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London W9 1SD  
Telephone: (01-894 8800)  
Telex: 840000115 Airtel/2000

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Stephen Woolley  
**Deputy editor**  
Terry Denton  
**Technical editor**  
Dr Peter Thomas  
**Sub-editor**  
Jan Hayes  
**Proof-reader**  
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10. Your software must sup-

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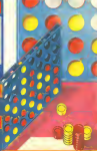
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# CABB: UP AND BUZZING!

**G**o onto Computer Answer's Bulletin Board with this simple step-by-step guide:

1 Check the hardware on your system. It must have an RS232C (or, in the case of the Bells, RS422) serial port. If it hasn't, then go to step 3, the next.

2 If you haven't got an RS232C 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 multiplex, you may prefer step 4.

4 Get a BT multiplex writer installed (usually well worth the £25 expense) and go to step 5, or, if you can't afford it, buy an acoustic coupler (unless you have a Transphone, in which case you will have to get the plug). Go to step 6.

5 As they're cheap these days (£26 instead of £150+), price less, but it is best a direct coupler (ie 'hard wired') modem, like the Dumbone.

6 Get the correct type of modem driver to match 500/300 baud, CCITT (V.21, synchronous, full duplex, requires a card to communicate with bulletin boards and on-line databases), or 1200/75 baud (synchronous), CCITT (V.22) asynchronous, full duplex, requires a card to communicate with Prodig and Muxnet and a few on-line databases.

It is useful but unnecessary to have options for stereo/teletext and full duplex.

7 Check you have communications software. If not, see Microware (page 144) for examples that will run on popular systems. If you have a problem finding the right program go to step 8. Else step 9.

8 Contact the supplier of the modem to find out what software's available, armed with the specifications given below, if no luck contact your user group, if one has contact us.

9 The software must support the local rates used by your modem (check option step 6). If you are simply wanting to chat with the board, find out what rates you've got and place orders then go to step 11, else if you want to download files (including program listings), then go to 12.

10 Your software must sup-

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

We recommend that you get software that supports the Christensen (also known as 'Prodig') protocols, which is supported by CABB. These aren't necessary if you only intend to download straight text (ANSI/O files, in which case go to 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 downloading files.

13 Three Computer Answer Bulletin Board (CABB) on 1200 baud 50/75 (24 hour service).  
By Tony Dennis, deputy editor.



## BULLETIN



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'Bulletin' information continues on page 144.

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Apple II (s. 11)	RS232C interface card	£120	Apple dealers
Atari 400/500 600/800 (s)	RS interface	£120	Atari dealers
Commodore Vic 40	RS232C interface	£25	Minor-Minister, PO Box 41 Spawley's Hill Tel: 0475 33324 Commodore dealers
48 only	Modem/RS232	£25	
Dragon 10, 44	RS232C interface	£47.50	Dragon Computers, 4 Middle Row Chipping Norton Oxfordshire
Lyons	Hardware modification		See next issue 1
Oric/Atom		£31.50	Major/Comcast Partnership, 12 High Street Chesham Westmore 144 57 Tel: 04753 84443
Tandy 100-40/50	RS232C board	£27.50	Tandy dealers
Texas Instruments	Expansion box + RS232	£24	Perkin Elmer, 4 Central Place, New Street Hove, Devon TQ14 8EJ Tel: 0408 44423
ZX 81	Unshielded modem adaptor	£27.15	Microcomputer Resources, 11 Branch Road Park Street Village 21 Alms, Harp Tel: 02737 0917
ZX Spectrum	MicroAlpine interface 1+ software	£20.00	J W F Software, 127 Alington Drive Stroud, Glos



Spectrum 486  
Oric 10-176  
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Spectrum 16-686  
Oric 10-486  
Commodore 64, Atari



Spectrum 16-486



Oric 486



Oric 10-686

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## PREVIEW

**SPECTRAVIDEO CARTRIDGE PROGRAMS FOR MSX**

MSX, the standard has been working competing that should mean users being able to swap programs and cartridge, in order to meet the demand of becoming desktop. As revealed in the January issue of Computer Avenue, Spectravideo's so-called MSX 218 and 219 machines aren't MSX. They differ in a number of important respects, not least of which is the Spectravideo MSX cartridge slot, which won't accommodate MSX cartridges.

Some differences in the basic are also emerging. Only three of the base MSX graphics modes are available on the 218, and there are fewer file options (for example, on the 219 you can't read the entire contents of a file, which you can under MSX Basic).

The original claim that the Spectravideo range is MSX compatible was free Spectravideo song Sanyo and is believed to have copied Microsoft, which developed the standard for Japanese micro users. However, to be fair to Spectravideo, it was a prototype hardware implementation of MSX while 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 Compulink claims that the 218 and 219 are '95 per cent' MSX compatible, a strange claim given that compatibility doesn't exist in degrees, something either is or isn't compatible. An adapter, bridging the 218 and 219 up to full compatibility, is due for launch imminently, at an expected price of over £40, and we now hear that a Mark II version of the 218 is due for launch within the next three weeks, which will be a proper MSX machine. The company is also planning two expansion units, designated 445 and 445A, complete with disk drives.

Though Spectravideo users are happy with their machines we gave the 218 our thumbs up in our review published in the January issue, they will no doubt be annoyed when the Jay MSX micros finally arrive and they find that all the accompanying cartridge software refuses to fit in the Spectravideo cartridge slot.

**MSX NOW FOR THE 8088, AND DACAL FOR THE COMMODORE**

A couple of new releases suggested in a month or so are an updated base MSX microprocessor chip for the MSX, 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 Basic versions 64's Pet Basic, which makes it one of the slowest micro bases around.

**MSX20'S NEW STEP TO MICROPC LISA**

One of the least known computers, despite very impressive specifications, is the MSX20 6801, a successor of the Apple Lisa. So potentially for MSX, the computer is over-capable going head to head with 'top spec'ers in this case. MSX20 has obviously thought that step-down is in most cases more important than computing power, and will be releasing a cut-down version of Step as a competitor for Lisa. What would be more impressive, though, would be a second-drive, high-resolution computer for the Apple Macintosh. It's about time MSX20 became better known, and benefited more from the success and of the micro market.

**MOTOROLA'S GRAPHIC CHIP, MARK II QLT**

Here in the British countryside, the chip maker Motorola is working on a range of powerful new semi-conductor products, primarily including a 386 Synapse MSX chip, the 68888 series of processors, and a new graphics processor. The graphics processor is only compatible with a few central processors, in particular the 68010 Motorola 8-bit processor, as used in the Spectrum and MSX20 (interestingly only found inside the 64, if you can find a Q1). However, few new machines, if any, are being launched with the 68010 (which has only been superseded by the 68888 series, which leaves the 68010 as the graphics processor most likely to be). Interesting, because Sinclair has probably looked up the supply of 68010'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 QLT? Whatever is due eventually appear, we can look forward to high resolution screens at about £80 by MSX 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 1983).



**S**inclair has done it again—in fact, a little as if he has. But quantum leap or not, the Sinclair QL is likely to prove to be another bestseller.

With the machine's technical specifications it should be very capable—well, perhaps the Microdrive being the weak link. Even without a current machine, we found we could stuff out a few other details about what a single bit bit power is.

The main processor is a Motorola 6800 running at 7.5MHz. The 6800 has a number of 16-bit registers, and is capable of 16-bit arithmetic, but the data bus is only 8-bits wide, which will slow things down a bit. The 6800 series of chips has proved to be very popular with programmers, largely because 16-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 organized into four 128K-bit chunks. Only the first 128K 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 128K ROM contains a new operating system, called QDOS, and a Basic Interpreter for what Sinclair call a reduced subset of Spectrum Basic, called SuperBasic.

QDOS is capable of multitasking (so to be confused with multi-task), so it can run a large number of programs apparently simultaneously.

The system can be divided into registers of various sizes, each module 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 program 'apparently' can simultaneously, because of course the processor is only capable of working on one at a time. What happens on one at a time? Well, happen not work 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 GUY WE SCRIBBLED SINCLAIR'S GREATEST RELEASE**

general strategy, such as 'shortest program first' or even 'largest program first'.

Whatever the strategy Sinclair uses, a number of important questions are raised. Multitasking is often used to mean 'work', but when a program is not being worked on it is available and (with the current state of its data) is (typically) very far from work. This allows many more programs to be worked on than the size of the processor memory. Sinclair's Microdrive (recently built into the QL) has been 'enhanced', so that their average access time is around 1/1000th, but this is obviously not true to most programs on and out. So all programs are held constant in RAM.

SuperBasic is similar to 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 system facilities are accessible from it. Fig. 2 shows some examples of some of the commands available in SuperBasic. SuperBasic also turns to the front end of the operating system the user accesses the facilities of the operating system using Basic commands. So, like many other cases, 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

40 columns, but the TV's this can be adapted to either 40 or 48 columns. The full mapped screen area will take up 512K of the 128K user RAM.

The sound capabilities is quite more advanced than the Spectrum—high beep-beep, as opposed to four-beep 'half' and.

The keyboard is in fact the Sinclair's proper 60-key QWERTY job, complete with a full space bar and five function keys. Its quality is nothing to get too excited about, but it does appear sturdy and has to be 16-line data width. The single keyboard entry system of the Spectrum has also been dropped—something which we welcome (though we have heard a few slight grumbles from some early Spectrum users).

Progressive 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 a different physical process to 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. Similarly, the QDOS-based Spectrum Microdrives, and their tapes, it would be possible to interface (and hence create 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 transferring Spectrum programs, they won't work) in a standard 1200 baud.

As interesting commentary comes round the use of a second processor, an Intel 8088, to control (among other things) the processing of data on the 8087C ports. The transferring 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 1-

**P RELIABILITY HOWLS OUT: THE QL IS A WARRIOR. IT IS WELL LIKELY TO SPAWN AN INDUSTRY SIMILAR TO THE SPECTRUM'S.**

## QL SPECIFICATIONS

Price £299 inc V.A.T.

Processor Motorola 6800

Memory 128K ROM (QDOS and SuperBasic), 4K 1/2, 128K user RAM, upgrade feeble to 640K user RAM.

Keyboard 60 full keys, including five function keys, no single key/multifunction.

Interfacings RS232C serial, two parallel, VAX and 8088 (you'll find it useful), hard disk (Firmware), LAN (local area network).

Disk drive 14400 microdrives (1 600 each), access time 1/2 sec on average.

Display 40x48 or 80x25 lines of text—512 x 256 pixels, 4 colours, 256 x 256 pixels, 8 colours.

Language(s) SuperBasic (ROM), Basic (Software), Advanced.

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

QL  
 MICRODRIVE  
 EXPANSION

32K ROM for

Basic and Operating system

32K cartridge

64K RAM I/O functions

128K user RAM

256K expansion RAM

256K expansion RAM

256K expansion for any

other purpose via

standard Eurocard I/O

ASCII ports, no console switches, can take an external Microdrive, one or two sockets, and a parallel port is planned as an optional extra. Four software packages (an interpreter, written by Pascal, come with the machine; there are a word-processor (called QL-Word), a database (Analyze), a graphics package (Draw), 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 Pascal took as has been applied to all the packages: a "do and see", that is, preview and something happens. Another principle, called "pre-rendered" drawings, is more easily described as references in the graphics package (this is a business graphics package for drawing pie charts and so on—no drawing package).

The idea is that the user can draw the package or whatever and they wish, for example, they can simply use the pre-rendered charts and colours available, or they can draw a bit simpler and change the colours, or deeper and change the

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

As the concentration of the software we should point out that no data from anything that you can't get elsewhere on other machines, but then again Pascal has a good reputation for quality and so this software is included in the initial price, all things considered you get a lot for your cash.

Other software companies here, as you would expect, show great interest in supplying programs for the QL, but there seems to be one fairly common griumble, the Microdrive. Puggly disks are, in most cases, sufficiently fast to be able to cope without interfering the user.

However, the Microdrive companies are not all good or Puggly. One possible solution would be to get hold of one of Sinclair's hard disks (when they appear), but in the price of this has been around £1,000 this may not excite too many people.

Admitted possible, and more

likely, solution would be to use some of the QL's large memory as a kind of RAM disk. This could probably be done about 30K on the unexpanded machine or upwards of 120K on the fully expanded version, 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 Microdrive.

Another griumble of the software houses is that Microdrive cartridges can only be bought from Sinclair, so you can't compare 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 blank silicon chips etched onto a ceramic board), but are made simply by making the chips directly onto the PCB (that is, on the circuit board). This makes them much cheaper to produce, except, apparently, in Siliconix independent companies will find it very difficult to produce ROM cartridges that can compete in price with Sinclair's ones. This is the case for the Spectrum.

As with the Spectrum, it



1. EUROCARD I/O
2. 256K PROGRAMME MEMORY
3. 32K USER MEMORY
4. MICRODRIVE
5. MICRODRIVE
6. MICRODRIVE
7. MICRODRIVE

seems a little more expensive will be required than software and hardware companies, then it perhaps necessary for most other users.

As the press launch of the machine, Sinclair was very close to covering any one discussion as to the QL's suitability for games. This is probably because they hope that the machine will appeal to business, universities, schools and libraries (an IBM interface is planned), as well as the hundreds of school games played. They may well hope it will be all things to all men.

Whatever the outcome the QL has its own character (Microdrive or otherwise), and are very unlikely to prevent the QL becoming another big winner. It simply has, as all Sinclair computers have had in the past, to be the money. By Dr Peter Furber, Institutional editor of Computer Business.



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880, 920, 960, 1000, 1040, 1080, 1120,  
1160, 1200, 1240, 1280, 1320, 1360,  
1400, 1440, 1480, 1520, 1560, 1600,  
1640, 1680, 1720, 1760, 1800, 1840,  
1880, 1920, 1960, 2000, 2040, 2080,  
2120, 2160, 2200, 2240, 2280, 2320,  
2360, 2400, 2440, 2480, 2520, 2560,  
2600, 2640, 2680, 2720, 2760, 2800,  
2840, 2880, 2920, 2960, 3000, 3040,  
3080, 3120, 3160, 3200, 3240, 3280,  
3320, 3360, 3400, 3440, 3480, 3520,  
3560, 3600, 3640, 3680, 3720, 3760,  
3800, 3840, 3880, 3920, 3960, 4000,  
4040, 4080, 4120, 4160, 4200, 4240,  
4280, 4320, 4360, 4400, 4440, 4480,  
4520, 4560, 4600, 4640, 4680, 4720,  
4760, 4800, 4840, 4880, 4920, 4960,  
5000, 5040, 5080, 5120, 5160, 5200,  
5240, 5280, 5320, 5360, 5400, 5440,  
5480, 5520, 5560, 5600, 5640, 5680,  
5720, 5760, 5800, 5840, 5880, 5920,  
5960, 6000, 6040, 6080, 6120, 6160,  
6200, 6240, 6280, 6320, 6360, 6400,  
6440, 6480, 6520, 6560, 6600, 6640,  
6680, 6720, 6760, 6800, 6840, 6880,  
6920, 6960, 7000, 7040, 7080, 7120,  
7160, 7200, 7240, 7280, 7320, 7360,  
7400, 7440, 7480, 7520, 7560, 7600,  
7640, 7680, 7720, 7760, 7800, 7840,  
7880, 7920, 7960, 8000, 8040, 8080,  
8120, 8160, 8200, 8240, 8280, 8320,  
8360, 8400, 8440, 8480, 8520, 8560,  
8600, 8640, 8680, 8720, 8760, 8800,  
8840, 8880, 8920, 8960, 9000, 9040,  
9080, 9120, 9160, 9200, 9240, 9280,  
9320, 9360, 9400, 9440, 9480, 9520,  
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APRIL 1984

Mag Number 112

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COMPUTER ANSWERS

## UPGRADE

**W**ith 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 is worth showing some respect called Macintosh. It is a considerably cut-down version of the revolutionary Lisa machine (it cuts the same 68000 processor), and takes up as much desk-top space (despite its keyboard exception) as a piece of Apple pie.

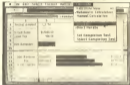
Macintosh fully exploits the advantages of mouse technology, featuring pull-down menus, icons, and graphics of software commands and program data, and a superbly-designed display. What makes it particularly impressive is its price. Macintosh plus printer and basic software is currently selling in the US for around \$1000. On its release in the UK as Agent, it is expected to cost only £1,700.

It weighs 22lb, can be easily carried around in a canvas hold-all, and features a built-in 9 inch square, black-and-white monitor, an integral 5 $\frac{1}{4}$  inch floppy disk drive (with a 400K capacity), and a detachable keyboard and mouse. Apple's adoption of the tiny drive should go a long way towards having them confirmed as an industry standard.

The machine boasts 128K memory made up of 128K RAM and 64K ROM. The ROM, which contains the user interface, toolbar, operating system and facilities of 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 by Macintosh's own software. That is a crucial feature of the Mac: developers are able to use the ROM's software structure to integrate their programs into the machine's menu, mouse and icon-driven environment.

As with the Lisa, the Macintosh option on a completely different principle to normal mouse. Rather than playing around with technological gizmos and drive alternatives,

# 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, as 'icons' in Appleese, on the screen. By pointing at these, using a cursor controlled 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 wrench and file.

Using the mouse, you can drag icons around, store them, organize your screen into 'desk top' and 'pull down menus'. There's visually exciting 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 is under total software control. (In fact, you can't even

use.) This means you can only access the disk when Mac's good and ready to give it to you. That is, at any well (it even increases disk swapping overheads, like backing up), but the user is probably losing control of the hardware—a fairly serious development.

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

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 the package for Macintosh, including the Word word pro-

cessing program for £100 and its spreadsheet package (also retailing £100). Other major names involved include the Software Publishing Company and Fontware. Apple says that by the end of this year at least 12 word processing programs will be available for the machine.

In an unusual department, 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 Effect technology' included in both Macintosh and the new-old Lisa will become an industry standard, perhaps. Bentley has confirmed this with the launch of the 68000-based QL.

That Apple might have got its name right is bolstered by its handling other manufacturers such as ACT, which has copied a memory access device to Ultra Series cards and, more recently, with the portable Agents machine. The Agents come about the same as a Macintosh, and also use only 5 $\frac{1}{4}$  inch floppy-disk drives.

However, the Mac has only one drive at standard, and these users will not notice.

Apple claims to have provided a machine that anyone can use. Many people don't get a damn about whether or not a computer has 128K RAM or whether protected that they can get it in the form of graphic representations or whatever tasks, and Nigel Holmes, one of Apple UK's Macintosh sales.

Macintosh is supplied as a box—unlike its Apple predecessors which were and are supplied as several components. Available extra-optional ImageWriter, a 128 pin dot matrix printer which is currently the only printer that will work with Macintosh, a carrying case, security kit—for locking Macintosh and keyboard to a desk or table, a manual keypad, a mouse, and an external disk drive.

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

Apple software available to launch includes MacPaint, MacDraw, MacDrawPlus, MacDraw II, MacDraw III, MacDraw IV, MacDraw V, MacDraw VI, MacDraw VII, MacDraw VIII, MacDraw IX, MacDraw X, MacDraw XI, MacDraw XII, MacDraw XIII, MacDraw XIV, MacDraw XV, MacDraw XVI, MacDraw XVII, MacDraw XVIII, MacDraw XIX, MacDraw XX, MacDraw XXI, MacDraw XXII, MacDraw XXIII, MacDraw XXIV, MacDraw XXV, MacDraw XXVI, MacDraw XXVII, MacDraw XXVIII, MacDraw XXIX, MacDraw XXX, MacDraw XXXI, MacDraw XXXII, MacDraw XXXIII, MacDraw XXXIV, MacDraw XXXV, MacDraw XXXVI, MacDraw XXXVII, MacDraw XXXVIII, MacDraw XXXIX, MacDraw XL.

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# DECIDING DISK DRIVES

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



5 1/4" External's Epte Drive 500 (also sells other BBC and Cricle users a 3 inch disk drive, power supply for two drives, and a Super 4100 or partly on the all track version (see page 118)

**A** person 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 update or program.

There is also the added bonus of not having masses of leads lying around to trip over during hours of work to be lost—the basis of many computer woes. But if you want to run disks with your machine, how do you go about it, and what hardware, other than the disk 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 division line between controller, DOS and interface is becoming thinner, even disappearing. Except for the BBC, most computers package the interface, controller and DOS on one box.

The interface can be all the chips that make the connection between users and disk drives, or the actual physical connection joining computer and drive. There is an industry standard connector for 5 1/4" 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 many different controllers available on the market for different reasons.

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 separate floppy.

When looking for a disk drive for your micro, there are various aspects of design 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 manufacturers 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 8201 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 Open Supplies manufactures a double density DOS. One advantage that allows even single density operation.

Many drives will refer to tracks, which are the circular strips of magnetic material on which the data is laid out. Most drives will have 40 (40 tracks per inch) or 48 (48 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 it is in the DOS. Some systems, such as those from Farni Peripherals and Watford Electronics, can read 40 track disks on an 48 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 reinserted. 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 on either side or merely refer to it as another drive.

Finally the controller: most machines today use what is termed the Sanyo standard, the SA800 is particularly nice as one of the most widely used controllers, and many on the form of a 74 way pin connector. The BBC was one and so too is most forms of the disk interface that we looked at last (Fig 2). Two machines that do not use it, however, are the Commodore (which use IEEE) and the Atari (accessing through an RS232). There are the two drives available for these micro-machines.

## BBC

The BBC, even at its high price, does not contain the chips necessary to control a disk drive, though all the essential 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 done later or later. With more than five, made on the board have to be cut. This is a job best left to an experienced Acorn driver. (The rear number of the board is printed on the middle left of the PCB.)

In all, there are two small logic chips to be fitted and a larger one (labelled 8201), 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 logic chip are several again sockets for users to fit their own chips—the DIPS also use one of these. When fitting chips into the BBC board remember that each one must be orientated the same way, that is with the notch always to 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 Desk to Desk, but the same does not apply to the Desk's DMS, called the Desk 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 Accessory Dec 71 issue) and Farni-Peripherals. Both the alternative DFSes 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 files to be in the catalogue.

Most machine machines use the "bugger" standard — one of the most widely-used interfaces.

Where the user might find a drawback is the hassle of having the various cards or 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 1K. It also consists of the software in the DFS-ROM and offers the option of installing any type programs on disks—a very useful feature that Acorn no-disk computers lack.

The third DFS from Pacifisoft is part of a complete system that can be bought as a single disk or part of an upgrade that includes a search for the keyboard code. As with the Watford DFS, it is possible to have more files than the Acorn DFS with longer file names (7 characters plus 1) and DFS bytes of RAM as well, and it formats disks in both 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 needs to be used for clockwork. Virtually any 5 1/4 disk (such as Comant, TRAC, Hitachi—see Fig. 7) can be used with the BBC because of the standard 14 pin drive connector on at least. In most cases the drive will have a separate lead disk, rather than going into a pin connector, goes directly to the disk's power supply, getting its power from the source. Acorn has taken the care 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, you 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 disk's.

There are no many drives on the market for the BBC that is available from all would take up the too much space, where will only look at those with a more unusual case. One of the newest, and smallest, drives to hit the BBC is the Micro Disk Drive (MDD-1) £115 (see V&T). As a space saver the MDD-1 is a winner. The drive uses small 3 inch disks and the whole system can be set on top of the both without any fear of disturbing the machine. Each disk has a capacity of 180K on the inside and can store up to 64 files. This means a new DFS is required which Directcopy, one of the first distributors of the drive, will exchange for the Acorn DFS at a cost of £13. This doesn't mean the Acorn DFS can't be used, because the DFS

can read both the Acorn format and the Directcopy, as the only necessary is the ROM.

