Disc Systems,
92 New Cross Street,
Bradford BD5 8BS.
Tel: (0274) 729306.

ZX universal modem adaptor, priced £29.95 (inc. VAT), from:
Microcomputer Resources,
1 Branch Road,
Park Street Village,
St Albans, Herts.
Tel: (0727) 72917.

The DUPLEX SUSS-BOX and DUPLEX SUSS-ADAPTOR have been designed to enable the less skilled computer user to have a better understanding of the correct working connection between a computer and a peripheral, such as a printer. This is achieved by using the commonly used signals (wires) of the RS232C serial data cable specification, a matrix-block and special connector pins.

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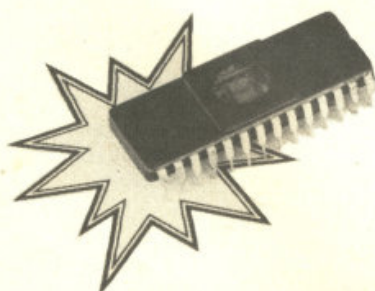
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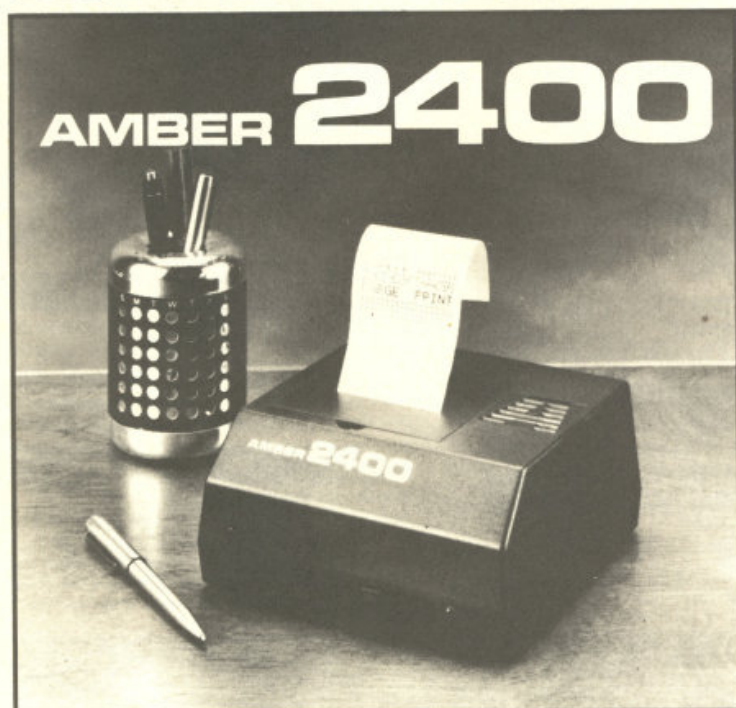
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WORKSHOP CORRECTION

In the October issue of *Computer Answers*, an example was given of how to use WordStar's Mail-Merge to produce labels two-up across the page. The example figure was shown incorrectly, because I specified it with insufficient accuracy, for which I apologise to any readers who may have been inconvenienced.

The exact specification of the Mail-Merge 'template' is shown right. Perhaps I should also remind readers — as in the original article — that the technique will only work properly if there are an even number of names and addresses in the Mail-Merge data file.

Dr Kathy Lang, Cornwall.

LAX TAX

Your article 'Second Hand — First Choice?' (in the February 1984 issue of *Computer Answers*) says: 'As a rough guide to what you should pay, remember at least 15 per cent should be deducted as there's no VAT on secondhand goods'.

May I point out that if a VAT registered company supplies secondhand goods it must charge VAT. There are certain exceptions, but computer equipment is not one of them. I have had this confirmed by a telephone conversation with the enquiry office of HM Customs & Excise.

Since the companies referred to in your letter are almost certainly all VAT registered, perhaps your writer would like to expand upon his comment.

N B Cray,
Financial Controller,
Arrow Computer Systems Ltd.

You are of course quite right Mr Cray — businesses which are selling secondhand computer equipment will have to charge VAT on their goods.

Quite obviously the context in which the sentence was written is not clear. When buying privately secondhand there is no need to pay the VAT that was charged to the original purchaser. Hence you should expect a private individual to knock off at least 15 per cent from the price he or she originally paid. My apologies to those enterprising individuals who tried to avoid paying VAT to secondhand computer retailers.

— Tony Dennis, deputy editor.