The only other with other types of drive is an important item's worth the effort buying a drive is general with the disk (the "floppy") for any problem because the disk, however it is made, the 8071, is a worthwhile investment and is compatible with high-resolution 350K disks.

One of the most unique applications for the BBC have seen over the past few months is the introduction of the low cost Borg Drive 1000 from I.T.L. Kestrel. The system offers the user a complete system that includes a 3 inch disk drive power supply for two drives, 24 way straight through cable, and a system called Zap. It also features a comparatively large capacity 41K on the 40 track version, costing £205-48 (see V&T).

Zap is a unique system that fits inside the BBC and gives the user such facilities as FORMAT and MONITOR. There is also talk of an Assembler and Monitor being given with the package but at the time of writing I.T.L. Kestrel 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 180K utility disk, cable and manual. As with the other drives mentioned, Micro Pulse is compatible with a 14 pin disk system and has a built in write protect function. With a utility that Northern Computers calls the Micro Pulse Monitor system, the user can initialize software from cassette or 5 1/4 disk onto a 3 inch one. The total package costs at £188.00 (see V&T).

## SPECTRUM

When we started looking for a disk interface for the Spectrum, the likelihood of finding one seemed slim as hoped in opening Lead Lines at 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 £69.95 and an interface £29.95 (if purchased with the Microdrive). From our findings that cost £4.95 a piece, each giving around 180K 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

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Tel: (0430) 880121  
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Hampshire PO14 0JW  
Tel: (00329) 230470  
ITL Kestrel,  
The Old Coachhouse,  
New Road, Chesham,  
Kent MK8 8QJ  
Tel: (0634) 813464  
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83F Holloway Road,  
London N19 3JL  
Tel: (01) 392 6232/  
6298  
Open Supplies,  
138 Cambridge Road,  
London SE5 0BB  
Tel: (01) 791 8668  
Preston Microsystems,  
228 Croydon Road,  
Ainstley,  
Leeds LS2 7YH  
Tel: (01) 429 2131/228  
1762  
(Continued on page 14.)

Drive	Price (£000)	Capacity	40 Tracks	80 Tracks	5 1/4 Disk/5 Density	Price	Supplier
MDD-1	2	180	yes	no	no/yes	128.00	Directcopy
DFSC	5.20	180	yes	no	no/yes	170.00	Photo Imaging Centre
Open 1000	5.20	180	yes	yes	no/yes	194.00	Cambridge Kestrel
Open Micro 1000	3	180	yes	yes	no/yes	192.00	ITL Kestrel Ltd
Comant CC480	5.20	180	yes	no	no/yes	176.00	Comant
Trac 40	5.5	180	no	yes	no/yes	211.00	Comant
Comant CC180	5.20	180	yes	no	no/yes	171.00	Comant
Microdisk Drive 1000	4.20	180	yes	no	no/yes	228.00	Microdrive
Open 1000	3	180	yes	no	no/yes	228.00	Open Supplies
Control Data 1000	5.20	180	yes	no	no/yes	190.00	Microdrive
Comant CC180	5.20	180	no	yes	no/yes	188.00	Comant
Control Data 1000	5.20	180	yes	no	no/yes	202.00	Comant
Control Data 1000	5.20	180	yes	no	no/yes	270.00	Microdrive
Comant CC180	5.20	180	no	yes	no/yes	170.00	Comant
Comant CC480	5.20	180	no	yes	no/yes	211.00	Comant
Control Data 1000	5.20	180	yes	no	no/yes	218.00	Microdrive
Control Data 1000	5.20	180	no	yes	no/yes	208.00	Microdrive

Note: The bracketed drives are due to be available in April.  
See 12 (1984) for more information about the Microdisk Drive, Photo Imaging Centre, Microdrive and ITL.

All these disk drives use the standard 14 pin interface.

# UPGRADE

## INTERFAC AND Disk Interfaces

### Acorn Computers

Water Road,  
Cambridge CB1 4RN

Tel: 032231 34000

### Advanced Memory Systems

Green Lane,  
Aylesbury

Warrington WA4 5PD

Tel: 09253 6268 2/  
629007

### Commodore Business Machines (UK)

675 Ajax Avenue,  
Teddington, Surrey

Tel: 0181 871 1400

Tel: 02752 77929

### Cybernetics

Five Trading Points,  
Broad Street,  
Gloucester

Surrey GU2 3HR

Tel: 02462 4031 20

### Digital Data

Early Industry of Finch,  
Milton, Port Talbot

West Gloucester,  
Wolke SA1 3 2PL

Tel: 02920 746706

### Haystack France

40 Bd de la Fayette,  
75008 Paris

France

Tel: (1) 254 84 44

### Interactive Instruments

Unit 6, Pilot House,  
King Street,  
Leicester

Tel: 05332 851194

10, Kestwell,

The Old Countess,  
New Road, Chalfont,  
Kent HA4 4QL

Tel: (0634) 813464

### Masses Peripherals

Dept MP,  
172B King's Road,  
Reading, Berks RG1 4EJ

Tel: (0234) 384238

### Oric International

Concorde Park,  
London Road, Ascot

Bucks SL5 7TS

Tel: 09942 27661

### Phase Disk Systems

93 New Cross Street,  
Bristolford RG5 8RS

Tel: (0274) 729306

### Peripheral Solutions

Uniten House,  
Wilford Road,  
Aldford

Worcestershire

Tel: 081 48411

after another across the board between the interface as it had to be really on the tape, so the control panels have to be made before the data's found (see Computer Users' Digest 1984)

Technology Research, a small London company, has not been caught 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 14-way interface on its rear for connection to a 5 1/4" floppy disk drive. The Disk Operating System (DOS) and utilities are contained in a single 48 KEPROM 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's the price: the FDC-1 with software disk but no disk drive costs £24.50 (inc VAT incl p/p), and a second version that also has a Spectrum interface on it costs £26.75 (inc VAT incl 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 law. 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 its EPROM. To do this, Peripheral Solutions would have had to almost duplicate Sinclair's ROM and put them one at one 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 1541S ROM. It won't get too complex yet - it appears that when the interface is completed, it will not be sold as a separate unit but with a disk drive. The final cost of which could be somewhere around £200.

Two other companies that offer, at least to offer, disk interfaces for the Spectrum are Interactive Instruments and Masses Peripherals. Interactive Instruments has already launched its system, which comes complete with a 1MB Shugart drive. Masses, however, had not launched its system at the time of writing, but from the pre-production based the specifications look very impressive, double density floppy disk interface, one or more 5 1/4" drives, online SP-DOS manual, DOS on a diskette, Master file database program, formatted word processor and Commodore spreadsheet package. There was no

protection, but it should be around £200.

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 steps in selling a disk drive at the present time that is unaccomplished by a company called Yarnout. The Yarnout system is a rather complex affair, a large black metal box containing the controller and the interface 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 1/4" one and costs 100K. However, the price is high at £295, being nearly three times the price of the Spectrum store sale!

A cheaper solution could be the Rye Drive (mentioned in the BBC account), as IFL hopes to have a Spectrum version ready later in the year. This will differ from the Rye 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 screen.

Another drive for the Spectrum comes from across the Channel - or at least it is supposed to. The Cybernet disk drive offers, according to the advertisement, a 5 inch drive that can store 700K on a single floppy disk. What makes the Cybernet so interesting is its ability to protect not files but almost any machine using what Haystack, the manufacturer, calls its personality module and system software. At the moment the Cybernet 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 the drive exists, and if it is a big one of the French imagination.

## ORIC

Drive for the Oric can soon disappear on the ground that there for the Spectrum. The Rye Drive 500 for the Oric is not for sale at the only real choice for the user of the machine.

Because the Oric does not have a screen disk interface, IFL, Kestwell, in conjunction with Tyrel Systems has developed a 'Hybrid' Cable. At one end of the cable is a small platinium head mounted on a 14-way IDC connector. To the other is all the necessary to control a disk system. This includes a ULA, 8K ROM with all trigonometric tables, disk controller chip for use with single and double density disks

Machine	Interface/ controller	Price	Price (incl. delivery)	Supplier
STARD	OSM44 OS10 OS10 OS10	129.00	139.00 139.00 175.00	Comarc British Microsystems Seagat Data
Oric	Cybertek Cybertek online 1MB Oric		159.00 175.00 199.00	Haystack IPL Kestwell Oric
Spectrum	Spectrum disk system TDC-1 TDC-1 (MSD) Yarnout	95.00	114.45 149.00 81.00 83.75	Interactive Instruments Masses Peripherals Technology Research Technology Research Spectrum Centre
BBC	Harford DFD Amos DFD Mass/Amos DFD BBC 14	185.00 181.00 185.00	215.00	Harford Electronics Amos Mass
Commodore 128			215.00	Commodore

(\* note that the BBC system requires the InterFace and Active DFD ROM)



and delay their own installation, or more more drives. The total package includes one Beta Drive 500, Hybrid Cache DMS, Disk, User's Manual and special power supply with main connector. Back 3 inch disk gives the user 40MB of storage space on a 40 track version and 80MB on the 80 track. The cost of the 40 track version is £280 (incl. VAT).

One is not just standing by and watching the disk market when every firm... that should have its own drive set by the time you read this article. These will be on the form of a 3 inch MiniDisk drive giving 20MB per disk (40MB per side). All the internal capacity will be inside the drive, as well as an onboard power supply, so the user's own supply isn'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 coming under £200 (incl. computer or ITLE).

Finally the chosen Ezybox. Again, when referring to the user's drive case it is hard as it is supposed to also be for this machine, we shall see.

### COMMODORE 64/ VIC 20

The Commodore 64 and VIC 20 are one of the most sophisticated machines on the market, and it was these in disk copy for both machines. Therefore it is a natural right for the user/Commodore to make 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 on the micro or a separate control box. The 1541 single drive and from Commodore can be used with both the 64 and VIC 20. As £215 the Commodore is a little expensive, especially as the storage capacity of the 40 track, double density drive is only 199K bytes.

### DRAGON 32/64

Again, one of the Dragon series are fairly limited in choice as how many disk drives are available for their micro, but the ones that are around are at a price of 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 secondary port. The box containing the disk controller circuitry is the size of a large cartridge and the disk drive itself is not massive, but very reliable. The disks used on the 320 Dragon Data drives are single sided and double density, giving a storage capacity of 179K.

Commodore, one of the best known names in disk drive suppliers also offers a solution for the Dragon. Commodore supplies both 40 track disk drives starting at £185 (incl. VAT). The 40 track single-sided disk has a storage capacity of 199K, unfortunately, with the 80 track giving 500K per side. As Commodore is only a supplier, the controller interface card with the drives is supplied by Premier Microsystems.

Whereas Commodore only sells the whole package, Premier Microsystems will sell the controller card on its own. The Delta system, as it is called, consists of the Delta DMS, user manual and documentation disks (£120). Only 1K of user RAM is taken up by Delta as everything is held in an EPROM. If the Dragon 32 user wants a reasonable demonstration then Premier Microsystems will supply them as an EPROM to fit inside the DMS. TA user, however, costs £20.95.

By Steve Applebaum, staff writer

A 40-track drive and drive interface supplies given on pages 12, 14 and above left. We have tried to make the list as comprehensive as possible.

**Premier Microsystems,**  
208 Croydon Road,  
Anerley,  
London SE20 7PL  
Tel: 031-829 7131

**Spectra,**  
Sonic Beta & Micro  
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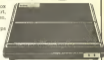


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# How many micro you try before All of

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you'll need to ask your-  
self 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 team 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 salesman  
you're likely to encounter

First thing 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 infor-  
mation 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 the one you buy one? of them.

on floppy disks. The normal 5¼" 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 Atan 800XL.

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 massed software available.

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

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## Commodore 64

And if you think trying all the micros in Laskeys 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:

**LASKEYS**

Acorn Electron

Atan 800 XL

Apple IIe



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4	THE WIZARD	9	THE WIZARD	10
5	THE WIZARD	10	THE WIZARD	10

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Warrior (Micrograff), Shadow (Image), Omega Run  
(SRL), Cyber Pilot (Digital), Demonic Destruction  
(Image)

TOP		COMMODORE 64	TEN	
1	THE WIZARD	6	THE WIZARD	10
2	THE WIZARD	7	THE WIZARD	10
3	THE WIZARD	8	THE WIZARD	10
4	THE WIZARD	9	THE WIZARD	10
5	THE WIZARD	10	THE WIZARD	10

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Process), Rich Of (Bubblebus), Super Pipeline (Taskart),  
Quick Thinking (Microsoft)

TOP		ATARI	TEN	
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2	THE WIZARD	7	THE WIZARD	10
3	THE WIZARD	8	THE WIZARD	10
4	THE WIZARD	9	THE WIZARD	10
5	THE WIZARD	10	THE WIZARD	10

TOP		VIC 20	TEN	
1	THE WIZARD	6	THE WIZARD	10
2	THE WIZARD	7	THE WIZARD	10
3	THE WIZARD	8	THE WIZARD	10
4	THE WIZARD	9	THE WIZARD	10
5	THE WIZARD	10	THE WIZARD	10

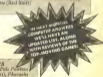
#### FAST MOVERS

Master (Linnsoft), Attack (And/Gen), Goshawk  
(Linnsoft)

TOP		BBC	TEN	
1	THE WIZARD	6	THE WIZARD	10
2	THE WIZARD	7	THE WIZARD	10
3	THE WIZARD	8	THE WIZARD	10
4	THE WIZARD	9	THE WIZARD	10
5	THE WIZARD	10	THE WIZARD	10

#### FAST MOVERS

City Deface (Bug Byte), Polar Dr. Frost (Program Power),  
Mr. Ace (Microsoft), Smacker (Waves), Saturn Baby  
(Prest), Apocalypse (Red Staff)



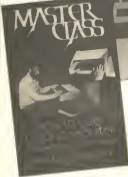
#### FAST MOVERS

Dig Dig (Atari), Polo Position  
(Atari), Gun (Atari), Phoenix  
Pyramid (Master Control), Zax  
111 (Infocom), Escape from  
Polaris 2 (Infocom), Krusty  
Kraut (English)

# PROGRAMMING THE EASY WAY?

**T**heir six-step "all-in-one" lecture-to-programming books, on the market, first looking very appealing to the beginner. Working through a terse, typewritten tome of another is off-putting to many new video owners, even the casual Users Guide can seem bewildering to the novice.

Realizing that 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, called *Microclass*, comprises nine cassettes in all, and covers the Spectrum, BBC and Electron machines. The new BBC cassette deals with Basic on the Beeb, and covers such aspects as program organization, data



input and output, processing statements, and so on - covering all to assist operators, using manipulation, graphics techniques and user-defined graphics characters in the advanced language.

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 (showing the Logo Language

and Turtle), and another dealing with BBC games and graphics combinations.

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

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

Their respective narrators are introduced by one David Reddick, who comes to the *Microclass* after over 15 years of programming and video training experience. During the tapes Reddick sets before his BBC or Spectrum and takes the pupil-viewer through a representative program, running a 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 title screen, while the reader knows where it was created is explained below.

The cassettes 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 attempt. The great advantage of this kind of teach-

ing technique is that the exercises is displayed on screen exactly as it would appear on your own machine, so understanding how the underlying process works is much less abstracted than printed and text in a coursebook/manual.

This was emphasized by the fact that Reddick seemed to draw much of his material from the respective Users Guide, and made it markedly clearer, however, the videos don't exploit the medium perhaps as well as they could, and evince a slightly stuffy "Open University" feel in them - but this, at best, leaves nothing to detract from the excellent information (apart from Reddick's rather glibly chosen cassette).

As a wholly laudable example to the principles of computing, *Microclass* is quite different. If the £15.95 price tag bothers you, the *Microclass* 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 game programs which can be loaded into your micro directly from the video soundtrack although nothing exceptional, these games do provide a useful insight into the intricacies of Basic programming.

**By Jim Heyes, sub-editor on Computer Abstracts.**

The Microclass series (each priced £12.95 inc. VAT) includes:

- Starting Basic with the BBC Microcomputer (M and D)
  - Start to Program with the Electron\*
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  - The BBC Microcomputer in Primary Education\*
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# WAR FOR THOUGHT

WE LOOK AT SOME COMPUTER WAR GAMES THAT RELY MORE ON  
CONTEMPORARY THAN ON STICK-BATTLING FOR EFFECT.

**M**ost of the computer war games that have appeared since the paralytic virus have been in the "stealthier" or "hard-to-spot" genre—ones that give you key-in-command control—in it is like a breath of fresh air when a game such as *Apocalypse* (for the IBM Spectrum and BMC II), that is both exciting and thought-provoking, arrives.

*Apocalypse*, from Red Shift, is a real software/war game company, it has a game of tactical destruction like so many others, but rather one of tactics and strategy—involves keeping track of three than *Defense*. In fact, in this game the aim is to avoid assassination by not using nuclear weapons.

The plotline remains *Apocalypse* over much to its older brother. Like so many tactical war games, it is based on the domination of areas of land, where defending them against the enemy—whatever they may be. Along with the original theme, the "new" game also contains a lot of the complexity associated with such war games. However, over the book of rules has been read and understood, the player can leap into battles of these parts, as though into the future and divide the fate of the world (available until the building is destroyed).

The game itself begins (after a long time loading) with the player being asked to select a map from a choice of Europe, Russia, London or the Caribbean. Whatever the choice, you then start over the scenario from the main program and load the map, otherwise don't you? Or do you?

Before building plans to invade. However, each player starts can be between 2 and 4) may choose the name of his/her empire, the symbols that will represent them and the empire centers where the army, navy, or even tanks will be created at the start of play. Centers can be chosen by each player, as, even better, you can let the computer do it so that the process is completely random—except the only choice even in *Apocalypse*.

Once settled, the procedure of determining forces begins. How many are available to each player depends on the selected world, which in turn depends on the type of land the empire centers (land) are based on, urban areas will have a different resource value in addition, for example. Also, unlike real life, there is no question of political dispute over the strategy of your side.

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 maneuvering forces and engaged in one-on-one combat. Within the movement phase the player is given four options: move, search or set, occupy and change (choose a different region from which troops are to be moved).

As time from past experiences of war, whatever a tactical army moves into an already occupied area, skirmishes are bound to break out. The skirmish occurs in *Apocalypse* if a combat situation is encountered, the players will be informed by the computer, with the forces of each available out hand. Here *Apocalypse* wins over most war-like type games, because the players are actually encouraged to talk to one another, and not just in comments,

but in a real sense.

The attacker selects 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 situation, there is a tie. Going higher or lower will determine the success or failure of the attack.

Games as just described, as based on conventional weapons, however, a player faced into a corner could miss nuclear weapons to use their ugly hands. It has to be said that although the idea of using nuclear 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 use or abstain. Should a nuclear be fired, the screen display begins to "ripple", while the sound of the bomb can be heard whirring 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 approach system for *Apocalypse* that enables different scenarios to be played through the same program. These include such things as Europe 1984, War in The Pacific, Mountain's Campaign and Fall of the Roman Empire—the last game including some tactical such as defense.

Of all the software companies to enter the war-game field, Imagines has got to be one of the most surprising. It's not often that a company, usually known for the more arcade style games, moves into an area where reputation is one of the best. However, Imagines has made the however, and the result is a challenging game that features the best of both worlds.

*Imagines* was written by Imagines' John Gibson, who also wrote the graphically excellent *Defense* program. Rather than choose a known game of land in flight on, Gibson has created an imaginary landscape that looks, may be realistically, to make the game a different class of game.

The scenario of *Imagines* 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 feature map shows 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, instantly any area of land under control. 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 strategy comes in. If an infantry is moved, the entire rock unit representing it will be across the landscape from its initial position to the new one decided by the player. It can be questioned when the enemy is on the move and lots of rock can be used towards your HQ with tanks and constant hit on their base.

If you have a Commodore 64 and don't mind buying in programs, Century Books has produced *Imagines* for the Commodore 64. It's well worth asking about computer strategy, the book includes *Imagines* for six games that of which take up as much as 20% of memory, using them the reader's skills in *Imagines* to the all battles of *Imagines*. *Imagines* is available from Century Publishing at 75 Old Computer Street, London W1V 6PA. Tel: 071 499 8414.

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### A CLOSE UP FROM STONKERS OF THE PLAYERS GROUND FORCES!

Because the only computer the player can have in the computer, a representation of a soldier-type vehicle moves across the screen with information on the type of play and how the enemy is doing the support. Keeping the supplies moving is important in Stonkers, as without them enemies tend to storm in tanks. Sometimes the supplies might not reach some way to some because the supply ship was slowed by bad weather.

Of course, as in any good board there are situations where opposing forces meet, and as it develops, the winner is determined by the strength factor of the different divisions—as measured in superior units or military divisions.

Stonkers is a game that should appeal to anyone wanting to get into wargaming. It is not, however, easy for the nonwargamer player, because it takes a long time to find out what's going on and what you are successful or not doing. At the end of Stonkers's manual, the documentation is a lot better, not being concerned with the quality of the software.

Another prolific producer of wargames is a Chesapeake company called Lookstone. Most of their games are part of a series called Warscape, an acronym of which is called Conflictzone. It suggests that Lookstone have taken a lot out of Red Alert's look, and have made it yours. It is supposed to be easier progress by looking at how someone else's game is played on the program that allows the users design maps and games.

A game called *Time River* is provided on the *Warscape* tape. This involves two computers in being trying to control forward between two cities. Originally it is as good as those from Red Alert and certainly nowhere near Stonkers, but it suggests you can't probably refer to the original board version about anything else.

Some of Lookstone's expansion strategies include *Power Wars*, *Bellevue* and *Overheadlights*. *Power Wars* is a small sort of game where being dropped behind enemy lines with the intention of blowing up a strategic bridge. Before the bridge can be destroyed, all enemy forces need be wiped out (only a few enemies, probably five).

*Bellevue* is a less sophisticated warfare based on the Japanese Civil War. A strategy has broken out between U.S. and Confederate forces around a city, drawing, and you go to the stage to collect the enemy's flag or achieve a position of dominance as required by war.

For third party, *Overheadlights* is a novel battle involving a British sea force trying to stop a German merchant fleet sailing the Star Coast of Sicily. It's not only the money that plays but is concerned with, because that's how.



### BATTLE 1917 (NOTE THE ROYAL CAMOUFLAGED TANKS IN THE CORNERS)



### APOCALYPSE CAN BE PLAYED IN 3D (NOT REAL LIFE WAR THEATRES)

The game Lookstone has produced for the other game series is a range of scenarios and modules. As well as the *Warscape*, many of the games also run on the BBC and Cric.

Probably a game for the Spectrum called *Attack 1917* from Games Computer, Southampton. *Attack 1917* has the distinction of having won the Cambridge Award for being a highly original wargame.

The difference between *Attack 1917* and other games looked at is that it's more like to show that 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 overrating strategy.

Whereas most of the other games have the option of playing the computer, *Attack 1917* has no—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 theory, the fact that neither player should not necessarily be required.

Whether or not you think war is a subject that should be morally sold to people (especially young children) the fact is that wargames are here to stay. Red Alert's scenarios, and those of the other major houses are better than the almost-everything-is-bright variety because they do allow the player to think, and avoid having the macro do the thinking for you. If you want a game that lets you think and play tactics on your own, a wargame is one of the best options.

By Steve Applebaum, staff writer on *ComputerGames*.