FIG. 1
(SEE LEFT)

```
.MT 0
.MB 0
.PL 9
.PO 2
.OP
.PF OFF
.DF PUNTERS.181
.RV Title,Initials,Surname,Addr1,Addr2,Addr3,Postcode
.RV Title2,Initials2,Surname2,Addr21,Addr22,Addr23,Postcode2
&Title& &Initials& &Surname&, "P <RETURN>
&Addr1&, "P <RETURN> &Title2& &Initials2& &Surname2&
&Addr2&, "P <RETURN> &Addr21&,
&Addr3&, "P <RETURN> &Addr22&,
&Postcode&, "P <RETURN> &Addr23&,
&Postcode2&.
PA
```

CASSETTE REGRETS?

Following an inability to load my own recorded tapes onto my BBC Model B from a TEAM recorder, I have experimented with a National Panasonic radio recorder, Model RX 1810 (which I had purchased in Singapore at about half the cost of the TEAM), I have found I can save and load my own tapes with the greatest of ease. Although I save with the volume control near the lowest and load with it near the highest, in neither case is it critical; the tone control I leave at the end (bass). The recorder possesses a counter, more or less essential.

Another snag about the TEAM, with which I have experimented with no success, is that the volume control is not calibrated in any way, so that I have had to paint marks to fix the position where the outside tapes can be loaded.

My experience appears to agree with what I have read from other correspondents — the cheaper the recorder the easier the loading.
K W J Wood, Powys.

WHY THE LAP NEGLECT?

You seem to rather neglect computers that can be used on the move — 'lap-top' models, in other words — in your editorial coverage. Are you planning to publish more about these in future issues of your excellent magazine?

C P Freeman, Coventry.
Thanks for your comments on our magazine Mr Freeman. Like all other bookstall magazines, we have to aim at as large and wide readership as we

possibly can. This means (unfortunately in some ways) that we have to concentrate on the microcomputers that have sold in the largest numbers, or are likely to interest a large number of people (for example the new Sinclair QL or IBM PC Junior). At the moment the volumes of portable computers have nowhere near matched those of other home computers.

Nevertheless we have published some articles on popular 'lap-top' machines: we had a review of the Epson HX20 and Tandy 100 machines in the October '83 issue of *Computer Answers*, and a road test exotique called 'An Epson in Turkey' in the November '83 issue.

We do appreciate that portables may well become a lot more popular, but until they do, the intent of our coverage will remain as the occasional article and answers to these technical queries.

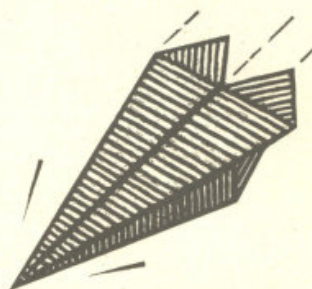
GENERATING GOOD COPY

May I congratulate you on your most informative article on data duplication in your February 1984 issue of *Computer Answers*. To my knowledge this is the first serious attempt at cataloguing the services provided by the various duplicating houses (though I was a little surprised by the output claimed by some of the duplicators).

I would like to correct a small error, however: your article stated that we work for Rabbit; we do not in fact duplicate for them, though we do work for Commodore, Dragon, Imagine and most other well-known names. P D Fanshawe, Sales Director, Kiltale Ltd.

DATA FILE

INPUT



MAIL-MERGE

ERRATUM,

TAX POINT

FOLLOWED UP,

MORE CASSETTE

FEEDBACK —

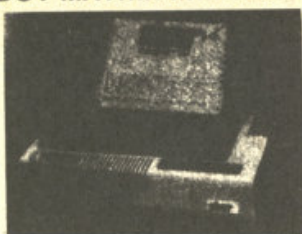
AND A COUPLE OF

PATS ON THE

BACK.

Computer Answers invites all its readers to Input — the hi-tec amongst you can even contact us via CABB (see page 3). Send your letters to: Computer Answers editorial, Evelyn House, 62 Oxford Street, London W1A 2HG (Please mark your envelopes 'Input').