### WARGAMES MANUFACTURERS/DISTRIBUTORS

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Battle 1917 (BBC)

Spectrum, from

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Games, War 70 and

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Stonkers, priced 43 99

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Image Software, 2 St

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Conflictzone (BBC)

Spectrum, priced

47 99, Overheadlights

(BBC Spectrum, priced

45 99, *Attack 1917* (BBC

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Apocalypse (Spectrum)

BBC, priced 49 99

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War (Spectrum) 2nd (of

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priced 44 99, plus

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# TAKING THE GRAFT OUT OF GRAPHICS

WE LOOK AT SOME PACKAGES THAT HELP MAKE DESIGNING GRAPHICS EASIER, REQUIRES FUN AS WELL AS INSTRUCTIVE



LOGO CONSTRUCTION FROM PAINTBOX'S DEMO PROGRAM



MAKE THE TIES FROM THE PAINTBOX DEMO



FALLANDS EFFECT—FROM PAINTBOX, SHOWING LOGS



USER-DEFINED GRAPHICS AT WORK, AGAIN IN PAINTBOX

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 artistic. 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 out four of a few programs (PaintBox, MakeSomeDraw, Canvas Animator and DrawIt) for the Spectrum that cover the ground between just drawing lines to user defined graphics (UDG) and animation.

## PAINTBOX

The adverts for PaintBox offer the user all sorts of mind-boggling things. Features taken from the demo program show such things as a cover design from *Vogue* magazine, and a very detailed Ferris wheel on *Howlers*, as well as many commercial products, what you get is not always as easy to use

as the advertiser promises. The facilities are impressive, user defined graphics editor, drawing board, stretch pad and precision plotters, to name a few, but each has its own little idiosyncrasy.

The graphics editor allows up to 24 user defined graphics (UDG) characters to be defined—63 more than the Spectrum can store. Because of the way that the Spectrum's memory is organised, 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. Three 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 stretch pad, both of which are used on 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 the

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



### MORE LOGS FROM THE MAINBOX DEMO PROGRAM

the laser. Finally, the user is left with a design, and each color that made up the character, which ends out all the essential information usually required when designing LOGs. Below the 'chars' board is a box indicating several options that enable the designer to zoom, rotate, or produce a mirror image of the character, saving time having to change the attitude of the figure, or its design.

To make sure the character designs work, the user is supplied with an on-screen character grid. This gives the designer the opportunity to try out the designs, and see what characters look like before saving them to an application program.

All the characters designed using the drawing board and sketch pad can be saved and called from a basic program using the MAINBOX user functions. There are four different PARAMSs (see calls avoided) for each LOG 'bank'.

LOGs are useful, but they are not any good for high resolution work, you could not create a Vegas magazine cover with them. So to give the 'artist' more freedom, Pawler designed a high resolution character. All the functions are there—plot, draw, fill, cross, try and circle—but the ability to move the cursor around the screen and draw is you go missing.

### MELISSA-JANE DRAW

Melissa-Jane was the package of the week last in *January*, and probably has one of the best packages of any design utility for the Spectrum. Not only was it written by Philip Mitchell, one of the programmers of *The Matrix*, but it was also used to create the excellent graphics used in the same game.

*Melissa-Jane Draw*, unlike *Penwriter*, is a micro-draw as the cursor is moved and, once frozen, small portions of the display can be exchanged between four sizes 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 irreversible, as the original screen that a design is saved onto tape before being drawn.

On *Melissa-Jane Draw* colour is probably the hardest feature to use. Unlike *Penwriter*, which has a simple menu from which paper and ink colours can be selected, *Melissa-Jane Draw*'s user can confuse the user by talking about attributes (see Spectrum manual—page 1). To make matters worse, there is no real explanation of how to use more than two colours (foreground and background), it may seem, it can be done, but with a great deal of trial and error. After necessarily finding out how to change colours, this package is very good for creating nice 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 Tally approach, with *Cartoon Animation* from Pawler 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 shorting figures very easy.

*Cartoon Animation* consists of a third program and various machine code routines that collectively allow the user to design characters and move them across the screen with the minimum of fuss. Getting started with the package is not very easy, as the handy-like manual has a very laud description of how to begin. Once created, 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 own grid and colour in the squares making up the character or use Pawler's *Draw2D* (see below). The character is then moved 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 on the form of PGM statements, don't be worried you get off if you're not sure how to use them, as all the necessary PGMs are given in the manual. It is of course easy to be moved around the screen, it gives a list of such statements (leave to be used, as a different one is used per character). Other effects such as speed, colour and movement can also be controlled with the usual command, giving some very acceptable animation.

To overcome the need of having to draw your own grid, Pawler has produced a program that transfers drawings from paper to computer. This utility is called *Draw2D*, and it is useful for taking the hassle out of the drawing your character.

All the other features are done simply through the length and height of the character, and the start address of where it is to be stored in memory. Known as the information about the dimensions of the character produced draws a grid on which a design can be made. A list of squares can be filled using the 'key' for ink and the 'x' key to leave a blank. Special keys are provided so that a line can be coloured in, ink completely blank or copied to the next. Once con-

**Cartoon Animation**  
(Features characters, stored in memory, control speed, animation and colour through simple PGMs) *recommended*  
printed £10 (inc. VAT)  
Sheet £2 printed £5 from  
Pawler Software  
Hendon Hill,  
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Tel: 00823 863837

**Melissa-Jane Draw**  
(Features envelope screen, storage with file settings, fill command, stored screen, palette, shading LOGs, — pen small, priced £8.95, inc. VAT), from  
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WE SHOW YOU HOW TO AVOID THE CRUSH AND TAKE TO THE TUBE.

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

While 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 monitor), 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 source 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 source to a standard domestic TV. The modulator may or may not be built into the source, it is external (like with the VCR), then designed to fit, from the source, is true composite video, and will contain a sound component if the source produces sound through the TV.

If the modulator is external (meaning that you plug your TV signal straight into your source), 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 box (small 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 on the other.

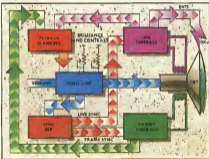
The signal leaving the modulator is a radio frequency, usually around channel 36. In effect, the modulator is a tiny transmitter (if an aerial were fixed to the modulator, your TV would receive it over a surprising distance, your TV might also be captured by a transmitter from the Post Office). The TV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

In Fig. 2 we see the signal 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
- Horizontal and vertical synchronization pulses, to lock the time base throughout the screen
- Sound component

These individual components are extracted as required, inside the TV or monitor. Some monitors, however, do not generate true composite video (as a TV does); 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 VDU's.

**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 colour Spun (the strong the signal) is also part of the RGB signal. Another factor that dominates in the superior display as a monitor for VDU is that bandwidth is wider - it can handle higher frequency signals - and the contrast/size quality is higher.

Can you connect your TV to RGB or composite

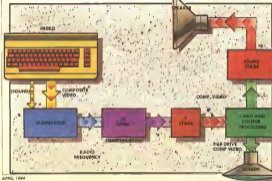
video? Unless you are very well informed on TV, use the safe, necessary video alternatives, which means the Euro's end of the screen is connected to several means (through many people try to try TV suggestions and connect it to screen line). Self-made cables among which mode power supply wires for the channel to flow at around 500 volts. This is why you do not have an earth on your TV, look it up to your monitor, and you seem will have - via most of the stage as that! The second matter on the TV is crucial component in screen voltage. Don't ever bridge it, should it be damaged.

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

Get the best screen by a video signal from your video to the television.



Before the computer will deliver a video signal, when getting into a monitor's compatible video output.



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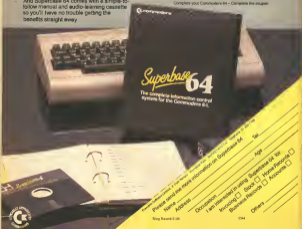
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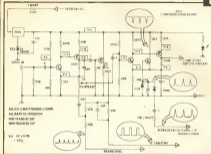
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Left: circuit diagram for a video board, connecting your video's composite video output to a VDU.

display, you can, of course, make all your colour statements, get the thing working, and then see the finished result on the colour TV (there are a good many, 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 video display, or VDU (that is, a video display unit, a screen or its own, not to be confused with a terminal, which would include a keyboard and extra circuitry). What wrong programs the advantages of a good quality display, even a black-and-white one, are considerable - reading terms of text on a TV screen is hard on the eyes.

The computer market is continuously expanding, so fast in fact that buyers' systems, whether in wrapping for old systems and starting again with the new generation equipment (MS) has led to an equally steady growth in computer screen wrap displays, and second user displays (the main benefit of the wrap display is the process itself as the background and so on). There appears to be little demand for the VDUs that these displays obtain as they buy top-quality 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 £10 for your wrap VDU, unless you are certain it is worth more. An exceptional model that really seems well probably cost you less for as little as £18. Haggled! There are the types of computer 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. Since all these are of use to us, and even within the same that look alike, there could be trouble. Basically, there are two components to a VDU - the display and the logic. It is the display, and how the VDU manufacturer has gone about designing, that is of prime importance.

When a manufacturer designs a VDU it has two

options at the display area, it can either design its own scanning circuit 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 monitors, TTL monitors, and monitor without horizontal syncbars.

The first type option 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 syncbars require a lot of intervention work, so are not really worth buying.

So, we are looking for a VDU, in which the system manufacturer has made bright an standard display, that accepts composite video. How can you identify the one that will be easy to connect? Here are some guidelines, but as 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 connection (like the power supply unit, PSU), the VDU was probably designed by the system manufacturer for use in an own system - in which case you don't like 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, redrains, colour and part numbering).

○ If the display looks like an independent unit (with PSU, control, brightness controls and so on) separate from the logic board, it is likely to be what you are looking for - get your reader out!

Data 100 and Monitors terminals both use a bright-on display in some of their equipment (made by Monitors) DEC, Velletron and Ferranti do not. Some Monitors terminals are variable. There are so many makes that it would be impossible to list all the types you may find. But typical equipment is really good, so that to the user's application, so-called VDUs often have very wide readability.

Having got a VDU, you require an interface card to extract the composite signals from the computer

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you will be tempted to look and get a display that is ready to go. We have our idea, but a will benefit from the signal processing of the video card.

The screen shows done 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 upgrade was constructed on the Video board, and connections listed in other items to plug into the backplane of the VDU.

The only problem you may encounter is that of frame flicker blanking. Again, it is not my intention to go deeply into the workings of CRT monitors, but, you 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 'bowed' up, and a number of lines fill the screen—this is called the raster. The frequency that 'pages' up the screen is the vertical or frame rate. 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 flicker period.

If we were able to see it (like, for instance, in a fault), we would see where lines about one inch apart go top of our display. All domestic TVs have automatic means that turn the CRT off during field flicker—can it damage it?

The answer, each country is not regarded as the same in VDU's is simple. It is quite usual for the manufacturer to arrange blanking on his software hardware. All frames tend to be pushed the video signal out to the correct moment in time. A simple timing problem when you consider some of the monitoring hardware.

The screen shows overcomes this problem by reducing a blanking interval, although the point is 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 of a typical monitor layout, to show what happens with composite video signal.

The screen of any CRT is coated with phosphor dots (unless we completely change with Thomson, AE series, Toshiba etc). The smaller the dots, the more you get on the screen, the greater the definition. The more expensive boards you will get from a VDU conversion will be higher resolution.

Finally, a word on where to obtain the rest of the parts required. The computer trade journal Computer Weekly (which isn't available on book stands) has many such advertisers in a regular feature called 'Market Place'. A couple of other sources are listed on page 15.

By Mike Hong Nam, A computer consultant.

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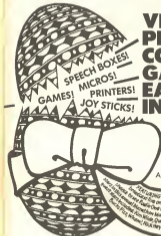
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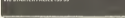
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# DOCUMENT AND SURVIVE

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 as a haze of ill-faded 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 report 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 those same old-fashioned users of what's going on.

More formal methods of documentation have been specified, with the naming of procedures and improvements made by people other than the original programmer. You may find there is a wealth of overhead as the approach described here, but you can selectively omit any irrelevant parts and simply use the headings as a basis for organizing your own documentation methods.

Documents can be a big score, but it is not nearly so painful as having to search a vast-quantity nearly-useful program code again because you can't understand what the hell is going on. Also, if there are specific rules and headings, documentation doesn't take that long anyway. The first main heading is:

- Program specification
- Program Descriptive Language
- The Program

Test data and expected results  
Results from test data

The first two should be written as 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 a rough sketch, but is simply a high-level description of a program in a Pascal (that is, structured) style system. It may not be necessary for a program written in Pascal, Algol or perhaps a well-written hierarchical flow program, but is very useful for nearly (but not most) Basic, 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 main inputs
- Details of main 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 two concerning the inputs and outputs outside detail of global variables stored (especially stack) shared by the program, as well as what would be described as the "own 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 of the Pascal style world of the 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 a virtue.

The high-level design decisions will include things like which type of algorithm is used, use for sorting, searching, or whatever. This section would probably be three pages (or one or two paragraphs), and should be in plain English not. All options, alternatives, show-outs and weakly bits should be explained here as well. There is a space section for calculations, so as not to bog-down the other sections with code.

The program description language (PDL) shows the structure of the code and sits in a language-independent form (that is, understood by city engineers, mostly an unnecessary system, as when not of any computer language). The example given shows somewhat PDL (Fig. 1).

The listing of the program should include what was shown in, and, of prime importance, when it was written and last amended. Given two long and nearly identical listings it can be tedious to ask which is the most recent. Date change! 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. Some programmers may well disagree with this code, as IBM contractors can write things down and produce a lot of a nuisance. If IBM's are proved 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 when should appear at the other end. This is should also include the extreme examples, like a file that is a row of data, or none at all. Examples of test data can go down every major branch of the program, with details of the expected results, in a similar useful notation. 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 Systems.

The final section contains the actual print-outs from one run. Essential when trying to compare someone's basic that it really does work. And what happens if it doesn't? Well you documented it so you were along so it'll be easy to find the bugs! No!—Back to the drawing board.

By Dr. Peter Tyrone, technical editor of Computer Systems

**Operator**

Reference: Section 4.4.4.1.1.1

**1.1 Title**

Number Base Conversion

**1.2 Purpose**

To convert any number in one radix base to another base

**1.3 Details of usage**

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

**1.4 Details of outputs**

The output is only to the screen. After a final prompt are both the base and the result are displayed

**1.5 Design decisions**

This is a utility package designed mainly for use with assembly computer programs. For this reason the maximum base values are 16 and 36 respectively. Do more numbers may need to be converted, the coverage procedure can be extended accordingly. It is so arranged that the next system components would involve bases 2 till up to several of other bases in the range 2 to 36 are called for. This change can be converted to functions

The procedure is to read in a number in the form of a string to allow conveniently input for bases 11 to 36 and to convert that string to a decimal integer. This decimal number is then converted to the required radix base. This is done by repeated division the decimal number by powers of the desired base.

**1.6 Subroutines performed**

To convert the string into a decimal number uses subroutine in the string is given in form, starting with the first, and adding to the following operation:

```
Value*10 + character * factor base to the power of the character position in the string
```

The character must also be converted into ASCII to a number in the range 0 to 35. It is so arranged that the number base can be 16 or 36, then the number cannot be converted

To convert the decimal into the desired base is to continually divided by a power of the desired base. The final value the desired is divided by is the desired base to the power of 0. Then to the power of 17, then 16, and so on down

to 0. Note that anything to the power of 0 is 1. The final number is not converted up, but is divided and so on, is called that when a digit has been placed into the value that it represents is removed from the decimal number.

**1.7 Error conditions**

The program detects incorrect input, but will not warn properly in the following circumstances:

- 1) The converted number is more than 32 digits. This is only likely to occur when a large base is being converted to base 2 or 3, and can easily be avoided by using the correct string power is more than 32
- 2) The decimal number input may be more characters than are allowed (a warning flag is set)
- 3) The decimal number is anything but an integer
- 4) When reading errors of fact, the program

Because of the utility nature of the program, more safety could be included and error messages have not been included

**FORTRAN Descriptive Comments**

THIS IS DONE IN THE POWER OF

**PROGRAM CONVERT NUMBER BASES**

IMPLICIT

REAL (INTEGER)

IF NUMBER = THEN

WRITE \*

WRITE (UNIT, FMT)

WRITE (CONVERSION UNIT)

IF SOURCE BASE AND CONVERSION UNIT ARE EQUAL, THEN

WRITE \*

WRITE (UNIT)

FOR POWER TO LOWEST POWER. I

WRITE \*

DO I = NUMBER DOWN

IF DIGIT IN I, I THEN DIGIT = MODULO (N, I)

IF DIGIT IN I, I THEN DIGIT = MODULO (N, I)

IF DIGIT IN I, I THEN DIGIT = MODULO (N, I)

CONVERSION = CONVERSION \* I + DIGIT

END

WRITE (UNIT)

FOR POWER DOWN TO

WRITE \*

IF DIGIT = MODULO (CONVERSION, I) THEN

IF DIGIT = MODULO (CONVERSION, I)

IF DIGIT = MODULO (CONVERSION, I) THEN



# SQUEEZING YOUR DATA

COMPACTING YOUR DATA GIVES YOU MORE STORAGE SPACE AND THUS MORE PROCESSING POWER — WE SHOW YOU HOW

One of a system's biggest drawbacks is the lack of off-line storage, especially for those managers who cannot afford disk drives. There is, however, a technique by which this problem can be solved — 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 units), less physical tape usage for data.

The main benefits for both one and two drive users is an reduced tape usage, for more 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 percent terms, if we take as an example a file of five, 50 character data fields (fully read) per record, the technique will give a saving of eight per cent.

In character terms, on a file of 1,000 records, the saving could be 4,000 characters out of a total of 50,000. All this reduction is achieved by the same systems of the individual data fields into a record. First 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 one single character fields, the data would previously have looked like this:



Using the technique the data would now fit within the size:



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 fields that need to be distinguished. Only record records themselves need to be distinguished, all the individual fields need only a single definition. Thus this 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 more coding is required to convert EBCDIC to an alphanumeric pair A, B, C, every instance of these fields will save three or four characters, as more access to a variable is used in place of its value.

IBM APPL/VSPL (200)

IBM APPL/VSPL

Reduction in physical tape usage is achieved by

using most of the wasted space contained when data is written. On the Commodore CBM 4032 for example, at least one carriage return is written for every 16-bit character read, regardless of the length of the field, by classifying these characters the savings reduced.

From that it can be seen that a one character field will require two characters of tape space in which to be written. Using this technique 40 single character fields can be written in the dimension of tape space. By the normal method this would require 160 tape characters, saving in the use of approximately 50 per cent.

Before	1	2	3	4	5	6	7	8	9	CR
After	1	2	3	4	5	6	7	8	9	CR

The concept behind the technique is simple. All data can be stored in alpha-numeric fields as variables. Integer and decimal fields can be converted to alpha-numeric format by use of the EBCDIC command (decimal points will automatically be stored as a "period"). Following on from this, all alpha-numeric fields can be access treated by using the '+' action — the result is a record containing a number of fields. To retrieve the individual data fields the string handling and numeric comparison commands can be used, and these are LEFT, RIGHT, MID, and WLEN, which can be seen in the example.

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 access to be taken after the decision to use

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

```

100 A$B=STR$(C*2)
110 W$B=STR$(L*3)
120 R$=W$+A$+W$+W$+W$+W$+W$
130 PRINT W$,R$

```

```

200 IF(PI*10) PR=PI*2-1+PI-PI
210 PR$=1+PI*4+PI PR$
220 IF(PI*10) PR$=1+PI*4+PI*4+PI*4+PI*4+PI*4+PI*4
230 PR$=PR$
240 GO TO 250
250 PI=PI+1
260 PR$=STR$(PR$)+PI*4+PI*4
270 PR$=PI*4+PI*4+PI*4+PI*4+PI*4+PI*4+PI*4+PI*4
280 CR=WLEN(PR$)+PR$+PI*4+PI*4+PI*4+PI*4+PI*4+PI*4
290 D=PR$, R$=R$+PI*4+PI*4+PI*4+PI*4+PI*4+PI*4+PI*4
300 PR$=PI*4+PI*4+PI*4+PI*4+PI*4+PI*4+PI*4+PI*4
310 CR$=PI*4
320 RETURN

```





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All the time the Corvids (8) is busy digging it's way through your waste earth pile (9) to reach the entrance to your mine. Once it does you have to



## ACTUAL ZX-81 SCREEN DISPLAY.

escape! - so you must stop it getting there by returning to the surface to replenish the main mound (9) with the smaller pile of earth which appears on the surface as you dig (10). The deeper you dig the more points you score -

but the further you have to go to replenish that mound! Once all nuggets have been collected, a cave opens (11) allowing you to pass through to the next stage - if you can reach it! This gives you more rats - but less snakes to destroy them with!

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# SECRET VISIONS

DISCOVER THE ALIAS CODE HIDDEN GRAPHICS MODES

**H**idden within the Atari 800 there 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. How can this be explained?

Inside the Atari is a list of numbers that tells the computer which graphics mode it is in, and displaying the graphics mode along that 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.

Mode	Graphics Mode	Mode Type	Number of Horizontal Lines	Mode Number (Display List)
0	Text	24	892	
1	Text	24	813	
2	Text	12	844	
3	Graphics	24	873	
4	Graphics	48	817	
5	Graphics	48	1,007	
6	Graphics	96	2,005	
7	Graphics	96	2,742	
8	Graphics	192	7,920	

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 use 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 that 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 to 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 entries, and if we divide this into 192 the answer is 16. This is the number of scan lines on each mode 3 row. Mode 1 on the other hand uses eight scan lines per row; the screen that our heading will have 40 right scan lines so mode 2 and seven as mode 1, making 84. This leaves us with 108 scan lines (192-84) to play with.

Each mode 3 row uses eight scan lines, 128 divided by 8 leaves us with 16 scan lines 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 these 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 813 bytes of RAM. Next we must find where the display list begins. It starts always at the same place, so we pick one convenient location to locate it (Line 20).

The next list changes the number for the memory location just before the beginning of the display list. We do not have to alter the list of the graphics mode at the top of the screen as the one that we have used in line 18, in the example is a text. Use the table below to give you the number you need.

```
mode 0 1 2 3 4 5 6 7 8
      44 78 76 72 71 74 73 77 75
```

Line 20 tells the computer how to give us the required graphics modes. We are already in graphics mode 1 so we have to alter the list to successively mode 2 and 3. To change the display list we must subtract +2561 number with the correct number for the mode we want in the row. The numbers are obtained by subtracting 84 from the numbers given in the table above. Mode 2 is 7 and mode 3 is 8. Line 40 starts the list to give us the required three rows of graphics 3. Don't forget that we altered the first row in line 36, which is why we are pointing now only two locations in line 40. Line 60 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 coded up with less rows than when we started. Graphics 3 has twenty four rows while graphics 2 has only twelve. To do this we must add to the next display list location. This tells the computer to return to the beginning of the display list. We also inform the computer where the beginning of the list is. When using your own screen list you will have to alter the locations for the display list (22, 23 and 24 are the independent row numbers in our example).

Lines 80 and 90 print the list in the desired modes. Location 87 used in these lines puts the computer into the graphics mode that you want to see. Line 90 outputs us to print in mode 2 so we print 87.2.

There are many other ways of customising the display list 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 and you find one that you like. There are many other sources, such as books and programs printed to magazines. You can always tell the cost of the display list sub-routine because it seems as a list number in the 20s on 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 list to the look of your programs.

Fig. 1 (The 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 the ability to change the screen.