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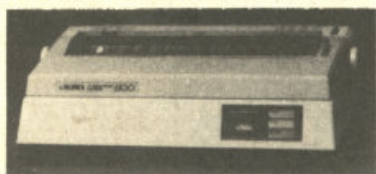
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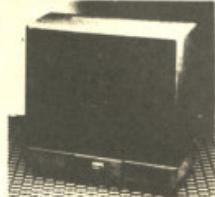
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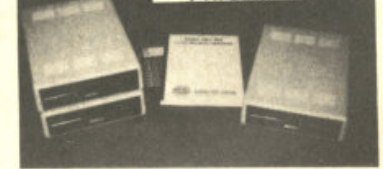
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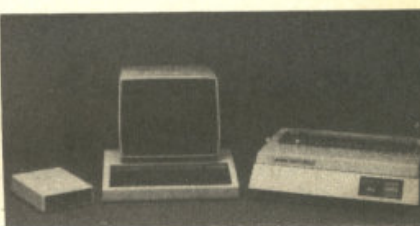
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ISSUE 1

(Nov/Dec 1982):

If you want a copy of an article from this issue, please send 50p per article (see contents page for address) marking the envelope 'Copy service'. We will send you photo copies of the appropriate pages. Jupiter Ace, DEC Rainbow, Commodore 64 (reviews); ZX81 upgrade; 8/16 bit choice; Z80 cards; ASCII code; Program swapping; I/O concepts; Printer plug-in; Assembler course (introduction); Program generators; Basic queries; Graphics; Communications; Database management systems; The UCSD p-system; Multi-user systems; CP/M utilities; Bad-quality software.

ISSUE 2

(Jan/Feb 1983):

CP/M Plus (CP/M facelift); Memory (RAMs and ROMs explained); Baud explained; Configurations (WordStar on Epson); Program editors; Assembler course (part 1); List sorting program; Program concurrency; CP/M revealed; **Computer Answers File No 1: Home Computing** (domestic applications); Word-processing advice; Communications modems; Maintenance; Sales talk; Legal File (maintenance agreement small print).

ISSUE 3

(March/April 1983):

VisiOn and Lisa (reviews); Torch upgrading (the Tube); Changing print characters; Z80 workhouse; Assembler course (part 2); APL program language; CP/M utilities and corrupted disks.

Sinclair Clinic; Systems expertise; Beware of selling hype ('relational databases'); Business graphics (principals); Stargazing and biorhythmic software; Copyright clauses; Budget micros; Micro manufacturers answer back; Renting software; Legal File (piracy problems).

ISSUE 4

(May 1983):

Sage IV (review); Microflopies; Data preservation; Apple IIe (review); Government's choice of micros; Monitors; Slide-show controlling; Digital input; Random numbers; Assembler (part 3); Professional games programmers.

Dragon and Texas Clinic; Making music on micros; Spreadsheets (Planner-Calc); Business graphics (practice); Toolkits; Ergonomics; Legal File (small claims procedure).

ISSUE 5

(June 1983):

Pinball Construction Set (review); VisiWord (review); Power (what constitutes a micro's muscles); IBM Clones; Buses; Data structures; WordStar Workshop (part 1); Number base conversion; Random numbers; Gw Basic; **BBC Clinic;** Business Operating System; Horserace Forecast Package (review); MasterCalc (review); Classroom computing; Games simulation; Software security; Setting up (selling your own software); Legal File (defaulting mail order advertisers).

ISSUE 6

(July 1983):

New Osborne Executive (review); Lotus 1-2-3 integrated software package (review); Plotters; Memory expansion; User-friendly software; 'Turtle' conversion job; Communications (file transfer); **Commodore Clinic;** Lisp language; WordStar Workshop (part 2); CP/M supervisors; Computer aided design; Spreadsheets (MultiPlan); Micros in the music studio; Insurance; Computer holidays.

ISSUE 7

(August 1983):

System speed; Choosing a printer; Typewriter conversion; Preserving on Proms and Eproms; 'Turtle' conversion (Part 2); Assembler course (final part); Programmers Ten Commandments; WordStar Workshop (part 3); **Atari Clinic;**

Exploiting Operating Systems; Cassette-based word processing, spreadsheets, and databases (reviews); Computer Aided Learning (CAL); Pilot (CAL language); Data management; Selling your programs to companies; Legal File: the intricacies of copyright.

ISSUE 8

(September 1983):

AMS 3 inch microdisks (review); **Computer Answers File No 2: Interfaces;**

Making 3D images; WordStar Workshop (part 4); dBase II Workshop; Numbers; Recursion; Game of Life; Programming logic statements; Data compaction; **Apple Clinic;** Microsystem's insides; BCPL (language); Speech synthesis and recognition; Spreadsheet formulation; micros in schools; Abstract computer Art; High street retailers; Legal file: the cost of going to court.