**Fig. 2**  
**Example Listing**

```

10  REM *****
11  REM *****
12  REM *****
13  REM *****
14  REM *****
15  REM *****
16  REM *****
17  REM *****
18  REM *****
19  REM *****
20  L=20:G=1:R=0:R2=0:R3=0:R4=0:R5=0:R6=0:R7=0:R8=0:R9=0:R10=0:R11=0:R12=0:R13=0:R14=0:R15=0:R16=0:R17=0:R18=0:R19=0:R20=0:R21=0:R22=0:R23=0:R24=0:R25=0:R26=0:R27=0:R28=0:R29=0:R30=0:R31=0:R32=0:R33=0:R34=0:R35=0:R36=0:R37=0:R38=0:R39=0:R40=0:R41=0:R42=0:R43=0:R44=0:R45=0:R46=0:R47=0:R48=0:R49=0:R50=0:R51=0:R52=0:R53=0:R54=0:R55=0:R56=0:R57=0:R58=0:R59=0:R60=0:R61=0:R62=0:R63=0:R64=0:R65=0:R66=0:R67=0:R68=0:R69=0:R70=0:R71=0:R72=0:R73=0:R74=0:R75=0:R76=0:R77=0:R78=0:R79=0:R80=0:R81=0:R82=0:R83=0:R84=0:R85=0:R86=0:R87=0:R88=0:R89=0:R90=0:R91=0:R92=0:R93=0:R94=0:R95=0:R96=0:R97=0:R98=0:R99=0:R100=0:R101=0:R102=0:R103=0:R104=0:R105=0:R106=0:R107=0:R108=0:R109=0:R110=0:R111=0:R112=0:R113=0:R114=0:R115=0:R116=0:R117=0:R118=0:R119=0:R120=0:R121=0:R122=0:R123=0:R124=0:R125=0:R126=0:R127=0:R128=0:R129=0:R130=0:R131=0:R132=0:R133=0:R134=0:R135=0:R136=0:R137=0:R138=0:R139=0:R140=0:R141=0:R142=0:R143=0:R144=0:R145=0:R146=0:R147=0:R148=0:R149=0:R150=0:R151=0:R152=0:R153=0:R154=0:R155=0:R156=0:R157=0:R158=0:R159=0:R160=0:R161=0:R162=0:R163=0:R164=0:R165=0:R166=0:R167=0:R168=0:R169=0:R170=0:R171=0:R172=0:R173=0:R174=0:R175=0:R176=0:R177=0:R178=0:R179=0:R180=0:R181=0:R182=0:R183=0:R184=0:R185=0:R186=0:R187=0:R188=0:R189=0:R190=0:R191=0:R192=0:R193=0:R194=0:R195=0:R196=0:R197=0:R198=0:R199=0:R200=0:R201=0:R202=0:R203=0:R204=0:R205=0:R206=0:R207=0:R208=0:R209=0:R210=0:R211=0:R212=0:R213=0:R214=0:R215=0:R216=0:R217=0:R218=0:R219=0:R220=0:R221=0:R222=0:R223=0:R224=0:R225=0:R226=0:R227=0:R228=0:R229=0:R230=0:R231=0:R232=0:R233=0:R234=0:R235=0:R236=0:R237=0:R238=0:R239=0:R240=0:R241=0:R242=0:R243=0:R244=0:R245=0:R246=0:R247=0:R248=0:R249=0:R250=0:R251=0:R252=0:R253=0:R254=0:R255=0:R256=0:R257=0:R258=0:R259=0:R260=0:R261=0:R262=0:R263=0:R264=0:R265=0:R266=0:R267=0:R268=0:R269=0:R270=0:R271=0:R272=0:R273=0:R274=0:R275=0:R276=0:R277=0:R278=0:R279=0:R280=0:R281=0:R282=0:R283=0:R284=0:R285=0:R286=0:R287=0:R288=0:R289=0:R290=0:R291=0:R292=0:R293=0:R294=0:R295=0:R296=0:R297=0:R298=0:R299=0:R300=0:R301=0:R302=0:R303=0:R304=0:R305=0:R306=0:R307=0:R308=0:R309=0:R310=0:R311=0:R312=0:R313=0:R314=0:R315=0:R316=0:R317=0:R318=0:R319=0:R320=0:R321=0:R322=0:R323=0:R324=0:R325=0:R326=0:R327=0:R328=0:R329=0:R330=0:R331=0:R332=0:R333=0:R334=0:R335=0:R336=0:R337=0:R338=0:R339=0:R340=0:R341=0:R342=0:R343=0:R344=0:R345=0:R346=0:R347=0:R348=0:R349=0:R350=0:R351=0:R352=0:R353=0:R354=0:R355=0:R356=0:R357=0:R358=0:R359=0:R360=0:R361=0:R362=0:R363=0:R364=0:R365=0:R366=0:R367=0:R368=0:R369=0:R370=0:R371=0:R372=0:R373=0:R374=0:R375=0:R376=0:R377=0:R378=0:R379=0:R380=0:R381=0:R382=0:R383=0:R384=0:R385=0:R386=0:R387=0:R388=0:R389=0:R390=0:R391=0:R392=0:R393=0:R394=0:R395=0:R396=0:R397=0:R398=0:R399=0:R400=0:R401=0:R402=0:R403=0:R404=0:R405=0:R406=0:R407=0:R408=0:R409=0:R410=0:R411=0:R412=0:R413=0:R414=0:R415=0:R416=0:R417=0:R418=0:R419=0:R420=0:R421=0:R422=0:R423=0:R424=0:R425=0:R426=0:R427=0:R428=0:R429=0:R430=0:R431=0:R432=0:R433=0:R434=0:R435=0:R436=0:R437=0:R438=0:R439=0:R440=0:R441=0:R442=0:R443=0:R444=0:R445=0:R446=0:R447=0:R448=0:R449=0:R450=0:R451=0:R452=0:R453=0:R454=0:R455=0:R456=0:R457=0:R458=0:R459=0:R460=0:R461=0:R462=0:R463=0:R464=0:R465=0:R466=0:R467=0:R468=0:R469=0:R470=0:R471=0:R472=0:R473=0:R474=0:R475=0:R476=0:R477=0:R478=0:R479=0:R480=0:R481=0:R482=0:R483=0:R484=0:R485=0:R486=0:R487=0:R488=0:R489=0:R490=0:R491=0:R492=0:R493=0:R494=0:R495=0:R496=0:R497=0:R498=0:R499=0:R500=0:R501=0:R502=0:R503=0:R504=0:R505=0:R506=0:R507=0:R508=0:R509=0:R510=0:R511=0:R512=0:R513=0:R514=0:R515=0:R516=0:R517=0:R518=0:R519=0:R520=0:R521=0:R522=0:R523=0:R524=0:R525=0:R526=0:R527=0:R528=0:R529=0:R530=0:R531=0:R532=0:R533=0:R534=0:R535=0:R536=0:R537=0:R538=0:R539=0:R540=0:R541=0:R542=0:R543=0:R544=0:R545=0:R546=0:R547=0:R548=0:R549=0:R550=0:R551=0:R552=0:R553=0:R554=0:R555=0:R556=0:R557=0:R558=0:R559=0:R560=0:R561=0:R562=0:R563=0:R564=0:R565=0:R566=0:R567=0:R568=0:R569=0:R570=0:R571=0:R572=0:R573=0:R574=0:R575=0:R576=0:R577=0:R578=0:R579=0:R580=0:R581=0:R582=0:R583=0:R584=0:R585=0:R586=0:R587=0:R588=0:R589=0:R590=0:R591=0:R592=0:R593=0:R594=0:R595=0:R596=0:R597=0:R598=0:R599=0:R600=0:R601=0:R602=0:R603=0:R604=0:R605=0:R606=0:R607=0:R608=0:R609=0:R610=0:R611=0:R612=0:R613=0:R614=0:R615=0:R616=0:R617=0:R618=0:R619=0:R620=0:R621=0:R622=0:R623=0:R624=0:R625=0:R626=0:R627=0:R628=0:R629=0:R630=0:R631=0:R632=0:R633=0:R634=0:R635=0:R636=0:R637=0:R638=0:R639=0:R640=0:R641=0:R642=0:R643=0:R644=0:R645=0:R646=0:R647=0:R648=0:R649=0:R650=0:R651=0:R652=0:R653=0:R654=0:R655=0:R656=0:R657=0:R658=0:R659=0:R660=0:R661=0:R662=0:R663=0:R664=0:R665=0:R666=0:R667=0:R668=0:R669=0:R670=0:R671=0:R672=0:R673=0:R674=0:R675=0:R676=0:R677=0:R678=0:R679=0:R680=0:R681=0:R682=0:R683=0:R684=0:R685=0:R686=0:R687=0:R688=0:R689=0:R690=0:R691=0:R692=0:R693=0:R694=0:R695=0:R696=0:R697=0:R698=0:R699=0:R700=0:R701=0:R702=0:R703=0:R704=0:R705=0:R706=0:R707=0:R708=0:R709=0:R710=0:R711=0:R712=0:R713=0:R714=0:R715=0:R716=0:R717=0:R718=0:R719=0:R720=0:R721=0:R722=0:R723=0:R724=0:R725=0:R726=0:R727=0:R728=0:R729=0:R730=0:R731=0:R732=0:R733=0:R734=0:R735=0:R736=0:R737=0:R738=0:R739=0:R740=0:R741=0:R742=0:R743=0:R744=0:R745=0:R746=0:R747=0:R748=0:R749=0:R750=0:R751=0:R752=0:R753=0:R754=0:R755=0:R756=0:R757=0:R758=0:R759=0:R760=0:R761=0:R762=0:R763=0:R764=0:R765=0:R766=0:R767=0:R768=0:R769=0:R770=0:R771=0:R772=0:R773=0:R774=0:R775=0:R776=0:R777=0:R778=0:R779=0:R780=0:R781=0:R782=0:R783=0:R784=0:R785=0:R786=0:R787=0:R788=0:R789=0:R790=0:R791=0:R792=0:R793=0:R794=0:R795=0:R796=0:R797=0:R798=0:R799=0:R800=0:R801=0:R802=0:R803=0:R804=0:R805=0:R806=0:R807=0:R808=0:R809=0:R810=0:R811=0:R812=0:R813=0:R814=0:R815=0:R816=0:R817=0:R818=0:R819=0:R820=0:R821=0:R822=0:R823=0:R824=0:R825=0:R826=0:R827=0:R828=0:R829=0:R830=0:R831=0:R832=0:R833=0:R834=0:R835=0:R836=0:R837=0:R838=0:R839=0:R840=0:R841=0:R842=0:R843=0:R844=0:R845=0:R846=0:R847=0:R848=0:R849=0:R850=0:R851=0:R852=0:R853=0:R854=0:R855=0:R856=0:R857=0:R858=0:R859=0:R860=0:R861=0:R862=0:R863=0:R864=0:R865=0:R866=0:R867=0:R868=0:R869=0:R870=0:R871=0:R872=0:R873=0:R874=0:R875=0:R876=0:R877=0:R878=0:R879=0:R880=0:R881=0:R882=0:R883=0:R884=0:R885=0:R886=0:R887=0:R888=0:R889=0:R890=0:R891=0:R892=0:R893=0:R894=0:R895=0:R896=0:R897=0:R898=0:R899=0:R900=0:R901=0:R902=0:R903=0:R904=0:R905=0:R906=0:R907=0:R908=0:R909=0:R910=0:R911=0:R912=0:R913=0:R914=0:R915=0:R916=0:R917=0:R918=0:R919=0:R920=0:R921=0:R922=0:R923=0:R924=0:R925=0:R926=0:R927=0:R928=0:R929=0:R930=0:R931=0:R932=0:R933=0:R934=0:R935=0:R936=0:R937=0:R938=0:R939=0:R940=0:R941=0:R942=0:R943=0:R944=0:R945=0:R946=0:R947=0:R948=0:R949=0:R950=0:R951=0:R952=0:R953=0:R954=0:R955=0:R956=0:R957=0:R958=0:R959=0:R960=0:R961=0:R962=0:R963=0:R964=0:R965=0:R966=0:R967=0:R968=0:R969=0:R970=0:R971=0:R972=0:R973=0:R974=0:R975=0:R976=0:R977=0:R978=0:R979=0:R980=0:R981=0:R982=0:R983=0:R984=0:R985=0:R986=0:R987=0:R988=0:R989=0:R990=0:R991=0:R992=0:R993=0:R994=0:R995=0:R996=0:R997=0:R998=0:R999=0:R1000=0:R1001=0:R1002=0:R1003=0:R1004=0:R1005=0:R1006=0:R1007=0:R1008=0:R1009=0:R1010=0:R1011=0:R1012=0:R1013=0:R1014=0:R1015=0:R1016=0:R1017=0:R1018=0:R1019=0:R1020=0:R1021=0:R1022=0:R1023=0:R1024=0:R1025=0:R1026=0:R1027=0:R1028=0:R1029=0:R1030=0:R1031=0:R1032=0:R1033=0:R1034=0:R1035=0:R1036=0:R1037=0:R1038=0:R1039=0:R1040=0:R1041=0:R1042=0:R1043=0:R1044=0:R1045=0:R1046=0:R1047=0:R1048=0:R1049=0:R1050=0:R1051=0:R1052=0:R1053=0:R1054=0:R1055=0:R1056=0:R1057=0:R1058=0:R1059=0:R1060=0:R1061=0:R1062=0:R1063=0:R1064=0:R1065=0:R1066=0:R1067=0:R1068=0:R1069=0:R1070=0:R1071=0:R1072=0:R1073=0:R1074=0:R1075=0:R1076=0:R1077=0:R1078=0:R1079=0:R1080=0:R1081=0:R1082=0:R1083=0:R1084=0:R1085=0:R1086=0:R1087=0:R1088=0:R1089=0:R1090=0:R1091=0:R1092=0:R1093=0:R1094=0:R1095=0:R1096=0:R1097=0:R1098=0:R1099=0:R1100=0:R1101=0:R1102=0:R1103=0:R1104=0:R1105=0:R1106=0:R1107=0:R1108=0:R1109=0:R1110=0:R1111=0:R1112=0:R1113=0:R1114=0:R1115=0:R1116=0:R1117=0:R1118=0:R1119=0:R1120=0:R1121=0:R1122=0:R1123=0:R1124=0:R1125=0:R1126=0:R1127=0:R1128=0:R1129=0:R1130=0:R1131=0:R1132=0:R1133=0:R1134=0:R1135=0:R1136=0:R1137=0:R1138=0:R1139=0:R1140=0:R1141=0:R1142=0:R1143=0:R1144=0:R1145=0:R1146=0:R1147=0:R1148=0:R1149=0:R1150=0:R1151=0:R1152=0:R1153=0:R1154=0:R1155=0:R1156=0:R1157=0:R1158=0:R1159=0:R1160=0:R1161=0:R1162=0:R1163=0:R1164=0:R1165=0:R1166=0:R1167=0:R1168=0:R1169=0:R1170=0:R1171=0:R1172=0:R1173=0:R1174=0:R1175=0:R1176=0:R1177=0:R1178=0:R1179=0:R1180=0:R1181=0:R1182=0:R1183=0:R1184=0:R1185=0:R1186=0:R1187=0:R1188=0:R1189=0:R1190=0:R1191=0:R1192=0:R1193=0:R1194=0:R1195=0:R1196=0:R1197=0:R1198=0:R1199=0:R1200=0:R1201=0:R1202=0:R1203=0:R1204=0:R1205=0:R1206=0:R1207=0:R1208=0:R1209=0:R1210=0:R1211=0:R1212=0:R1213=0:R1214=0:R1215=0:R1216=0:R1217=0:R1218=0:R1219=0:R1220=0:R1221=0:R1222=0:R1223=0:R1224=0:R1225=0:R1226=0:R1227=0:R1228=0:R1229=0:R1230=0:R1231=0:R1232=0:R1233=0:R1234=0:R1235=0:R1236=0:R1237=0:R1238=0:R1239=0:R1240=0:R1241=0:R1242=0:R1243=0:R1244=0:R1245=0:R1246=0:R1247=0:R1248=0:R1249=0:R1250=0:R1251=0:R1252=0:R1253=0:R1254=0:R1255=0:R1256=0:R1257=0:R1258=0:R1259=0:R1260=0:R1261=0:R1262=0:R1263=0:R1264=0:R1265=0:R1266=0:R1267=0:R1268=0:R1269=0:R1270=0:R1271=0:R1272=0:R1273=0:R1274=0:R1275=0:R1276=0:R1277=0:R1278=0:R1279=0:R1280=0:R1281=0:R1282=0:R1283=0:R1284=0:R1285=0:R1286=0:R1287=0:R1288=0:R1289=0:R1290=0:R1291=0:R1292=0:R1293=0:R1294=0:R1295=0:R1296=0:R1297=0:R1298=0:R1299=0:R1300=0:R1301=0:R1302=0:R1303=0:R1304=0:R1305=0:R1306=0:R1307=0:R1308=0:R1309=0:R1310=0:R1311=0:R1312=0:R1313=0:R1314=0:R1315=0:R1316=0:R1317=0:R1318=0:R1319=0:R1320=0:R1321=0:R1322=0:R1323=0:R1324=0:R1325=0:R1326=0:R1327=0:R1328=0:R1329=0:R1330=0:R1331=0:R1332=0:R1333=0:R1334=0:R1335=0:R1336=0:R1337=0:R1338=0:R1339=0:R1340=0:R1341=0:R1342=0:R1
```

## MAKING MUSIC

FANCY YOURSELF AS THE WANDERER OF THE MICRO? WE PROVIDE A PROGRAM TO TURN YOUR HUMBLE ORC-1 INTO A NIFTY SYNTHESIZER.

The Orca 1 is capable of producing a wide variety of musical (and non-musical) sounds. However, it contains a special sound generator capable of producing a wide variety of musical sounds.

The program below is designed to exploit this facility to the full, turning the Orca into an electronic organ, with the top row of the keyboard becoming the keyboard. Four different "voices" are provided: bass, clarinet, mandolin, and vibrator. When you run the program a portion of the keyboard is shown, showing which Orca keys play which note. The four voices are selected by pressing the appropriate keys (B for bass, C for clarinet, and so on). The space bar ends the program.

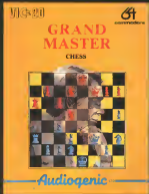


```

10 20000000
20 00000000
30 00000000
40 00000000
50 0000
60 KEY GETTING UP 1/4 NOTE
70 KEY FIRST NOTE 1/4 NOTE
80 000
90 000
100 000
110 000
120 000
130 000
140 000
150 000
160 000
170 000
180 000
190 000
200 000
210 000
220 000
230 000
240 000
250 000
260 000
270 000
280 000
290 000
300 000
310 000
320 000
330 000
340 000
350 000
360 000
370 000
380 000
390 000
400 000
410 000
420 000
430 000
440 000
450 000
460 000
470 000
480 000
490 000
500 000
510 000
520 000
530 000
540 000
550 000
560 000
570 000
580 000
590 000
600 000
610 000
620 000
630 000
640 000
650 000
660 000
670 000
680 000
690 000
700 000
710 000
720 000
730 000
740 000
750 000
760 000
770 000
780 000
790 000
800 000
810 000
820 000
830 000
840 000
850 000
860 000
870 000
880 000
890 000
900 000
910 000
920 000
930 000
940 000
950 000
960 000
970 000
980 000
990 000

```

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- + TAKE BACK MOVES
- + "HURRY UP" FUNCTION
- + AUTOMATIC SELF PLAY
- + CHANGE LEVEL
- + SQUARE PLAYING BOARD
- + CHOICE OF COLOUR SCHEME
- + AUTOMATIC QUEENING, CASTLING, EN PASSANT

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ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_  
POSTCODE \_\_\_\_\_  
COUNTRY \_\_\_\_\_  
TELEPHONE \_\_\_\_\_

```

4020 PEEK 12, 2 : P
4100 GO 3, 50
4200 GET SUBROUTINE (B) (L) (P) (S)
4300 GET FOR HOLD IN JUMP
4400 GOTO IN HOLD : IF HOLD < 0 THEN GOTO
1 : 10-01
4500 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
2 : 10-01
4600 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
3 : 10-01
4700 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
4 : 10-01
4800 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
5 : 10-01
4900 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
6 : 10-01
5000 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
7 : 10-01
5100 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
8 : 10-01
5200 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
9 : 10-01
5300 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
10 : 10-01
5400 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
11 : 10-01
5500 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
12 : 10-01
5600 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
13 : 10-01
5700 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
14 : 10-01
5800 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
15 : 10-01
5900 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
16 : 10-01
6000 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
17 : 10-01
6100 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
18 : 10-01
6200 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
19 : 10-01
6300 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
20 : 10-01
6400 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
21 : 10-01
6500 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
22 : 10-01
6600 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
23 : 10-01
6700 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
24 : 10-01
6800 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
25 : 10-01
6900 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
26 : 10-01
7000 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
27 : 10-01
7100 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
28 : 10-01
7200 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
29 : 10-01
7300 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
30 : 10-01
7400 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
31 : 10-01
7500 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
32 : 10-01
7600 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
33 : 10-01
7700 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
34 : 10-01
7800 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
35 : 10-01
7900 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
36 : 10-01
8000 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
37 : 10-01
8100 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
38 : 10-01
8200 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
39 : 10-01
8300 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
40 : 10-01
8400 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
41 : 10-01
8500 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
42 : 10-01
8600 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
43 : 10-01
8700 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
44 : 10-01
8800 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
45 : 10-01
8900 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
46 : 10-01
9000 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
47 : 10-01
9100 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
48 : 10-01
9200 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
49 : 10-01
9300 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
50 : 10-01
9400 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
51 : 10-01
9500 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
52 : 10-01
9600 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
53 : 10-01
9700 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
54 : 10-01
9800 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
55 : 10-01
9900 GOTO (L) (S) : IF HOLD < 0 THEN GOTO
56 : 10-01

```

This Data Link 32 program is by Peter Dwyer and is from *Real Time Handbook*, published by PCW/Compu, priced £5.95.

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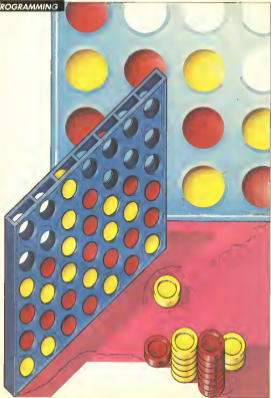
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# GAME FOR FOUR-SIGHT?

WE PRESENT FOUR-SIGHT, THE QUIRKY COMPUTER GAME OF SIMPLE STRATEGY—FULL LISTING AND INTRODUCTION

There's nothing like becoming a computer in its own game—no countless minutes of button-pushing, just a plain old battle of wits. *Four-sight* isn't exactly a replacement for chess, but an interesting little mental exercise for those warm evenings spent in front of the box of your Spectrum.

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 three coin counters into any one of the columns. A winning line can be horizontal, vertical or diagonal, similar to a way to connect four crosses. Fig. 1 shows a typical mid-point, the box 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 first discuss some other moves and future moves.

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 dumb, level two is quite fast and deliberate, level three is a bit slower but plays better, and level four is slowest to make a move, but plays best.

The computer player's strategy is based on maximizing the following components:

□ **The column and row points:** Increased the lower and more central the position the better.

Column number: 1 2 3 4 5 6 7

Weights: 1 2 3 4 3 2 1

Row number: 1 2 3 4 5 6

Weights: 6 4 3 2 1 0

□ **The stacking 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 two in a row and three just diagonally, so that—

For making Weight  
a row 10,000

3 horizontally 30

3 diagonally 20

2 vertically 20

2 in any direction 0

□ **The defence 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 draw, so that—

For preventing Weight  
a draw 1,000

3 horizontally 15

3 diagonally 14

2 vertically 13

2 in any direction 0

□ **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 three difficult for the player to try a trap for the computer.

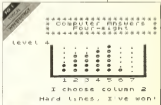
In order to be able to calculate the value of a position, the program looks three spaces in each direction, adding up the number of three points, the number of empty squares and stopping if an

opponent piece is found. Three games are complete and over, the Spectrum's score is printed and a disk is made for the middle. The pieces will drop into the columns when a move is made.

Your grey counter will not be over-represented by playing at level one, but you will need to have some 'two-sight' before you will become level four.

By Dr Peter Tunney, technical editor of *Computer Analysis*

Below Fig. 1 shows the board after two moves; Fig. 2 contains the Four-Sight listing for the ZX Spectrum.





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# THE ADVENTURE MAN

WE TALK TO PHILIP MITCHELL—  
CREATOR OF THE HOBbit  
ADVENTURE GAME

**R**apidly regarded as a software breakthrough, the highly successful Hobbit was one of our best-loved games of 1983 (see *Computer Journal* 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 two years, finishing last year's *Star Trek*.

In addition to his success with *The Hobbit*, Mitchell has also received a lot of praise for *Prozac*, a version on the old 'Strawhat' theme. In *Prozac* you are not confined to the pre-programmed landscapes, but with a special vision, 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 breakthrough. "We set started with a pair of dice 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 Malgren, of Melbourne House, the local publishers, was trying to move the company into the software field. His idea was to produce a good adventure game, finding that those around were not making the best of the computing power available, and he wanted to produce something better. Before anything could be done, Malgren had to recruit a programming team, which he did by posting notices around the University.

Mitchell had for one of the jobs and got it. He was an obvious choice—apart from being computer in part of his degree, he had been building and debugging games for some time.

Mitchell feels that his knowledge of hardware and how it works has been of enormous benefit to him, especially when it comes to programming an assembly language. Being able to understand it a little, took the way it is done, in doing things has made a career to go to pipe with a new machine," he says. The *Hobbit* concept took adventure gaming to a new level.

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

The job of writing the language analyzer is a high-level was given to Stewart Ritchie, a language graduate studying for a computer science degree, but all the main innovations 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 "pushing techniques"—creating a lot of information into a small space.

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



Philip Mitchell. My overall aim is to produce something that does a real job because it is. The main results are the quality and response, the better the game."

language analyzer is a very important feature of the program as it translates together all the other parts. It also allows the user to enter quite complex commands, like the rest of the program to understand without error.

Although the language analyzer is a later part of the program, it (along with everything else) is designed by a simple database. This defines the dictionary, which is the essential part of any adventure game, nouns, verbs, locations, the various characteristics that personalities.

Finally there are various 'bits and pieces' that manipulate the data in the database, the workhorse behind getting everything moving. Though all the words quite complex, virtually 90 per cent of the code used in the program is machine independent, the only things that have to be altered are the device names being the IBM PC machine.

Due to various legal complications, there is not going to be a direct follow-up alongside lines of "See it Miller", who we are going to get in *Star Trek* *Adventures*, the next open-ended, pipe-making, water playing, *Adventures*. Unlike *The Hobbit*, the *Star Trek* adventures will not be based on any one Conan Doyle story, but on a compilation of information and experiences.

However, it will not be just a revamped *Hobbit* designed in derivatives and tapes—Mitchell wants to make the new *Star Trek* game stand what was done at *The Hobbit*, and only up a lot of house rules. The aim that he most wants to refine is the character's personalities. "Looking back on *Hobbit*," he reflects, "There was a pretty boring period, he follows you around and says about gold."

As the moment Philip Mitchell is leaving 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 IBM Spectrum early this year.

After the *Star Trek* program, Philip Mitchell can't see what direction he is going to take. But whatever, it will probably be more graphics oriented. With progressive games such as *Alone* *Alone* and *Art Attack* on the market, he feels that computer imagery is the path to follow.

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

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# SCREEN STORAGE

WE PROVIDE A SHORT ROUTINE TO STORE SCREEN DISPLAY.

**T**here is a short machine-code program, which will enable you to store the screen display in memory at approx 4100 oct, and then to restore it later on, for example during the running of a program, at approx 4100 oct/oct.

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

Everything above the RAMTOP address is not free being overwritten by a Basic program (or later for exceptions to this rule), or NEW files (NEW, or CLASH files from). 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.

Usually 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 0000 to set RAMTOP to 0000, and in the way made (0000-0000) - 1197 bytes is available for machine code programs. Type CLEAR 0000 to set RAMTOP to 0000. Now you have 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 restore it (using the PEKE command). This is an efficient way to store data, but each address can only hold whole numbers from 0-255 (unless otherwise designated as in Fig 2).

The program in Fig 1 stores the screen display above RAMTOP. The screen display can be thought of as 6012 data items. The TV display is divided in four segments storing data: 6012 data items in the 6012 addresses 18264-21085 inclusive. There are 10 screens per second. It is not necessary to understand which address of the 6012 screen addresses refers to which dot or colour on the screen display. It is sufficient to know the numbers as follows:

Each address refers to the colours on the screen as to an eight 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 store this, type POKE 6044 (80) or another number, smaller than 255. For eight of these items on top of another, and you have one character.

Total number of addresses needed for the TV display is equal to 8 (per character) x 32 (characters per row) = 24 (number of rows) x 32 = 768 (the minimum to cover the colours, one character per line copied by a character). A total of 6012. To store a copy of the screen contents above RAMTOP, first CLEAR 0000 then type in the program in Fig 1 and execute.

The machine-code subprogram is now stored in memory above RAMTOP, and you can delete lines 24 and 30 if you load in any Basic program now,

60000	UDG
44004	
space space for data or machine code programs	
	RAMTOP
23294	BASIC PROGRAM (empty)
	SCREEN DISPLAY
18264	
0	ROM

Fig. 1 (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 0000 to 9999). When you have a screen display that you want to store, type LET 0 = GET 6041. To restore the screen display, type LET 0 = GET 6042. If you think you might have a variable M in the program whose value must not be stored, then use another letter in stead of letters placed in M.

You can SPEAK into a Basic program as it is running, move the screen display as described (in global instructions), and then type CONTROL to get back into the program. If you want to save the stored screen contents to tape, you must use a "save" (SAVE) by typing in the following SAVE name CODE 00014715.

To save the machine code program that stores the screen, type SAVE name CODE 000119. To reload the machine code program and the screen screen, type SAVE name CODE 00014715.

The following lines of Basic will store the screen above RAMTOP, save the stored screen on tape, and verify a LET 0 = GET 6041 (to store the screen above RAMTOP).  
 SAVE name CODE 00014715  
 VERIFY name CODE 00014715

The following lines of Basic will recall the machine code program and the screen screen, so there's no need to type in the program described above.  
 CLEAR 0000 (after restoring machine on end of)  
 LOAD CODE (load in the saved screen p for the machine code program)  
 LET 0 = GET 6041 (copy the stored screen so you can work again)

You can save the screen you are looking at with SAVE name 000119, but you can't verify it. Note that when you do "save" in the LOAD, SAVE and VERIFY commands, substitute your own filename, and try to include allow lines of Basic in for your guidance, machine code programs.

By Stephen Purdie, author of *The Drive 73 and Clavton Amstradpak* packages.



$$\begin{aligned}
 & 2 \times 10^8 + 5,431 \times 10^6 + \\
 & 5 \times 10^4 + 10^3 + 3 \times 10^2 + \\
 & 1 \times 10^1 + 2 \times 10^0 + 4 \times 10^{-1} + 3 \times 10^{-2} + 4 \times 10^{-3} + 6 \times 10^{-4} + 3 \times 10^{-5} + 2 \times 10^{-6} + 1 \times 10^{-7} + 0 \times 10^{-8} + 1 \times 10^{-9} + 2 \times 10^{-10}
 \end{aligned}$$





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00027	Torch 1000 Desktop Computer	499.00	499.00	598.80
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# CLINIC

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# Software for the BBC micro

# Graphics ROM



## The Graphic Extension ROM for the BBC Micro 12K

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- 1. 3D GAMES**  
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- 2. LOGO like graphics**  
By using simple BASIC commands (SET and GO) commands a 'logo' like language can easily control the screen producing intricate patterns by the most simple means. Including three examples as standard, BBC BASIC programs provide a system better than most. However, this being in the program's currently used in educational use for LOGO language.
- 3. The first section consists of a large number of general purpose programs, such as:**
  - **GRA** which will draw lines on screen, but also will set memory.
  - **GR** graphics routine allowing 8 x 7 co-ordinate plotting.
  - **GRA** character printing in a range of patterns.
  - **ROTTING** - allowing any part of the screen to be expanded or shrunk.
  - **SPIN** - an example that will rotate objects from any angle around the origin.
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# SCREEN DUMPING

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L-01

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

John Walsh, 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 waste to try and keep a screen dump program in memory at the same time as the game.

Many games relocate their video in memory, especially those that have been patched to run on the system, and so any program dump program would be unable 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 in any time, and dumped onto the printer. Finally, a Toolkit ROM happens to contain a command "SCREEN" which was just what we wanted. "SCREEN" file name" saves the screen contents, allowing automatically

## CLINIC

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

The next problem was how to achieve the OSCLI call. In reality we tried sharing the contents of ROM09, the keyboard read character routine, 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 place. We then decided to try intercepting the character entering video buffer every time a key is pressed, an interrupt is caused, and the ASCII value of the key is stored in the keyboard buffer, from &B0. 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.

List 50 contains the command that OSCLI will perform, "SCREEN: file name". The screen contents will be saved as a file called "file name". The machine code is incorporated into a fairly simple one or two page, but the command itself has to be higher in memory, as the BBC does not allow reading or writing of memory in one page. The screen will be saved when it is printed.

The "SCREEN" command keeps, and then starts saving when you hit a printed. Unless you have very fast cassette, your "keypress" will probably be missed a second time, and when as the start saving key, so it is probably best to wait the recorder before pressing it.

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 were here to stop any messages appearing, and also want a message error on the keyboard buffer on the OSFILE screen saving. The next 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 3 screen, and the correct block values on lines 470 and 480 would have to be altered to

LINE0: Interrupt routine to dump a screen

CODE: In base or dual, using the BTRND

2000: Toolkit ROM routine, SCREEN

OSCLI:HD=000

OSCLI:SB=SCREEN 0

OSCLI:SD=000

OSCLI:SM=000

OSCLI:SN=SCREEN

OSCLI:SP

OSCLI:SQ

OSCLI:SR

OSCLI:SS "Screen dump"

OSCLI:ST "0" pressed

OSCLI:SU

OSCLI:SV=000 000 000

OSCLI:SD=000 000 000

OSCLI:SB=000 000 000

OSCLI:SD

OSCLI:SB

OSCLI:SD

OSCLI:SM

OSCLI:SN

OSCLI:SP

OSCLI:SQ

OSCLI:SR

OSCLI:SS "Screen dump"

OSCLI:ST "0" pressed

OSCLI:SU

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# WHICH DATABASE?



Is there any program which stores data to be randomly accessed, and 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 Ferox package on an ordinary TV?

Data D Database, Here

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

your database, you could record represent a historical event. Each record might 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 'travels' and so retrieve information that way.

Some programs to consider are Ferox's P-D-File at £18.95, Gemini's Database at £19.95, or you could go for a plug-in

ROM with GDC's BeBASE at £45.95.

The problem with Ferox is that as soon as you enter the program, the screen is closed and reverts to where you left it. All the basic colour commands are no longer available, so you cannot set RGB or COLOUR. It would have been quite easy to have included colour commands in the Ferox ROM, but unfortunately Acornsoft didn't. It is, in fact, possible to change the screen colour, but this is achieved directly programming the video ULA via 'FX' calls, it is

not particularly easy. The best way of the response I can think of is to produce the letter blocks when entering on the keyboard.

At 054  
 W000 00  
 W000 00  
 W000 00  
 W000 00  
 W000 00  
 W000 00  
 W000 10

If you have a disk system, then you could 'BUILD' a file with those commands on it. It could then be 'EXEC'ed after entering View. Your screen could write a program such as W00000 0000  
 000000 W000 00  
 000000 W000 00

-and then 'EXEC' that instead. If you change mode after entering View, the default black-and-white will return. For further information on Ferox, look in chapter 20 of the Advanced User Guide.

Philip.

2 Hunterworth House,  
 Gloucester Place,  
 London W9J 6DD  
 Camden District,  
 18A (Orbiton Rd, Barnet),  
 Devon EX8 3DD  
 Tel 030701 0657/65

GDC (Cambridge),  
 24 High St, Sawston,  
 Cambridgeshire CB3 4BG  
 Tel 022331 8333/35

# 'TAPE-WORM' CURE

I am unable to load my own program as it successfully ran loaded on tape - still volume settings the word 'bit' appears, which the manual states means a cyclic redundancy check error - and that means nothing to a layman such as me. Can you help? RFD Wood, Chislehurst

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 the program has 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 on, an error has occurred. In other words, a cyclic CRC error means that what has been loaded into memory doesn't exactly match what was saved.

The fact that you get no message at all confirms that the wiring of your connecting lead is correct, so the problem lies with the tape recorder. Conventionally produced tapes such as the 'Welcome' tape need to be recorded at a much higher level than normal, in order to overcome recording differences.

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

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

Most compressors, including the BBC, require a good volume stand from the tape, but if you have no tone control then all you can do is ensure that the levels are close. As regards tapes, one experiment is that a good quality music recording tape such as TEAC may give better results. In the final analysis you may be faced with buying a 'compressor compatible' tape recorder, which should solve 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, Middlesex, Uxbridge

Acorn have now confirmed that they are no longer to manufacture the BBC Model A computer. With its limited life expectancy, the Model A had been overtaken by what now seems obvious, including Acorn's own Electron. The Model A has never been offered so the overseas market. Acorn have produced a brochure to support existing Model A owners.

# The Hobbit. Now the best is

...and the best is...  
...and the best is...  
...and the best is...

...and the best is...  
...and the best is...  
...and the best is...

#### MR J STERN says

I cannot remember your Hobbit...  
...and the best is...  
...and the best is...  
...and the best is...

...and the best is...  
...and the best is...  
...and the best is...

...and the best is...  
...and the best is...  
...and the best is...

...and the best is...  
...and the best is...  
...and the best is...

#### WHAT MICRO

...and the best is...  
...and the best is...  
...and the best is...  
...and the best is...

...and the best is...  
...and the best is...  
...and the best is...

...and the best is...  
...and the best is...  
...and the best is...

#### MR B J POLAK says

...and the best is...  
...and the best is...  
...and the best is...  
...and the best is...

#### SIMON MOORE says

...and the best is...  
...and the best is...  
...and the best is...  
...and the best is...

#### COMPUTER

...and the best is...  
...and the best is...  
...and the best is...  
...and the best is...

...and the best is...  
...and the best is...  
...and the best is...  
...and the best is...

#### JEREMY CREECH

...and the best is...  
...and the best is...  
...and the best is...  
...and the best is...

#### SINGULAR USER

...and the best is...  
...and the best is...  
...and the best is...  
...and the best is...

#### COMPLAINT

...and the best is...  
...and the best is...  
...and the best is...  
...and the best is...

#### CONDOX COMPETES

...and the best is...  
...and the best is...  
...and the best is...  
...and the best is...

#### MR F HUBBARD says

...and the best is...  
...and the best is...  
...and the best is...  
...and the best is...

#### COMPUTER NEWS

...and the best is...  
...and the best is...  
...and the best is...  
...and the best is...

CHRISTINE BURCHARD says

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- Epic 48k 48k
- Melrose 48k 48k
- R.I.P.D. 48k
- Sheriff 48k 48k
- Slime 48k 48k

#### COMMODORE 64

- Commander 64 'The Hobbit'
- Commander 64 'Rings/Quest'

#### ORIC 1

- Knight Of Heavy Metal

#### BBC

- BBC 'The Hobbit' 48k 1

#### BBC 1

- BBC 1 'The Hobbit' 48k

#### PC 386

- Commando (Expanded PC 386)
- Wizard & Phoenix (Expanded PC 386)

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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TOP

“The Hobbit” is a beautifully presented, traditionally excellent fantasy adventure — the better than I could have hoped for and certainly the finest of the dozen or so adventure programs there is about. I appreciate the four who worked for a year and a half.”

MR. PETER JONES, South Coast  
Nothing is certain in the Adventure but certainly add to the list brilliant graphics that are used to describe many of the locations and we have no Adventure that is going to become closer to the Spectrum.”

POPULAR COMPUTING WEEKLY  
“We are not eating food we are using sleep and it's great we are best in the Hobbit program.”

MR. JOHN HUFFORD, Essex

“The Hobbit” was immediately as dramatic about the program (very detailed, excellent) gave up some paydays to use it). Many children borrowed copies of “The Hobbit” from the library (read for Christmas)”

JUNIOR EDUCATION MAGAZINE

“The Hobbit” arrived and single handedly set the standard for adventure games to come with its sophisticated mixture of advanced language systems and beautifully detailed graphics.”

WORD ADVERTISERS





## UPGRADES COMING?

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

At Atari's London, London BBC software that doesn't meet the video RAMs are made use of the Telecom 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' RAM banks, nor printer, user, and joystick interface. The Electron is about the

the BBC, especially in the latter modes, and an upgrade will be a considerable one.

Solobak Technology has produced a General Purpose keyboard for the Electron. This has a Customarc interface, Atari-type joystick port, three sideways RGB modes, and other features. It costs £29.90.

**Solobak Technology,**  
17 Swanton Avenue, Southwell  
on Sea, Leics. NG7 7JG  
Tel: 0509 764474

## MODE METHOD

I have been trying to create a new mode of 80x24 two colour text only, so that it would only take 80x24 bytes or about 2.4 to 3K bytes of memory to 'wrap' the screen. In other words, it is a mode 7 with 80x24 text. I have tried typing in mode 7 via a video to which the appropriate parameters, but it did not work. Any ideas?

Don Mark Day, Birmingham  
It's a good idea, but unfortunately, it won't work. The mode 7 Television display is created entirely differently to all the other modes. If you look at the appendix to the BBC User Guide, you will see that mode 7 has no own character set compared to the others. The video command allows the BBC's OMS code to say how character chip to be programmed, and this in fact is used to create new modes. The Advanced User Guide contains a program to create a mode 7, which allows 16 colours to be used, but only requires 10K of RAM, something it to be used on a Model A. The catch is that you can only have 16 character across the screen.

## JOYSTICK SHORT-CUT?

I recently bought a Quickshot programmable joystick which was very tedious to set due to the need to load the joystick utility program (as the BBC, it would like to know if it is possible to change the current programmable interface to a non-programmable one which fits into the rest of the BBC's I/O where can I get it?

I would also like to know which word-processor to buy—any recent recommendations?

The Clavin Ring, Colwyn  
We haven't been able to find anyone supplying just a joystick interface for the BBC. Since the standard Atari systems are so satisfactory for using with arcade games (even with the addition of rubber bands), it is surprising that

you can't get one up with an adaptor to allow Atari type 400-centring joystick to be used.

With regard to word-processor, as a general guide the more features you pay, the more features you get. Computer Concepts's WordStar (£35 inc 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 are made as menus in Teletext mode, which allows a very clear display, with good use of colour if memory allows, your text can be previewed as mode 5, 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.

Amstrad's Pro (£29.90 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 sight.

Text editors can also be set into memory to be edited, although it is not as transparent as the famous 128K colour WordStar. The 128K comes with a very thorough and well-written introductory booklet, and has a separate flip-over reference manual.

Wordprocessing and double strike is done by entering special codes, which is tenable on a wordstar printer driving program you have in memory. These codes have

to be brought separately.

Amstrad's ModPro uses a Mode 3 green-on-black screen to create text, which may not be very clear on some monitors. Unlike the previous two ROMs, commands are entered with direct null characters.

We suggest you go either for Pro or Wordstar.

**Computer Concepts,**  
18 Weydon, Chippingfold,  
Herts MK45 9UJ  
Tel: 09927749727

**Amstrad,**  
c/o Vector Marketing,  
Dunstable Farm,  
Willingborough,  
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# THE SUPER-DOODLER

CLINIC

**T**he difference between an old-fashioned camera-focussed pen and the state-of-the-art that they are, Hewlett-Packard's new pen, can be put so much like the well-known fundamental principles of graphics as words, we appreciated 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 is linked to the BBC Micro pen and motor ribbon. A 'pen' is used to move around the surface of the pad, a cursor trace appearing on the equivalent place on the screen. The resolution of the pad is 500 x 256 pixels, exactly that of the BBC Micro. The pen has two positions, up and down, depending on whether a 'tab' 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 both

processors every 1/60 of a second. X co-ordinates 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 respectively Prog1 and Prog2. Prog1 is mainly for use within a user's own package, it simply converts 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). Also the 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 GAD package, allowing the user to define symbols and shapes, and even store as characters of 16 symbols each. These can then be placed on the screen, and connected with lines, coloured as or whenever. As yet, busy things like windows, windows box 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 will

be a bit unstable and appeared to jump as the screen. The software is also sophisticated in comparison with some other graphics systems (for example, the Macpac), but having said that we hope will help the knowledge able user develop their own system.

**By De Peter Thomas, technical editor of Computer Amateur.**

Graphpad (140) on VAD and CAD program £100 on VAD from British Micro, Parkfield Works, Imperial Way, Northallerton, North. Tel: 0823-49223.

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An Introduction to Micrographics



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# GRAPHICS ROM

**E**xcellent graphics facilities are one of the BBC Micro's main attractions—but even in the machine there are things missing (apart from memory, which is vital to good creative design). PAI, and GEMME commands would have been useful, but the designers have seen fit to leave them out.

To close the gap some way, Computer Concepts (designers of Windows) 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 generators programs that create easily manoeuvrable graphics characters in the January issue of *Computer Systems Machines* such as the Command file *Sprite* (see review on this page), and created three through hardware, but others, such as the BBC, can only manipulate pseudo-sprites through software. This worked usually means a memory or disk file to be loaded each time the user wants to design a sprite. However, all the routines for designing up to 16 different sprites are built 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 *MEMBER* (address and) to address two times the space you will depend on the mode you're using—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 hexcode, the manual gives two hexcodes that should provide enough space for most users' needs. The manual contains some care in the way it helps the less knowledgeable user, but unless usually there are some places where important commands or codes have been left out, so users do happen to be misled.

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



WANT TO MAKE MORE OF YOUR  
MIM'S GRAPHIC CAPABILITIES?  
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they are quite good, a new-looking screen for instance, moves rather slowly and with a constant flash that is more like a character being moved and over-printed than a sprite. This, however, is more the fault of the host'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 Paperstrip. Computer Concepts' Logo has simple functions such as *MOVE*, *MOVEP*, *TURN*

THE GRAPHICS ROM ADDS TO THE ALREADY  
EXTENSIVE FACILITIES OFFERED BY THE BASIC  
MICRO. FOR MOST USERS, THE 30 NEW  
COMMANDS WILL BE MORE THAN ENOUGH  
TO PROVIDE SOME EXCELLENT DESIGNS

## SOME COMMANDS INCLUDED IN THE GRAPHICS ROM

**ALL** sets an area for the *Picture* command.

**CIRCLE** draws a circle of specified size, radius and colour.

**DISQUAL** sets up a grid of specified size, an address up to character is defined.

**END** returns to a given screen.

**FLM** makes an entire line response using styles.

**GPS** gives the user help on other about the uses of graphics routines and shows the results in the resident program modules *RM*, *RT*, *CM*, *CM*, and *L*.

**MODE** is to set some modes themselves up to 128 of memory (over 16 screens) and sets a resolution of 10 x 32 character ROM x 236 graphics.

**PATTERN** creates multi-character, plus graphic or patterns to be drawn on the screen in *OFF* and *ON* colours.

**PRINT** plots a grid point in any where on the screen.

**PUT** plots a point between characters.

**ROTATE** rotates the position of a point plotted in hex printed about the screen co-ordinates (x, y) through positive angle.