ISSUE 9

(October 1983):

Colne's Armadroid robot (review); Advanced VisiCalc; Coping with cassettes; Tandy 100 versus Epson HX20; Translating Basic into Assembler; Data Programming; WordStar Workshop (part 5); dBase II Workshop (part 2); Bill Budge interview; True Random Number Generation;

Logo (language); **CP/M Clinic;** Probing the processor; micro-designing computer; database reviews; Spreadsheet formulation; computerised graphics on Rock albums; Disk prices; Legal File: customer/dealer disputes.

ISSUE 10

(November 1983):

ACT Apricot (review); Hard disks (overview); The Sord M5/CGL M5 (review); Spectrum expansion (add-ons); Vic port project (Rs232 card); Break into Barcodes; Getting RAM; Wordstar Workshop (part 6); **Tandy, Dragon, Genie Clinic.**

Memory Mapping; Peripheral chips; MSX Compatibility; War games (reviews); An Epson in Turkey (roadtest *exotique*); Keyboard trainers; Computer training courses; Brixton ITeC (Econet); Buying second hand systems; Legal File (problems of setting up a software library).

ISSUE 11

(December 1983):

New generation of cheap modems; printer buffers; Watford Electronics disk filing system; Disk benchmarking test; Mice-like inputting devices; Communications software; Using arrays; Seymour ('Logo') Papert (interview); Programmers Workshop ('Wolf Fence Algorithm'/Instrumentation'); Worms; **Sin-**

clair Clinic; Device drivers; Bulletin boards; dBase version 2.4 ('dBase III'); Spreadsheet DIF facility; Choosing a user group; Correspondence course in computing; GOSH - the Guild Of Software Houses; Legal File: options on going to court.

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ISSUE 12

(January 1984):

Elan Enterprise; Atari 600XL; Spectravideo; Cheap daisy-wheel printers; Best games of '83; Personal CP/M; Converting one Basic into another; **BBC/Electron Clinic** Cassette editors and assemblers; Games programming with sprite graphics; Bank Street Writer word processor; Reflexive VisiCalc; Start your own user group; Furniture to keep your micro tidy.

ISSUE 13

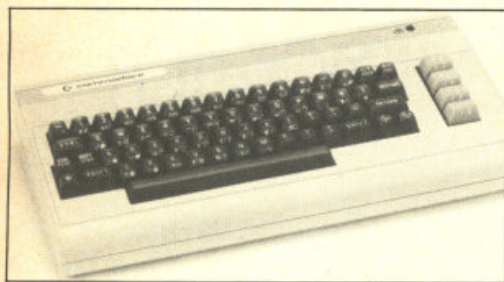
(February 1984):

Inside the Oric ROM; IBM PC jr; Joysticks; Scope (games writer); Instructional games videos; special effects from dot-matrix printers; Interface 1 problems; Beyond Basic; Getting Sound Effects; Game of Go (Part 1); Game of Nim (Part 1); Programmers Workshop: speeding up; **Commodore 64/Vic 20 Clinic;** Microcache package; Business databases; Everyman database package; Disk corruption; Cassette duplication; Second-hand peripherals; Setting-up a bulletin board; Legal File: second-hand micro sales.

ISSUE 14

(March 1984):

Memotech MTX; Dragon 64; Vic 20 add-on boards; adventure game writing packages; fancy fonts for the BBC; RS232 interface revealed; Bluff (game); Go (Part 2); BBC disk file expansion; Nim (Part 2); Fog Index (game); Wordwhizz (game); Assembler Workshop; Basic Workshop; **Spectrum/ZX81 Clinic;** Operating systems; Business: accounts packages; accessible mega-databases; weekend training course.



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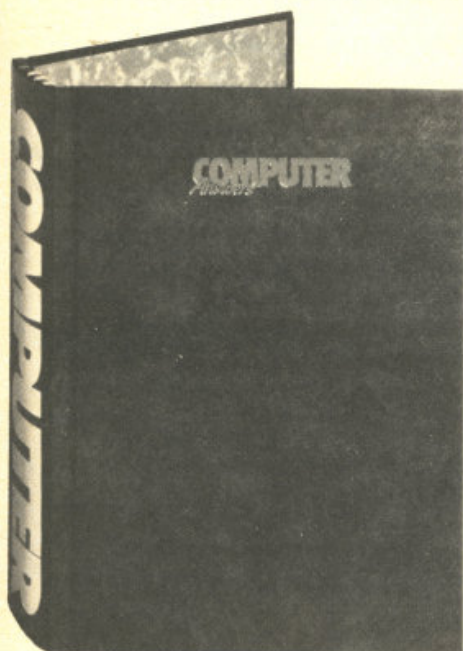
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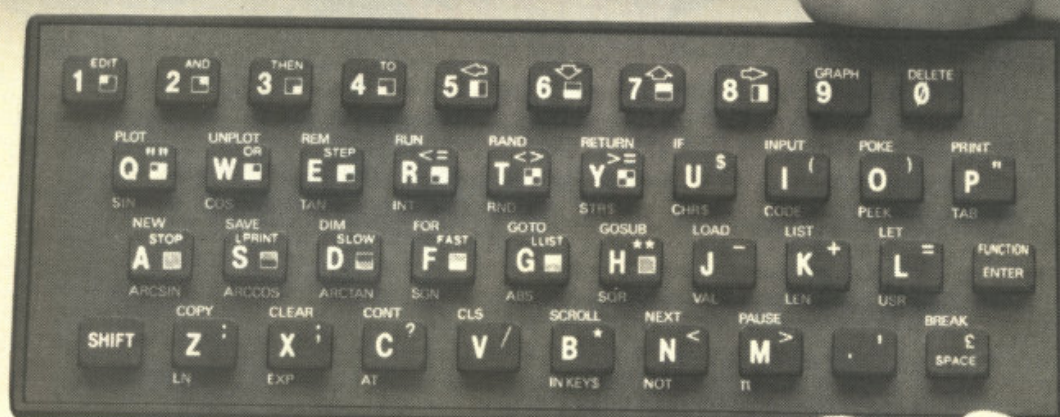
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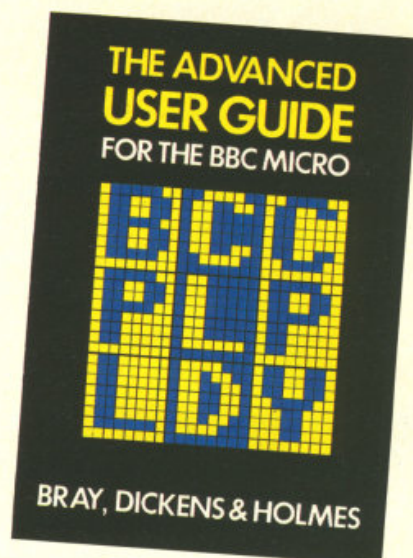
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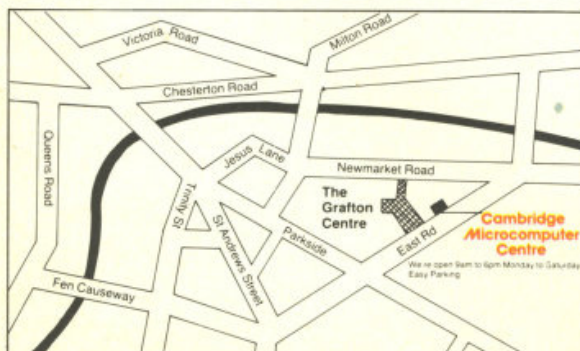
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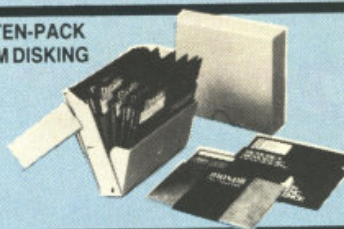
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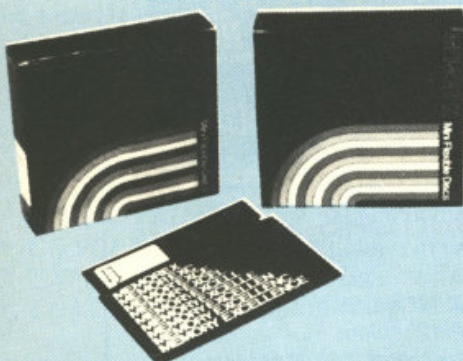
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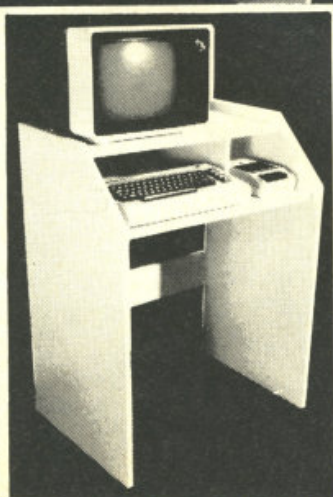
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