**SCALE** changes the position of the a given and the *angle* (angle) from *center*, setting the same of the algebra to the same relative use.

*WAVE*, and so on. It has used in a simple program, the Logo commands can produce some very complex patterns.

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* as Basic, the implementation in the Graphics ROM can only be used as graphics mode. There are three parameters after the command that allow the user to place multi-parameter, multi-line 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 make good effect, the *PUT* command. Instead of working in the usual two dimensions, so extra parameters give any point and position a pseudo third. With a point is plotted in the position, in relation to the screen, it then is drawn of a plane going into the display, as well as the other two going north and up. With a function such as this, there are obvious advantages for the 3D screen 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 system for a command. We found if you explain the manual, it's well possible to use virtually all the commands from any of the system messages and the help menu.

From our impressions of the Graphics ROM, we think Computer Concepts has another winner on its hands. Yet again the target 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, multi-writer on *Computer Systems*.

The Graphics Rom costs £29.95 (inc. VAT) from Computer Concepts, 18 Wyndale, Clippesbury, Herts WD24 8J. Tel: 02275 47777.

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by Brian Smith

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## ADE TO BEEB ASSEMBLY

**D**espite its ubiquitous-sounding name, ADE is not some universal might, but a new ADEE 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 on Beeb, assemblers and debuggers. 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 FOR.

In addition to the EPROM, the package includes a disk containing a "reference" listing which allows macro listings to be sorted and annotated, a system library providing general purpose macros, a formatter (used when printing), and a disassembler program which shows how ADE can be used.

The text editor is screen-based with the screen split into three parts, the editing, information and command areas. It works very much like the Turbo 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 F8 (delete char), and so on.

In command mode all the editing is done by entering commands in the command area of the screen (the character-based line). Commands are entered and recognized 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 repeated 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 load 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. This editor could well prove to be useful for applications other than assembly development work.

As well as occupying the full ADEE software set, the assembler will run on the following pseudo-ops: LABEL, AND, XOR, SHL, SHRR, WEB, MOV, COMPARE.

with into the specified library LABELS AND LIBRARYFILE NAME macro - controls the macro when they are specified code.

LABEL CPU FILENAME - shows in the PROGRAMS for assembly. Check must be locally specified. It is not possible to create a control file consisting of CPU operations.

ORG and END - 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 program development on

TOP - shows assembly.

The spy debugging utility is a serious debugging utility which shows the status of the registers and displays a block of code as ASCII, hex or as a disassembled listing. The instruction to be disassembled is highlighted. Debugging is carried out in one of three ways: single stepping through the code using the "S" key, by stepping breakpoints in the code using the "BP" instruction, or by explicitly inserting a breakpoint in the code by inserting an instruction in memory.

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

However, there are default set with the 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 original breakpoint has to be used in the instruction which it overwrites, but the stack has to be displaced by three bytes and the PC back-tripped by one instruction.

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 rewire registers, would make this utility more like those available on micro-computers.

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

**By Derek Lohman, a computer consultant.**



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memory. The only way to select a connection between modules is a linker or get available, and the absolute substituted addresses are not known, it is done jump-stacked out tables for each module.

TL - allows words to be passed when the module is assembled and listed. The assembler produces listings compatible with those produced by an assembler on a microcomputer. VIEW - allows VDU commands to be sent to the OS and are the same as the Beeb VDU codes.

TR - allows TR commands to be sent to the OS.

TR - allows changes to be sent to the printer during assembly giving an indication of how the assembly is progressing. UNP - skips one or a specified number of lines.

ADE is provided on the VDU system software.

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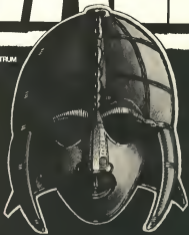


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## ANSWERS

FURTHER  
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Despite obtaining the Commodore 64 Programmer's 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?

at T. Comptel, Co. d'Europe  
The 64's function keys are not really programmable function keys at all; they simply generate the ASCII codes 110-120, and are consequently recognized by receiving 8086 as carriage returns in your program. There are a wealth of examples in *Basic Programming for the Commodore 64* by Ian Stewart and Robin Jones (published by Pitman) (p. 95).

Other disk drives than those from Commodore are possible to use via IEEE488 interfaces. 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 opening routine is rather a pain to use. Alternatively, you will probably do better to stick with Commodore. They also use printers that interface directly with the serial port of the machine. The 1120 printer, although more expensive, being noticeably better than the 1125.



## PRINTER CONTROL

I am having difficulty in using my Commodore 1125 printer under program control. While it is easy to get hard copies of program listings, so to speak, the Commodore printer manual does not seem to include instructions within a program to print output, file contents and screen dump. Can you help?

John P. Moss, Sheffield  
Duplicating on a printer on the Commodore 64 requires that

you use the printer as a file. The first job is to define a channel number for the printer, then you can use any number you want using for name when file (such as the channel). So you could enter:

```
PRINT #1  
OPENPRINT 4
```

(because 4 for 5) as the printer device number. Now to print a message: PRINT #1 "Hello there" which sends the symbols "Hello World" to channel 4. What it doesn't necessarily do is print them, because the Commodore 64 has a buffered file system, and in 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 issuing the file #CLOSIOFFPRINT.

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

So far as copying a file is concerned, it is only necessary to read things from the file, and print them to the printer as shown above. A screen dump can be achieved by PRINTing each of the screen locations in turn and printing the equivalent characters. For example, the top left hand corner of the screen is at 15286 so what a PRINT command will output on screen. 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 on the row. (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 instructions book—does the warranty cover both? What can one do?

C. S. Davies, Essex

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

the cartridge plugged in. SP87-10-84

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 replacing 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 may realize 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—but do you test a manual?

## INTERFACING

What would be the cost of an interface to connect an Electronic 5 disk drive (printer)?

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

William Lupton,  
Newbury, Oxford

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

A Commodore 1125 or 1120 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, Leeds

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 avoid if it keeps with an error as for an INPUT statement by POKING 20000. 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 POKEing the ZX Spectrum crashes.

## KNOW A GOOD MODEM?

Is there any software available at the moment which will enable me to use a 2400 baud modem with a ZX Spectrum (with H.S.I.2 interface)? If not, what alterations would be required to show up and down loading of programs, as well as straight forward data transmission with TBSB systems and Provis II?

A.J.Winter, London

Spectrum Communications. Triotype programs from JRV Software will allow a ZX Spectrum to communicate with both Provis and TBSB (including our own CAUSE). It can be set to 2400 or 1200/75 baud operation.

While it will allow straight forward communications and the wonder if there are Xmodem error checking programs. Spectrum by Andrew Chisner (published in the March issue of Computer News) has Xmodem, but currently is not configured for 1200/75 Provis and both use the Morse Morse interface (also available from JRV Software).

JRV Software,  
125A Highgate Drive,  
Stroud, Glos GL8 2JL.

# LOAD PROBLEMS

I wrote a program to aid the selection of bytes for search services and print it on their systems and have had consistent loading problems. Program has a basic title line, including many media-stations lists, with large (120x45) character section for bytes search with character codes. Taken about 3.5 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 re-loads four times out of five, with an error in loading report. Other programs load and run with total reliability. This problem has prevailed while about 10 lines have been added to programs, so necessary limits does not seem to be the cause. Can you help?

C.M.Jones, Devonport, Devon  
The screen lines around the error (the loader) will be confused - that is the data you are seeing coming in from the tape recorder. It could be if your system variables are corrupted, and that the program

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

It is also possible that due to the long loading time the noise from the mains power supply may be upsetting the program. To test the idea, try putting up another long tape by using a large data extension as a program, so that entering another program has given to that of necessary error! Save this, and then try CLEAN.

This should determine whether you're having some more problems.

## MODIFIED MONITOR

Where can I obtain a suitable disc player to connect my Spectrum to a US-made APP cassette interface? The monitor has two tape ports (15 and 16) and 'high impedance'. I would like to retain the Spectrum's compatibility with the domestic CTV.

J. Harris, Devonport

The US monitor needs on a transmission frequency of 60 KHz, and the Spectrum works on a frequency of 50 KHz. This may cause some problems relating

to the TV channel capabilities

input in the one to use, and should be obtained from the appropriate interface via its edge connector after connecting the VHD strip inside the Spectrum (on Models 1 and 2 only). This is just the video monitor (the large metal box), the connections on the spectrum interface are detailed in the manual under LOW VOLTAGE and OUTPUTS.

Model 1's have the video output connected direct to the edge connector. You can operate both at the same time, but expect some degradation of the TV signal.

## BOARDING UP

I have bought a Hi-pak 2000K81 sound board, which is now being advertised for the Spectrum, and would wonder if it could be used on the Spectrum without a connecting us interface.

I have also bought a Kempston Controller joystick for my ZX Spectrum, and wondered if it is compatible with my ZX81 by using the machine code conventions in part of a standard library.

The Hi-Pak sound board will work directly on the ZX Spectrum

as long as the interface 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 an A-D converter in the input of the joystick. Each direction sets a different number in the read/write mode. The read is zero when the stick is in the central position, the controller then sends the Kempston-Pro joystick one product two numbers, if used on the diagonal directions, and a check for three more to make up the program.

## SPECTRUM ON-LINE POSSIBLE?

Is there any equipment available to do so?

Can fax and Datalink on the Spectrum?

J. F. Jones, Birmingham

No, there isn't. As it is a one way driver (from the TV to the user), Section 1000 is the only extension of providing a line.

## DECIMAL SPREAD

Is there any approachable package for the Spectrum which gives numbers correct to decimal places, with automatic rounding up and down?

Inside that the Provis PacCalc program uses only integer arithmetic on the Spectrum version, whereas on the illustration of the EMU version it shows an answer to two decimal places.

J.H. - edited, Birmingham

While you first load Provis PacCalc from tape, the default format has the value a program.

However, the program can handle real numbers with nine decimal places. The command to convert the entire table to real numbers is (R)ALL - on the one can set individual cells to display integer, real, or decimal format for each type.

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

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## DIRECTIONS EXPLAINED

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

*G. Jack, Birmingham*  
The direction FCB (Fixed Constant Byte), FDB (Fixed Double Byte) and FDC (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 @LAMP, FCB 76H is 42194D.

FCB is used for 16-bit values between 0 and 65535, for example @LAMP, FCB 207H, and FDB is used for strings for example @LAMP, FCB 76H is 42194D.

FCB will make the ASCII value of the characters in the string into memory locations starting at @LAMP.

These commands are only used from assembler programs, and, in effect, replace variables in those programs.

## AUTO-REPEAT POSSIBLE?

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

*Brian Adams, Coventry*  
You can simulate an auto-repeat function in your program by repeatedly REPEAT

between 200? This holds the ASCII value of the key being pressed.

Dragon Data say that the BREAK key can be disabled by accessing the return address of the 'read user message' ROM address by 4. This can be done by getting a jump substitution at location 40104, which should point to a routine of your own which

should pull the most recent return address from the system stack, and then to a real-time patch to back into the system stack. Your routine should finish with an RTS instruction and the will bring the BREAK checking routine.

Programs can be made to auto-run with a local software interrupt, but once again, this will involve you in some non-trivial low-level programming (see comment) that you invest in a good assembler/debugging package! Before your main program starts you will need to have a machine code program which will make the start address of Basic's RUN routine into location \$PROM CLOADM. Your own program and then call the BASIC routine as BASIC. This program will need to be in memory protected by a CLOADM command.

In the January issue of Computer Journal there was a full article on ethical assemblers, giving details of supplies.

## DUMP CODES

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

*T. J. O'Neil, Kent*  
The following code will (very slowly) dump a 64-line screen from the Dragon to a Seiko-EPSON printer. It would benefit greatly from translation into machine code:  
 10 P=PAGE+SCREEN\*12  
 20 PRINT (-C)CHR\$(P)  
 30 FOR Q=0 TO 63 STEP 1  
 40 FOR V=0 TO 63  
 50 A=PEEK(P+Q+V\*64)  
 60 A=CHR\$(A)PRINT

```

    70 Q=Q+1:IF Q=64:PRINT
    80 Q=Q-64:PRINT
    90 Q=Q-64:PRINT
    100 Q=Q-64:PRINT
    110 PRINT (-C)CHR$(P)
    120 NEXT V
    130 NEXT Q
    140 PRINT (-C)CHR$(P)
    150 NEXT P
    
```

To use the program, press your printer at P=PAGE+4, return to user mode and then (your printer will be in memory) end load and run the dump program.

## ATARI

### ATARI 'JOYSTICK BUTCHER' RESTRAINED

Can I butcher my Atari 2600 games machines to work on a Spectrum 48K? If yes, 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 1 or 2600 I and 2)?

*S. J. Meehan, Leeds*  
The answer is a big no. But during 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 systems in the February 1984 issue of Computer Answers.

## MACHINE CODE LOAD

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

*K. Parker, Aberdeen*  
The Atari loads machine code programs the same as a disc basic program. Most machine code programs are loaded in. To do this, put the tape in the recorder, press 'play', then watch on the cam viewer while holding down the

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

If programs will refuse to load, try cleaning and decontaminating the heads. Most department stores offer a special tape that will do both in one pass. Don't forget that the Basic cartridge must be removed when loading some programs. Games may not be loaded over the TV set or other sources 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 DIN port instead of a standard 5 pin DIN, as others have? Where can I obtain leads with 13 pin plugs? Can I obtain an adaptor to connect the Atari for use with a 5 pin DIN plug? Can a printer be used with the 400 Mega, home, and which are the cheapest

available using glass paper?

*S. Gwynne, Aberdeen*  
You don't say why you require a 5-pin DIN outlet. Mr. Consable, which makes ink available as we could have faced a way round your problem. Unfortunately, we know of no adapter of the type you mention. The only source of 13 pin plugs we can think of is Atom themselves. Try ringing their Customer Relations Depart-

ment on 02733 2444 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 870 produced by Atom, or one of the ones on the market which plug into the system port.

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

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## MODEL HARDWARE

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

C. J. Sall, Cuckoo, Devon  
Nothing seems to be currently available to interface the Oric 1 to the real world, although Tansend Microsols Ltd are currently advertising an I/O board as 'out soon'. Apparently the board will have a 2525A VTA chip to give three 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 inter-machine communication.

Tansend Microsols Ltd,  
403 Dulver Road,  
Luton LU1,  
Tel: 02583 41 8956

## APPLE

I see from the May issue of *Computer Answers* that the GDS II lightpen costs £249. In October 1986 U-Microcomputers were advertising a lightpen for the Apple II at £149 however, they're now using the name to supply their line. What is the reason behind this enormous price increase? Surely if other computers can advertise a light pen for the £89, more at £14.99 it should be possible to do the same for the Apple.

R. J. Bates, Plymouth Heath, West Devon

The difference 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 passive I/O socket on the motherboard, and Basic subroutines are published to operate it, which can be accomplished from programs.

The LPS II (Johnson 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?

Phil Davis, W. Sussex  
If any program containing DATA statements is saved on cassette, then clearly what the program is loaded upon the DATA statements will appear with line numbers. However, if a version of memory containing data is saved, then no line numbers will appear, because programs 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, some variables do not store their character contents explicitly so the data area pointer is held after each string data-item showing where it starts

contents is found. This can make the saving of Oric data on cassette an awkward task.

The Aquarius and the Oric are in different price levels, and naturally the facilities provided correspond to their price. Aquarius Basic is licensed, and if, as the first part of your question suggests, you want a data recovery 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 BASIC 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 compression is where the array can be read, integer or string. An optional 5 can be added for storage at 500 bauds rather than the central 2400 bauds.

ORIC1 can be used to load an array from tape, and has a subinstruction to STORE.

For a sophisticated wide system network system on the Oric, a good choice is *Two-Dots by Tansend*, which works with a 2525 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 main licensee. It is very basic (with a string 4K of RAM) and not suitable for serious work.

More information on the Oric Atmos is available from *Oric Products International*, Caswell Park, London Road, Ascot, Berkshire SL5 7SE. *Oric* files are available from *Tansend*.

Units 1/2, Courtledge Technic Park, Harlow-road, Cambridge Tel: 0223341224

# LIGHTPEN PRICES

all the operational voltages to its energy capabilities. A soft wire driver is located inside the computer's video signal, ensuring the exact spot position of the scanning dot is known. This allows accurately tracking the pen across the screen and real-time drawing.

There are four complete hi-res drawing systems available, offering all the required

graphics operations together with hi-resolution generation.

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 *Pen Touch* from Robinson is highly recommended.

The Gibson Lightpen (GDS II)

at VAD is available from **FACE**.

79 Nine Cross St  
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# STUNG BY THE HUNG

I lost my system. Master disks lost my Apple II and type.  
FROM PRILIMBACH  
(RETURN) (RE TURN)  
LOAD COPY A, (M) TURN  
& P 1000 (RETURN)  
& H (RETURN)  
...DAD COPY A, (RETURN)  
& M (RETURN)  
and the computer  
'hangs'. How can I avoid this?

Alan de Mee, Ipswich  
We have tried the operators 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 addresses after each of the quoted operations to see if any fault is readily apparent. The program disk *Master Disks* from Milton may prove very useful, as it will test the memory and much more, of your Apple.

However, we had to ask why you are carrying out these operations at all, unless it

was to illustrate a fault, as they will result in two identical sequences of programs in the case of your memory, one starting at line 10 and the other at line 1000. Normally this facility is used to combine different sections of programs, stored on data, into a single program. Care should be taken when using this feature because line numbers do not occur in any of the sections to be combined, as both sets of statements in these line numbers will work. We hope these points avoid any





# The Quill

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# UP-MARKET CHOICE

As a new entrant 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, do a little BASIC.

Steve Dugg, Lees

Where should we start? There are many machines on the market, with so many intended for kids and pros and ones that we could fill a year's worth of Computer America sending this question (or almost as many).

However, we can narrow the field, given your final comment that you are used to using a powerful professional system, and would therefore like the more powerful machines rather than going to what we'll start by ignoring three computers with a price

range of five, limited memory capacity, poor displays, and responses at poor quality peripherals. The Dragon and Vis 20, for example, have by current standards, inadequate displays and rather primitive implementations of BASIC.

The Spectrum has a good BASIC (as a Pascal compiler is available from Hamit) and a case steadily displaying some people find the alphanumeric keyboard annoying, although given a little practice, it can be mastered to an adequate degree. The Commodore 64 is a substantially complete machine and has a number of useful features, but as BASIC is poor, and peripherals (such as disk drives) are somewhat slow and too cheap.

On this, the Spectrum stands out with a price of £200.

Microdrives (with the appropriate interface) costing only about £150 for about 10MB of on-line storage.

The BBC Model B has an excellent BASIC and a number of other languages available (such as Fortran and Logo), but, in the current market, does not overprice at £200.

The Sinclair QL, with its impressive specifications, can be regarded as a best buy for someone in your position. After all, a BBC Spectrum with dual Microdrives could cost you around £260, for an extra £140 you could be getting an extra 80K, a clock processor, slightly improved Microdrive, an extra 16K102 interface, and the facilities for an extra 4-5 MB of RAM and Winchester disks.

So there you go—hope you find these 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 neither under £100 have considerable distinctive features in their programming skills (that is, 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 £100).

Andy Dorell, New Street

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 dual-key of the Spectrum a little disconcerting, although you can alternate this by making the machine beep whenever 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 high-level version of BASIC. The Commodore 64 BASIC can most likely be described as primitive. It is an implementation of Microsoft BASIC which has not been updated for almost a decade, so there are no built-in facilities for handling colour, alphanumeric or round. In particular it is not at all easy to draw graphics displays. In contrast, Spectrum BASIC is among the most available. It is not that, but that doesn't really matter. It has powerful graphics commands, excellent error checking (the 64 will allow you to make the same error as typing a program dozens of times, only when you run the program does it tell you about it, that 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 entries already entered—a very useful and convenient feature.

The Commodore 64 has one of the most sophisticated sound chips available, capable

of acting as a portable synthesizer. The Spectrum, on the other hand, has only a simple tone channel, although it is very easy to use.

As far as peripherals are concerned, the advent of hard-disk Microdrives has put the Spectrum ahead of the opposition in terms of low-cost mass storage. The Microdrives really are an acceptable alternative to disks, and for most users, are not significantly slower.

On balance, these considerations tend to point to the Spectrum, particularly as you mention a top price of £100, for which you can buy a BBC Spectrum, whereas the lowest offer we have yet seen on a Commodore 64 is £105. You may add to the latter figure about £30 for the special cassette recorder which the Commodore requires.

## DOES DISK CONNECT

Is it possible to connect a Cyber disk drive to a Sharp Model A?

If it does, it's Thom

Sharp's own disk drives use 76 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 year 4482 assembly listing of 'Lilly' (Computer Answers October issue) to a 280 assembly listing, suitable for the New Britain.

David Steve Leonard

A full translation from 280 to 4802 code would take a considerable amount of time and effort. It would probably be slightly easier to hand-translate the Basic listing of 'Lilly' given in the previous issue to the one that the 4802 listing was published in (that is, the September issue) than the October issue! What would be a lot easier would be to translate the Basic listing into Pascal and then use the New Britain's Pascal compiler to produce a binary file that should run on an acceptable speed.

## MUSIC TO LOAD BY

I have read that it is possible to re-record a cassette program and an unaltered track at the same time, so that when the program is loading you hear the actual sound track, not the squawks of the program. How is this done? (I have an Atari 800.)

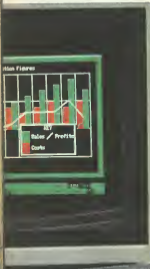
Richard Brown, Feltham

The answer you is simply to record a sound track onto the tape cassette first (you will need a stereo recorder), so that 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 POST seems to be able to use the 410 or 1810 Atari sounder POST seems to will come off.

# New-Sinclair QL

## There's no comparison chart, be



The Sinclair QL is a new computer. Not just a new-looking computer, but a totally new sort of computer - nothing like it exists anywhere.

It's not just a bit better than this, or a bit cheaper than that - it's a computer built very hard to compare with anything, but check the features below - and if you don't agree, take up the challenge at the end of the other featured.

If you're 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 months after 128K RAM, or twice as standard. The 'What Interest' table for December 1983 lists over 50 of them - but 400 of the 50 more listed cost over £5000.

The Sinclair QL offers you 128K RAM for under 1400, and an option is available to 240K. That's a lot of bytes for the pound!

### The Sinclair QL has a 32-bit processor. Who else?

Under £7500 nobody else! 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 68000 family - widely regarded as the most powerful microprocessor available - will remain a luxury.

Yet with the Sinclair QL, the 32-bit 68000 is available for less than £400.

You can't be sure that the QL will not become obsolete. 32-bit architecture is future-proof.

32-bit processor architecture, 128K RAM, and QDOS combine to give the QL the performance of a micro-computer for the price of a micro.

### Exclusive: new QDOS operating system

No competitor's QDOS offers a new standard of operating system for the 16000 family of processors and may well become the industry standard.

QDOS is a single-user multi-tasking, time-sharing system using Sinclair's new SuperBASIC as a command language.

One of the 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 positions of the screen. These are features not normally available on computers costing less than £7000.

### Seven input/output ports

QL ROM Cartridge slot  
2 x logic ports 2 x RS-232



### New professional keyboard

The QL keyboard is designed for fast input of data and programs.

It is a full-size QWERTY keyboard with 68 keys, including a space-bar, left and right-hand shift keys, two function keys and two programmable cursor-control keys - key which a pointer and screen.

A wristrest beneath the keyboard protects the machine from dust (and coffee) and for users who find a angled keyboard more comfortable, the computer can be used upright at the back by a real desk-side fit.

# £399

# because there's no comparison!

## Advanced new friendly language - Sinclair SuperBASIC

The new Sinclair SuperBASIC contains the functionality of BASIC with a number of major developments which allow the QL to power into the 1980s.

Unlike conventional BASIC, its procedure facility allows code to be written in clearly-defined blocks so that it is readily alterable without procedures to be added which will work in exactly the same way as the command procedure 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 20-Megabyte, large capacity (at least 100K bytes) floppy disk drives data transfer rate. Typical access speed is 10 seconds and loading a full up to 50 bytes per second. Two Sinclair QLs may both use microdrives. If required a further two units can be purchased.

Four Mark controllers are supplied with the machine.

## Included - superb professional software

The suite of four programs is written by Peter specially for the QL, and incorporates many major developments. All programs use full colour, and data is transferable from one to another. (For example, figures can be transferred from spreadsheet to graphics for an instant visual presentation.)

### Word-processing



ENTER INTO A NEW WORLD of software. QL Quill uses the power of the QL. It allows you to write nearly what you lay on and to print out exactly what you see on the screen.

A beginner can use QL Quill for word-processing within minutes.

QL Quill gives you all the facilities of a very advanced word processing package.

### Spreadsheet



QL Active makes professional calculations and what if? model construction easier than they've ever been. Sample applications are provided including budget planning and cash-flow analysis. QL Active allows you to enter tables, columns and cells by name, not just letters and numbers. Function keys can be assigned to change variables and construct a complete table of calculations with a single key-stroke.

### Business graphics



QL Active's high resolution colour program package to use you probably won't refer to the manual but try it. Anything from line charts to 3D bar or histogram overlays or stacked bars is possible. QL Active does not require you to format your display before entering data; it handles design and saving automatically or under your control. Labels can be added and altered as simply as data.

### Database management



QL Active is a very powerful filing system which sets new standards, using a language more complex than BASIC. It contains state-of-the-art file applications - such as software - with huge power at a cost - for data processor.

An easy-to-use labelling facility means that you don't have to label your file by its full name - a few letters are enough.

## New - the Sinclair CLUB

The CLUB is the QL Users Bureau Membership is open to all QL users for an annual subscription of £9. CLUB members receive one free update to each of the four programs supplied with the QL, and an 80 page monthly newsletter. Sinclair has also made exclusive arrangements for CLUB members to obtain software assistance on QL, Quill, Active, Archive or Quill by writing to Peter.

## The Sinclair QL challenge

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**GREEN TOAD**  
This is the toad version of the original game. You must solve a series of puzzles to escape the forest and find out what happened to the other toads who were sent to the forest.

Help him cross the river on the log and finally to reach the safety of the 3rd castle. This version costs double the price of the original version. The game is available on the MSX-DOS-1 and DOS-ATMOS.



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# OPERATING SYSTEMS

THE SECOND PART TAKES AN OVERVIEW OF THE OS MARKET

SHOWING JUST WHAT IS A VARIAME AND WHAT YOU SHOULD LOOK FOR

**W**hen considering which is the best operating system, the question 'for whom?' must be asked. The programmer and the end user will be exposed to very different things.

Simply put, a good range of packages and an even greater number of variations of given packages is the business aim. The computer expert, on the other hand, will expect a very range of sophisticated functions, a wide variety of languages and many system utilities. There will want to a multi-user applications, personal processors and proprietary and nonproprietary.

There will be some of the more we'll be looking at in this, the second part of our overview of operating systems—distinguishing between the three common systems, the old favorites, and those typed for future success, finally closing on the handle for multiplatform.

All OSs will provide the basic data file functions of copy, move, directory listing and format, but the more sophisticated systems will incorporate many others. The large systems now offering an option (Unix and Pds, for example) are here not because they have been trimmed down to fit, but because the market has grown to encompass them.

The greatest jump in power comes when the user is made from single to multi user. To have a 'real' environment a whole range of goods then have to be incorporated. Password protection is needed, preferably with a separate screen mode and, going well beyond, a queue-oriented user read, write and execute. Looking the protection against the user is not always 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 several levels, some only allow the look or view of the file.

## CONCLUSION

Apple, Commodore, and Tandy dominated the early years of the UK micro business. The micro world left to just the state way as the manufacturers are in present very manufacturer dependent. However, to the surprise of many people, especially the powerful manufacturers, portability seems to have superseded the 'best' approach.

This already can have many benefits for the humble user, but it also forces the buyer into having to already which operating system to go the same machines offer very many operating systems, the IBM PC is no out as hardware (at the best times).

Of the three early manufacturers' specific systems, only TRSDOS from Tandy looked something like an operating system of today. The Commodore DOS (also 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 environment on computers.

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 enter load programs and some simple drawing of output and file protection against deletion, but not password controlled. Fac-

ilities for loading, saving, and executing machine code programs are provided. The IBM (Sophisticated Operating System), powered with the Apple III, improved on a number of features, but still falls the short of the class in some respects. It is a close contender, and offers some input and output routing and it was also revised DOS 3.3, which stabilizes it as one of your old favorites Apple II programs (including the graphics games).

The latest to hit, the Lisa, is no different that competitors are difficult. The seven main applications (LISA-MAIL, LISA-PROJECT, WRITE, GRAPH, DRAW and TERMINAL) are seamlessly linked with the operating system to such an extent that applications and operating software really fit together, this is no surprise, as it was the original design intention. For a discussion on the concept see the section on Smalltalk (Comdex), the system on which the Lisa was based. At present only one state of accounts packages exist for the machine in the UK.

The first Commodore Pet computers, the 2001, was a cassette based system and therefore had to need for a DOS. LISA versions (2000, 4000 and 6000 series) all included a ready-improving operating system, Commodore DOS as part of the BASIC stored on RAM, and hence it does not have the same 'fall' as the more conventional disk based systems that have separate command languages of their own. Despite this point, it has all the features 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 the more user-friendly. The system had help levels, both short and long error messages and an error check.

All the above manufacturers are expanding, in varying degrees, to regain the evolutionary momentum of micro computing and word maintenance. Apple has been able to support (although not from Applications) CP/M for many years, but the use of a DOS card, and Lisa is open to have Unix and CP/M on the Commodore is agreed to soon be offering CP/M and Unix on all new micro machines. Tandy's Model 4, an unapproved version of the Model III, now supports both CP/M and TRSDOS, and the Model 6 Unix.

The Digital Research family is probably the largest of the operating system families. It consists of the following users: CP/M 80, CP/M PLUS (1), CP/M 86, Commodore CP/M, MP/M, MP/M 86, CP/M87, PARADIGM, CP/M.

It all started in 1977 with Gary Kildall writing his own operating system for a single disk system for use handling for fun. The result was CP/M (Control Program for Microcomputers) which was written on 8080 hardware. This was capable of running on just three 8 bit chips, 8080, 8085 and the 280, and although it had many faults it became the de facto standard. It is well worth us today, after a number of revisions, but tends to be known as CP/M 80 (the '80' is 8080) or differentiates it from the 16-bit versions, CP/M 86 (the '86' is 8086). The first version of the multi-user system MP/M for the 8 bit



The Olivetti 1/2 floppy diskette business unit runs Digital Research's CP/M 4.0 - although it has some faults it became the de facto standard for future operating systems.

market 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 or PC/M. This is to be a little brother to the disk system, allowing greater interchange of software (the more details see Computer Answer 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 for CP/M 3.0 has been released, which offers a number of improvements, bringing it to last year's CP/M 3.0 - while still maintaining CP/M 3.0 compatibility.

#### IBM AND MICROSOFT BATTLE

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 Altair computer. 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 boot-up times.

Rather than concentrate on the system in isolation, we are going to try and produce a compact and covered system, using the top offerings from each company: MSDOS 2.0 and Classroom CP/M.

Both systems have time and also changing in the disk directories, background printing (in a updated disk file), accurate program loading and sophisticated disk handling using native and formatted characters. Classroom CP/M has a full range of passwording, good help levels and more with query (seq). MSDOS 2.0 has many similarities to the multi-user system Unix, but it is not yet directly compatible. It has nice document, a sophisticated

batch system, with utilities to sort out and find in well-organized files.

In addition, the Unix-like "Pipe" system to redirect output and output is also provided. The big difference though is concurrency. CCP/M can run four "processes" at the same time - one at a time, in the foreground, and up to three are virtual and in the background. Therefore the user can switch from one task to another in the past of story.

#### UNIX PARALLELS

Unix appears to be an operating system that appears doing more, but not all good. While scanning the text we have come across with varying opinions from people who think it is the best thing since sliced bread, and others who would not give it a second thought. It first appeared on a PDP-7 at Bell Labs (a subsidiary of the AT & T company) in 1969. We heard that it is Unix performance it was originally called "Burdock", as it was a somewhat 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. Fewer than university and similar institutions had been receiving a 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 to two versions, C, and Digital Research is re-writing all the CP/M systems in the language for portability. The system has many complex facilities usually used by the programmer and these will be covered more deeply in the next article.

Finally, the system is very hardware independent, it has a directory tree structure, and many input and output control 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 feedback. To some extent the latter point has been overcome by "friendly-load mode", such as Veritas supplied by Rothrock, or the menu on the B-

The Microsoft family has many useful parallels in its small, stable, and an operating system that is very hardware dependent.

Fortran system. Another early entrant into the lack of packages. Two years ago there was very few— a place to do just what you will show that this has been remedied.

### BCS

Business Operating System was conceived by CAP (Computers Analysis and Programming), one of the larger main and minicomputer companies in the country. CAP was probably the first of the '80's school to take interest seriously and view them as business computers with a future potential. The system was developed complete with its own language, MacroCobol (all the only one available), helped by approximately 20 million of government money from the DOD.

The product was a professional operating system with a number of packages all designed for the 'office' environment, using traditional I/O 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 system. MFSL, Macro Products Software was formed in 1981 as an offshoot of CAP to support and exclusively market BCS. This has proved to be a success and the system is expanding quite rapidly.

Popularity is one of its main focuses, and it is available on over 50 machines, from the humble Apple II to powerful main (such as the VAX 11) and the Data General Nova). This is possible because each machine has its own specially-written BASIC interpreter, which then runs the portable BASIC intermediate code produced by MacroCobol. A similar principle is used with P-code (of course).

The strong points of the system for the user are hardware portability, networking, multi or single user, a range of base applications from the simple (database, key word systems, word-processing, full screen and a GUI), and a good number of quality vertical market software (the DPs, finance trackers and so on) from independent vendors.

For the programmer, the system has many utilities (including library, making and menu design, basic file access types, and print spooling). The system hardware interface is set up on the initial installation, and therefore programs do not have to be individually configured for screens, and such like.

### DFPC/OS

A number of vendors in the market place such as DFPC/OS (BRIDGE) and MELMAC/ST and others) are very similar, rather than share a processor amongst a number of users, like Unix would, they give users one user. The situation historically was that it is difficult really have enough power to drive a number of users, hence the more powerful 16 and 18/31 bit chips. The other tech, which resulted in the multi-processor systems such as DFPC/OS, was of an 8-bit (or only drive not user), then provide one processor for each user.

In actual installations each user has a processor and MR RAM, which for all users and purposes is their own computer. Within the system itself are one of two other processors controlling the central resources such as disks and printers. Therefore, until the disk is accessed the individual processor will be running at full speed and additional users on the system do not degrade performance. The extent to which disk usage affects 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 CFM compatibility. Taking the reasons to as full confidence, a number of systems are providing the more powerful 16 and 18/31 bit chips in addition to the 8-bit options for more user 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 BCS, 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 Pascal, the product of a variety of computers.

P-system was developed in 1974 at the University of California in the name of Pascal (developed at that time, the Pascal language, according to the producer, was going to support all languages away (Cobol, Basic and Fortran included) and in the following language, especially an error).

The first installation was on the microcomputer (PDP 11) and then the Apple II, hence the system a greater popularity in the US, where the Apple had no larger 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 systems. Additionally, Turbo graphics, one of the first portable graphics systems, is available with the P-system.

### PICK

Another system that is taking the news at the moment is Pick—developed by one Richard Pick while at CMC, is run on a Seabury case. It is designed around a database language and many of the commands are involved with this function. Its current operation on a micro would probably be offset if it were to appear on any Pick platform at present (though that has not after reading that comparison, but microprocessors are not studied database theory at university. Pick can interact with the stand alone the way the dBase commands can be directly typed to produce, for example, a word report. The language is known by a number of names, but usually English by Acron, and the commands can be remembered by the user to any key words they require.

Features to be, sort, count, sum and simple calculations are all included (and is implemented by a greatly extended (Database) Basic. Down from the main a mass of a number of powerful menu-based macros and Pick is working on an IBM XT version, running under MSDOS and linked to the 80486 multi-processor. Pick has few packages in fact, but according to the manufacturer, that 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 that for non-computer users, a type of program generator called System Builder is available.

### SMART/OLK

We have included Smart/OLK here not because it is a mainstream operating system, but because it opened a way of thinking which may well change the very design of operating systems.

Its first offering 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 in Palo Alto in the US and the first 'product' we were aware of was a press

DFP's strengths are portability, networking, multi/single user, and a good range of base applications. DFPC/OS has the advantage of being able to run some of the popular single user software and CFM compatibility. P-system has wide portability, and Pick is based on a database design.

reference on the Xerox file at read-194). Then, like the Lisa (with which most of you will be more familiar) had a screen and mouse. An icon is a screen representation of a real-world object, such as a trash bin. Icons to be deleted are "pointed at" with the mouse and then moved over to the bin for storage, then can be "copied" removing the file forever. The file can be recovered before you empty the bin, but it is not life.

### THE BATTLE

In the UK, Microsoft's latest Contour software directory, a monthly publication, which lists over 3,000 disk-based packages, lists the UK operating system sales as:

Apple II	—	583
SOA	—	31
CP/M/MS-DOS	—	1493
Lotus	—	98
MS-DOS/PC-DOS	—	932
PC-Dos	—	86
Mac	—	232
TRSDOS	—	30
Unix	—	246
Am	—	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 manufacturers 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 better standard) facilities to small numbers of users, but these have their own business and are not "consumer".

Paradoxically one can wrong to take all comments about the very focus of our 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 "fadness" changes.

Perhaps a better guide to what is actually happening are the job ads. During the time of the Unix fad, so many went by more and more positions appeared for Unix and C programmers - the time they were right. The trend has swung away from manufacturer-specific systems, and there does not appear to be any sign of converting soon.

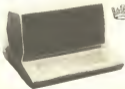
However, the main reason for the success of MS-DOS in the IBM PC, which has (arguably) just become the most popular small business system in the UK. In the UK, in terms of market sold, it is hard and shoulder above its rivals. IBM themselves has the power and the user base to change the face of micro 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 compatibility offers great advantages - but who knows what Microsoft has waiting in the wings. (Always keep your eyes open for Pack.)

The best advice is first to opt, where possible, for suppliers who have provided in the past support paths. Second, there is safety in numbers, a large user base will keep software suppliers motivated for longer. If you are thinking of moving up to multi-task it would be wise to select one of the single user stage systems capable of on-line transfer.

By Eric Magshaw of the NCC.

## Guide to buying dust covers:

- ★ Make sure it is designed for your particular model
- ★ It is anti-static. Static can lead to breakdown, especially on printers.
- ★ It is flame retardant to a British standard. Ordinary covers can flare up alarmingly if they are accidentally set alight by a match or cigarette.
- ★ The on/off indicator light can be seen through the cover as a double check that the machine is not left switched on when covered, and possibly overheated.
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# PEOPLE TO THE POWER

HOW DOES THE ENVIRONMENTAL NATURE OF THE SOFTWARE MARKET AFFECT THE END-USER? AND HOW COULD YOU EXPLOIT IT?

**T**he meeting of the New Technology with a plentiful supply of risk capital has, during the last few years, spawned more new business "start-ups" than ever before in the most entrepreneurial of industries.

Many people who have success in their homes or in their desk tops, are consequently looking for ways in which to use the computer as a new solo business (something that has the potential of adding to one's income should be thoroughly explored). Often early, not everyone who starts up as a home business will be successful, but if you already have a career, and a desire to profitably employ it, then such a second career makes sense.

The first question is, of course, what kind of business? The answer is really only limited by one's creativity and resources. To be successful you need a good idea, a little talent, a modicum of aggression, a bit of persistence—and a good deal of luck.

There are two basic categories you can take: the first is to offer a service to local organizations (using traditional business techniques for leads, mail lists, word processing services, proofing, statistical analysis)—or you can create something new.

If you know something about programming, then consider programming customarily made 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 sizable market. Give your mind a free run, a database for a newspaper's delivery board—a database for an independent diary for a very local, occasional database are the primary ones if you have a good knowledge of how a business operates.

You need to do your homework, researching current market needs and designing operational products and services to fill any promising gap in the market. The justification for the market research is clear and provides the month's Mandate: Mandatory Market—over the next few years, as the computer industry explodes today's average maker and business major market.

A computer on every desk top, kitchen table and work bench, means eventually the 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 new software market is making programs genuinely user-friendly, and the most exciting thing that is happening is that it will not be the computer "enthusiast" who leads, it will be "the people," the ordinary users.

Let your software equip the US consumers could start up business in their garages because everyone had garage and they were prepared to leave their cars in the street, however, in the UK, people only had parking tickets, and could only use them when the places were not there—thus the project did not come off until before the places needed to be parked, cars were the project.

Looking across at the success stories I have mentioned, that gap does not really build up in the country's static community that it is a given since revolutions. In 1985, the UK computer establishment was not very far beyond the UK market place.

For example, the Economist Intelligence Unit published *Personal Marketing and Computers*. The paper is aimed at management, and it is not only

rather boring, but also shallow as to a couple of pages the program used as an excuse—the biggest volume market for financial modeling!

The financial markets in the City might also get it very wrong too, by providing expensive capital for the software company that has no existing major or entry-level product. With the software marketplace still in its infancy, absolute rubbish can be sold successfully if promoted aggressively enough—and the City is already helping some "losers" become almost household names.

Although the speculative bids were always with us (and always will be), getting your quantity before product quality can only do damage to the end user industry in the long run.

By Stephen Mandelstam, a computer-crazy futurist.

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# ALL IN THE HEAD?

IS CANTON'S BRAINSTORM IDEAS PROCESSOR, DESPITE ITS ASPIRATIONS, ALL THEORY AND NO PRACTICE? WE FIND OUT.

**W**hat will make our program data more visible more users will tell they need along with data input processes, data base and spreadsheets? Many software developers are researching a feasible search for the answer to this question. Canton thinks it has an answer, with the *Brainstorm Ideas Processor*.

Canton is an imaginative software publisher; its programs aren't processing, but they always assist in if they can. For example, Canton's *Cardfile* package was never sold as a database, but rather as an extensive address book; yet, hidden beneath the name was a very simple, well-written file handling package, offering only basic facilities, and by its users helping new standards in data processing. Canton has shown that a good program is to match those imaginative marketing an advanced software technology.

*Brainstorm* is much the same, only more. In fact, it is probably so much. It is effectively a simple database, with its hidden data in a good structure with links between the branches. Canton says it's an ideas processor, which takes your ideas and helps them become sort of order.

'Idea processor' is an opposing though slightly appealing idea, comparing process of running everyday ideas via notes of general. Canton embraces the expression with which, claiming in the package's documentation that 'creative thinking programs are necessary of a system, designed to assist, and *Brainstorm* is able to capture your ideas in the form while normally organizing and relating them so that they can be re-processed in a more organized way'.

This division means you'll see your random ideas and turn them into a series of links, used by applications and something more useful, more leading. It can do nothing of the sort. Such claims come periodically close to reaching the techniques used for selling body-building equipment. You have to do the modeling - *Brainstorm*'s certainly a good fit for coating the model.

These claims succeeded in generating such responses in the launch of the package, something of a *Brainstorm* in a message. This, really, seemed to obscure some of the reasons. It is a very nice and simple file program, a very helpful planning aid.

It allows you to enter headings, or blocks of text, and you then use hierarchical codes. Each heading can have subheadings (or 'dependencies') beneath it, and 'superheadings' above it. So, for example, if you were wanting to write a letter (a lot 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 'King Jan', 'Write article' and so on. Each of the subheadings could be promoted to a superheading, and then the proposed sections of the article entered as subheadings ('Lore', 'Development'). You could even have the whole article itself as a set of subheadings. The package includes some editing facilities, like word wrap, insertion and deletion.

You only realize how unnecessary. There are indications for free currency, so you can carry on until it says you're full up, in which case you'll have to try something to do it.

The links between the branches of the growing

Fig. 1 (right) shows *Brainstorm*'s *Master Menu*, which is divided into four sections. Following the title in the top section, the user section displays the commands available, and below that is the display area for all or part of the file directory. The bottom section prompts the user against commands and displays the current status of *Brainstorm*.

```

BrainStorm Master Menu
-----
G  on          L  list          P  print       I  d-drive
C  Lear       S  save         M  rate       D  directory
D  no        M  merge
-----
Directory of B          *****  ***          Page 2
STAT  .COR  BRAIN  .COR  RISC  .DOC  DAVID  .BIN
BILL  .DOC  WOODY  .BIN  VIV   .DOC
-----
Make selection by pressing one of: G C D L M P S I X

Drive: B          Model: none          Status:
-----
  
```

area of tags and subheadings. (Known as a "model"), are similarly simple. Every time you enter a heading the program looks for "markers", which mean that if an entry matches another, the program will give both the same subheadings (subheadings, sub-subheadings and so on). And if an entry is unrecorded, so will its subheadings (if any exist).

Other facilities for moving between headings include a "Show facility", which will hunt for a string of characters through the entries in the model, and "Jump", which will jump to a marker (the "b" character) placed by the user whenever necessary.

Canon has put a lot of effort into the print/write facilities, which are designed to use the model in the form of a text file so data (which can then be re-processed) is read in to a printer. You can specify the format of the text file (format), altering line spacing and width to show the structure of the model (for example, with subheadings indented more, sub-subheadings indented more and so on). You can print selectively, according to entry or from the "b" marker. You can also suppress various levels of the model (i.e., 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 one file 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. Revisions will require a manual or a table of merge file.

Revisions' uses are many and varied. It could be applied to all sorts of applications, and many people would find it useful. The manual has a whole chapter devoted to example applications, which is very useful and explains how the package offers wide scope for the programmer.

The first example application is an electronic diary and address book. You have dates and names in the headings, and details in the dependents. 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, names of the day as sub-sub-subheadings, what you're doing on that time as sub-sub-sub-sub-subheadings and so on.

The "list" command would be used to list for a month, or day, or evening. The current day could be marked with the "b" marker.

More subheadings would be to use Revisions 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 dependents. Procedures could be reported at various stages in the program simply by typing in their names at the appropriate position in the program, and all the dependents 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 control comments left out.

The manual includes full details on the structure of the Revisions' facilities used to create the model, so (as demonstrated in one of the examples given) you can write programs that will generate files.

The package includes two useful editors, 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 keyboard's modified screen commands.

The recovery program, called "Recover", 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. Revisions uses a simple recovery technique well known to CP/M

Day	Activity
1985	
Jan-85	
Sat 01-Jan-85	Take Jackie dancing Get drunk for tonight Coral and Leo dinner
Sun 02-Jan-85	Music - Chalfest
Mon 03-Jan-85	Bill 18 30 Katie 12 18 Susan 3 00 Steve 5 00 M.C 7 00
Tue 04-Jan-85	Printer 11 00 Woody & Bill lunch
Wed 05-Jan-85	Fulham all day
Thu 06-Jan-85	Breakfast with Chuck 9 30 Board meeting 3 00 Auditors 7 30 Robin accepts
Fri 07-Jan-85	Daguel school sports 8 00
Sat 08-Jan-85	Nothing
	Take Tony and blanket

Fig. 2 (left) shows an entry from a slightly used Revisions 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 issuing an empty file (any name, up to eight characters) with a COM extension under CP/M. Run the program, and CP/M will restore it (with no serial, because it's empty) and put you back at the beginning of the TPA. Normally you will think that you are back where you were before the program crashed.

Revisions uses this simple technique, so you can save with any CP/M program, not just Revisions.

Revisions is an interesting, simple and useful program, but, despite the name, 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 sublines, block moves and string search.

Claims that Revisions enables you to make better use of ideas are difficult to substantiate, principally because the idea of "data processing" is so vague. What's a processed data look like?

It's well written, well documented, easy to use, useful, fun to experiment with, but, for the money, insignificant. Some people have suggested that, given its size (31 Kbytes) there should be a similar system for machines like the Sinclair Spectrum. Perhaps, but it works best with a decent word-processor, and you don't get that on a cassette. It would be just to best use as part of a word-processing package. We hope Canon gets together with a company like MicroVid (who make *Printaid*), and offers it as an integrated extension. Then, contact the price. By Benjamin Winstley, editor of *Computer Answers*.

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# LOOKING TO THE STARS

WE LOOK AT THE NEW WORDSTAR OPTIONS—STARBLAST AND STARDOCK

Microsoft's word processing package WordStar is the market leader in its field. It already has options for handling repeated text (through the Multi-Merge program), text for spelling checking (through SpellStar).

The latest WordStar releases are an option called StarFishes, which allows the automatic production of outlines, tables of contents and so on, and StarBlast, a program which allows computer professionals an experienced user to construct a complete system of menus to custom operators from the weaknesses of macro-operating systems. In view of the popularity of the WordStar, we decided to review these in detail.

## STARBLAST

StarBlast has two main options: its use by system builders for constructing systems for users, and its subsequent use by operators. System builders may be menu designers and software houses, supplying customized systems for clients, or experienced users responsible for providing a helpful image to less experienced users within their own organization.

At present, StarBlast is available only on the IBM PC, but you should be able to buy it on the CP/M and MS-DOS systems soon. As a tool for system builders, StarBlast allows the construction of what is called a menu tree (an example is shown in Fig. 1). This menu-tree has three levels, and consists of the main menu (MAINMENU), two sub-menu menus (SUBMENU1 and SUBMENU2), for tests (COPYFILE, EDITFILE, SAVEFILE and RESTORE), and two 'Help' screens (HELP and ENTERHELP).

StarBlast allows a maximum of twenty levels, meaning of menus, tables and 'Help' screens. A sub-menu can only be selected from one operator menu option, which a user may be selected 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 authorized 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 options items may not exceed 78 characters, but menus may open onto other menu screens. You can specify a default option when building a menu, and can also (when building a system or using the built-in tool, StarBlast) set the ESC key to go back to the preceding menu level, but you can't go directly back up to the main StarBlast building menu, nor could we find any way for the system builder to provide an 'exit' for the user.

A task is one or more set notes, carried out when invoking a particular menu option. These activities are coded by the system displaying a message to the user, reading the operating interface copy file or to run a program such as an invoicing program, and so on. A list of the commands which system builders can include at tasks is shown in Fig. 2. You will see that this is a complete system commands for repeating commands and for testing results. These facilities are not extensive—they are more for those found



ASK	Request information from the operator for a variable in the task.
CHUCK	Make sure it fails to run the escape file. The statement assigns a new value to the system variable %RCODE.
CLEAR	Clear the terminal screen.
COPY	Make a copy of a file.
DELETE	Delete a named file.
DISPLAY	Give a message to the operator.
END	Stop the task.
LIST	Show each statement to the operator before the entire performance.
MOUSE	Make sure it fails to go the proper file or keep 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 a task statement.
REMARK	Display a builder's comment with a task.
RENAME	Change the name of a file.
RUN	Perform a task until found only to CP/M operating systems.
SET	Start a program.
SET	Change the tagged drive.
SET%RCODE	Give a value to the system variable %RCODE.

## 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 statements following the ELSE statement.
ELSE	The condition specified in the IF statement must reference the value of the system variable %RCODE. Always start a group of IF/ELSE statements with the statement ENDIF.
ENDIF	Perform the statements following the IF/ELSE statement if the condition is not true. Always and a group of statements to be executed with an ENDIF/IF statement.

Who would like to share Micro Technology of Exchange Works, and Richard Ashton in particular, the leading in an IBM PC with software

in the 'Job Control Language' (as many mainframes programmers a programming language, but should be quite adequate for the purpose).

Help screens (typed, rather confusingly, 'Help Menu' by StarLine) may be provided anywhere - indeed, since they are 'the end of the line' they are more like text files than so. (You could, of course, construct a tree-structure of help if you wanted to, by calling the upper levels of help 'menus' in StarLine's terminology.) They consist simply of screens of information which the user can read to gain more information about the current level of activity.

We used StarLine 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 1

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 control information. The commands available in the builder show that StarLine follows the practice of its predecessors in being driven by commands evoked from control keys.

The excellent use of colour in showing StarLine to the system builder does not extend to allowing him or her to see colour when designing screens for the user, and all the main screens on card had not 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 iFlexStar to indicate bold, dim or underlining, so that the system builder could gain the benefits of colour display in StarLine users.

The main appearance of the screen to the StarLine user depends almost entirely on the specifications of the system builder. Fig 2 shows how the main menu of the menu-tree shown in Fig 1 might appear on the user's screen. Users of iFlexStar will recognise most of the basic concepts which StarLine provides for menu movement. An important one is *h*, which allows the system builder to switch between building the menu tree and using it for test purposes. StarLine can tell whether you have previously carried out building work on the screen, and therefore asks you for the building password only if you are entering the build phase for the first time in the conversation.

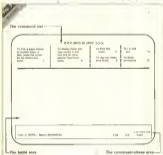
The documentation is in two main parts: a builder's manual, and a workbook for builders which is really a tutorial guide. Given the problems of documenting something which can only be used effectively in conversation with programs whose names and nature the manual writer can't predict, the manual is quite effective.

StarLine is an attractive and powerful system, which should be quite a help to people putting together menu systems for less expert users. It is an advance on most previous systems of this type in its provision of several levels of menu, used as a facility to carry out several operations within a single task. Most similar systems do not provide an easy way to allow for the first failure, and only permit the second through the use of operating system's 'back' facility (SHIFT or CTRL-BK or M-DIG). However, this more expensive than most of its competitors, at £120.

## CONCLUSION

While StarLine is a general purpose tool for system builders, StarLine will be of interest to a quite specific group of iFlexStar users, namely those who need to process long discussions. However, it will interest many people who fall into that group, but who do not need to produce endless to their discussions, since it contains other useful features. These are implemented by a combination of 'hot' commands and embedded control characters, just as in iFlexStar itself. Fig 3 shows a list of the available commands and control characters, while Fig 4 shows on the left some sample text including commands and on the right the way in which parts of the text would be processed.

StarLine allows the user to exercise overall control over the numbering and printing of chapters and screen headings (up to four levels deep) and the numbering of figures and tables, but to cope with the details automatically. So if you number screen headings incrementally - using, say, 1, for the first level, 1.1 for the second and so on, you can include 'direction' to StarLine to indicate the level of



The build area

The command/status area



The main area

The status area

The command/status area



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required, and let Star Index control the actual numbering. Then, if a section is covered 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 can be a master entry or a general entry, with the difference being indicated by embedding the page number of the master entry. Either type of entry may be a main entry, just one line entry or a list entry, such as "flow and arrow", or a sub-entry, such as "Diagram, early", which would be printed with the word "early" on a new line and indented. Whatever the format of the printed entry, the indexed word or phrase may either be embedded in the body of the text, as in the example "lossless coverage", 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 "Having, conversely 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, with an embedding of the page number of a master entry in the index, but you can change these conventions by using the STPLS system to set up formal descriptions of your own, that 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 Long, a computer consultant.

StarIndex is available on all the systems for which WordStar is provided, and runs £110. Both StarIndex and StarIndex are available from *Designs of Windsor (see advertisement)*.

**Designs of Windsor**,  
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**24 PEOPLE AND MACHINES**

**1 Introduction**

We as humans and computers have always reached for new ways to extend our capabilities. To improve and elevate the

**2 Machines of Our Future**

1 Invention, 1990 B.C. - 1990 A.D.

2 1990 B.C. - 1990 A.D.

The Stone and Iron Age early extensions of ourselves

3 Hunting, invention for arms, invention for hunting capabilities. The Point P led to the building of roads and gave us

4 Trade early

5 Agriculture, early

6 Machinery for agriculture and trade. The use of...

7 Invention, 1990 A.D. - 1990 A.D.

8 1990 A.D. - 1990 A.D.

The invention with flight led to the creation of

9 Flight, led to balloons.

10 Balloons, led to the hot air balloons and finally leading really

The early "Plasticine carriage" increased our speed

11

12

**Hot Air Balloons**

**1 PEOPLE AND MACHINES**

**1.1 Introduction**

We as humans and computers have always reached for new ways to extend our capabilities. To improve and elevate the

**1.1.1 Description of the Machine**

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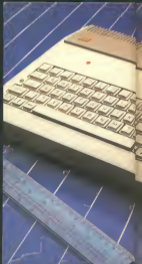
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You'll save it from the learning programs. There are cassette instruction courses on writing programs in BASIC. Other cassettes get you and your family off to a flying start into skills like typing, household budgeting, tax returns and investment management. And of course there's our own

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# LOOKING FOR A FIX?

WHAT SHOULD YOU DO WHEN YOUR MICRO SYSTEM GOES A/USE (OR EVEN IF WE LOOK AT WHAT CAN BE REPAIRED, WHERE AND HOW MUCH IT'LL COST.

**N**othing 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 best deal if you didn't buy it from them, they can't help.

However, the good news is that almost every repair firm are operating open over the country to cater to this. With an increasing number of businesses using micros, there is also a need for repairs, who can fix faulty machines quickly, so they look as the kind of services available and the paths to reach this fix.

Although the main reason to get someone to fix could be the IBM PC, there are people who can repair the Dragon, Cines and Spectrum.

The best way to keep your repairs bill down can be to take out some form of insurance against failure. Many Microcosm operators with a service in the form of a contract which covers the micro for 12 months after the actual manufacturer's warranty has expired. The contract covers the cost of parts and labour following mechanical or electrical breakdown. It costs £14.99 for micros running up to £250, and £24.99 for micros up to £500.

A similar scheme is offered by Computers for Owners of Business Micros. Taking the form of an extended warranty it covers 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, Agnost and Epson QX10, but Comsol also could be covered provided you are willing to pay Comsol's maintenance charge.

While Professional Computer operators what are to offer someone policies, another actually carry out the repairs themselves. For that reason you may wish to take advantage of the maintenance contracts which most repair companies use often. These can vary from a charge of two pence per year and 12 percent of the cost of the hardware.

Ques, 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 the company actually said no, its emphasis that if you actually buy your micro through the manufacturer company you could expect some level of coverage on the repair situation. When contacting a repair firm, it is best to establish just what kind of repair service it can provide. There are basically five main types of services, namely all of them aimed at business users. However, if your Spectrum is not in the business, it is not just large systems, owners who should 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 set time period and effects the repair on your premises. In such cases, most operators will have a replacement item at the repairer's use to take the faulty machinery back to work.

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 over a van than have it stop at the dealer to take the different items into the repair company's own workshop.

Finally, for those who contact on a regular basis, there are mail repair companies, such as TV Services of Cambridge, who operate a fixed price service where it costs £13.95 to have your IBM fixed or £16.95 to cure your Spectrum. The important proviso here is that you have to change the micro beyond recognition with a minimum of add-on.

So far we have only been given some of the more recent, but figures have been produced to show that the CPU board is the most 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 any other 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 floppy isn't covered!

For the operators more aware who can't afford such insurance as cover, there are operators such as North Audio who are ready and willing to repair your Agnost 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 in your premises to service your printer or other peripherals, which can be done at a check point when you pay your work.

Keeping the micro clean can help prevent that one day, and there are many "value" services like Spectrum, not only will it clean your screen, it will blow the dust out of your keyboard 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 machine maintenance. It is clear that the companies which have traditionally been involved in maintenance repairs are now moving into the micro market, since it is quite possible to persuade a company like Computer Field Maintenance not only to fix the DIBs but to extend their service to include your IBM PC as well.

Prior to covering this, we would've liked the feeling that the chapter more was not covered. A look at our inspection guide (Pg. 17) shows that to be aware—a servicing grade of effort. One final tip—don't worry if there does not seem to be anyone on your doorstep. The address given are mostly land 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 Business



"These Computers aren't operational, they're still in the factory!"



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### Advanced Graphics with the Sinclair ZX Spectrum, by IC Angel and H Jones.

**S**o proud to be the Master of your graphics? Or perhaps you'd just like to present some information personally? 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 elements 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.

### Advanced Graphics with the Sinclair ZX Spectrum



IC Angel and H. Jones

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 filled patterns.

After this relatively tedious beginning we move to the more 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 area chapters, where the use of matrices to perform transformations is introduced, along with the techniques used to draw compressed 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 either reading the 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 presented, but they are also comprehensively 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 run on a BBC machine, therefore it's something of a relief that a cassette of the programs for the book is available.

If the book covered just the material described so far we could recommend it as an excellent, if occasionally mathematical, introduction to computer graphics to a computer, but there's more than that. Also included is a chapter on character graphics which includes a complete entry program to allow you to design your own graphics characters. Examples include a "Hexadecimal" program, and even the one described.

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 culminate 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 up 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 Jones.

**M**icrocomputers are rather more complicated than most domestic appliances. When you measure, hardware or TV set, comes with a plain instruction pamphlet, this would hardly be enough to even the simplest users. When your home computer gets as complex as the BBC Micro, you find that a chunky User Guide of over 100 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, then you still want to give a simple overview of all the features of the machine's hardware. 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 bit is taken for granted). It is assumed that the reader is already quite familiar with microcomputing. The acronym, part numbers and hexadecimal fly thick and fast right from the start. There isn't even an introductory section on binary notation.

Because the author believes, quite correctly, that a proper appreciation of the micro can only come through some understanding of the hardware, this 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 details of the video circuit, the serial interface and the various parallel interfaces. From this fairly brief hardware gives a valuable insight into the hardware, and makes sense of the B-

### DATA FILE

#### BOOKSHELF



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Advanced Graphics with the Sinclair ZX Spectrum (234 pages), by IC Angel and H Jones, is published by Macmillan, and priced £9.95



behaviour of the system as a whole to be done.

The chapter on Basic does not concentrate much on the details of the language, which is assumed to be familiar. Instead it goes concerning 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 creator of their Basic programs and extend the use range of performance.

The chapters on software continue in the next chapter with a look at the Machine Operating System (MOS). The MOS is a collection of subroutines, mostly in Basic, which can be called by the user. Because more sophisticated handling can be done in a language like the MOS, the user is contained from future hardware to software changes.

As well as the simple use of these functions, this chapter also looks at the way subroutines are handled. The rest of things really is for the expert—now here is where what you're doing in one statement can get into the system. Unfortunately these aren't exactly worked examples to make things easier.

Shifting the emphasis more to hardware, the chapter on the video processor goes into some detail about how the contents of memory decrease when you use it. On the screen. An understanding of the address appears why the display works in just the way it does. It might also seem to increase your respect for the designers and programmers who made the thing in the first place! Although he warns of the dangers of FORKING 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 computers give the better of us.

The chapters of the sound processor cover the use of the sound and switching commands to generate tones and notes. There is a program to help you experiment with envelopes. For 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 converter and user part are provided in the chapter on servicing. There are the only two sections worth a thought.

The last two chapters look at

some of the more 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 last of the two chapters looks at the internal details of the MOS and gives a crash course through the available instructions and addressing modes. The operation of the assembler is demonstrated, with further details as described in the next chapter.

To help you on your way there are four sample programs which illustrate some of the techniques and most of the power of assembly.

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 scene, but experts will find plenty to savour both themselves and their machines.

By **Ron Verwee**, a researcher in computational physics.

The BBC Micro, an Expert Guide (128 pages) by **Mike James**, is published by **Sharnack**, price £14.95.

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### Exploiting BBC BASIC

A P Stephenson and D J Stephenson

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# THE BIGGER THEY COME

**T**he month of Legal File Focus—a computer focus—will conclude. At the heart of it is a discussion of a series of registered accounts. In June last May purchasers of more than 10,000 words of ICL's multi-user computer for its own mainframe systems house, in a local systems house, it also bought software, to look after their client files and train accountants, clerks, nurses, generalists and systems work.

Now as terms of the current capabilities of computer systems, there is no reason to think why such a configuration should not have provided the brokers with a more than adequate service, but unfortunately—as the words of the firm's principal—there "have had no satisfaction right from the very beginning" and are now all too ready to blame the parties some of the problems they have encountered.

Despite specifying a reliable hardware area, the brokers have not so fully supplied with a 10MB system and then put to the considerable trouble of having to install all their data when the IBM house eventually arrived.

The floppy disk drive apparently rejected several disks, and every system-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 data files disappear without a trace (the system and can only be recovered on the firm's secondary disk).

The systems house have provided "the most dreadful service imaginable" sometimes taking up to six days to reply to a request (brokers will be surprised).

Despite being sold a life assurance program back in May, seven months later that system house had still not managed to issue a policy.

On top of all that, the firm now finds itself caught in the middle of a disagreement 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 any technology/computer. On a more serious note, it has also

included the cost over that the firm for negotiation is now just and the negative possibility 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 to a single aspect—in defective ICL hardware? Or should the systems house bear the blame of the Island? With regard to this, the reply must be that the systems house, as it is the party with which the brokers have formed a contract. In fact this is known as the doctrine of privity of contract. Accordingly 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.



In 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 the 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 buying firm (once Mr. May has tried to load data and got 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 then get a money returned.

The brokers' allegations that the systems house have not recently provided a post service is certainly good material in the sense that it stands as evidence of its unreliability, but it may not provide a separate cause of action in itself. If however the brokers have a separate arrangement with the systems house, or if the question of service was specifically incorporated in the terms and conditions of the original contract of sale, then this contract matter grounds for a valid breach of contract.

Thus 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 the particular system in the first place, it would appear that the system house was also capable of "misrepresentation", which means that the brokers were only induced to enter into the contract on the false premise that the strength of promises which were subsequently found to be untrue. One upon this legal "wrong" enables the brokers to sue for damages and/or rescission.

Finally—although given, they maintain it seems hard to believe, so you can only submit their plea—the brokers firm must advise us where it might be able to find assistance in obtaining a detailed computer system for it's office (or at least to give 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 the problem. The Association of Professional Computer Consultants can provide assistance on this matter. Some of its members are also qualified to give specialist advice as "expert witnesses" on the reliability of a system with a view to providing evidence, so see out a commercial organization called EXBA Computer Service.

To sum up then, the brokers would (given time) 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.

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I haven't seen any other compiler that could match Hisoft's Pascal 4T (only for Spectrum users — Autumn 1987). This is a very impressive product... of benefit to any Spectrum programmer. David Bolton, ZX COMPUTING, Aug/Sep 1987.

Just two comments from my rough review of our powerful and vitally full experimental Standard Pascal. The advantages of using Pascal are well-known — fast, self-documenting, and above all, structured algorithms and flow with Hisoft Pascal. You can say of these benefits on a wide range of more computers, including the new smaller Spectrum. Hisoft Pascal provides programs that run typically 40 times faster than most Pascal compilers for: DO WHILE, DO REPEAT, UNTIL, CASE, OF, INTEGERS, PEEKs, CHRacters, RECORDs, POINTERS, SETs, ARRAYS, etc. etc. — a total of 740 Pascal but a vitally full implementation of the language allowing the user to develop his high-level language skills while retaining a superior speed code to that of machine code. Complete with a 70-page manual. Hisoft Pascal is also available in a variety of disk formats, including compressed FLEP Assembly.

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DEVPAK is most highly recommended. The programmer is not dumb! Your Computer May 1987.

If you write programs in machine code, say C/C++ — it is the best currently on the market! Adam Corning, ZX SPECTRUM, March 1987.

Two comments: both reviews of earlier versions of DEVPAC — now we have DEVPAC 3 available. A powerful 286 assembler with contextual assembly, assembly from tape to enable access to very large code files; 64K, 128K, 256K, 512K, 1024K, blocks of any length — in fact all you need for fast (3.0M lines per sec) and powerful in-source programming. But it doesn't stop there. DEVPAC 3 also includes an immediate debugger/trace assembler giving you a front panel display of the 286 system and allowing extensive debugging of your machine code programs, including single-stepping programs. **EXTRA \$6.99**! Open up the secrets of the best programming with DEVPAC 3.

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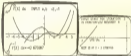
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## FRESH NOTES

Despite persistent complaining, Prims still will not say when (and if) they are going to release the necessary software to allow the VTX2000 modem interface for the Spectrum to be used as a standard 1200/75 modem. Even though we have described elsewhere how to hook up the VTX2000 ROM, it will still generate unwanted Frotz characters. A spokesman for Prims said that it was up to their hardware people but the software's release was contingent (maybe John Vaughan has done the job for them?).

Supplies of the Modem 2000 Microsoft adapter for the BBC are still rare, but we looked out for a short period and a second lot. The latest Microsoft offerings are intended for the latest and 16M PC. Unlike Prims's latest modem, the Modem 2000, the whole package is expected to retail at a staggering £250. It would be well worth the money if both software and modem allowed 300/300 or 1200/1200 full duplex, constant-on-line—meaning you could access something besides Frotz! Windows Systems, but sadly they won't.

These packages should be out this month, but later in the year depends on the Apple II. Asa's range including the latest KILL plus both Dragons should be available.

## GAMES NEWS

My new readers should have been able to take advantage of our chat board rate reduction board system, thanks to the use of the DuCom G/T intelligent modem. This is a combination of a modem's first issue normally systems offering a dual service are run on standard computers and our separate telephone numbers. In the US, dual systems have been tried that offered 1200/1200 and 300/300 local rates but these required the user to read a couple of characters, such as a 'Y', so that the computer could recognize the local rate. However, the G/T modem seems to have worked automatically and responds accordingly. We firmly believe we are the first bulletin board in the world to offer that over 1200/75 and 300/300 bandwidth simultaneously if your modem can cope, that you can search the board at 1200 and upload at 300!

## ALL THE LATEST BULLETINS...



The latest addition to the Prims range of modems is the Modem 2000 above. It will form part of packages for the Spectrum and 16M PC. The modem should allow both 1200/75 and 1200/1200 (half duplex) communications.

The next development will be to convert the board (CA88) to constant users. This will mean that you will be asked for a password before getting full access. If the support person (CR) is 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 our own records 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 TRS80 going. This includes Andy, Damon (owner and modem), Cammie for their superb disk drive, Wessley of London NBT for the Prims printer, hi-demos for the latest version of LDOS and Herb Personal Computers for the excellent TRS80 software. Our thanks also to Frotz Tools, John Smith, Les Knaggs, Trevor Smith, Paul Brown, Andy Head and all the others too numerous to mention who've

given advice and encouragement.

## CALLING PRIMS WITH SPOONFEED!

Spectrum customer support Gold has not discovered how to make the Microsoft adapter for the Sinclair Spectrum (Prims's VTX2000) work as a 1200/75 local modem using the existing software in ROM. Please up the Prims as usual. However, the modem switch is set to M/Yes. From the appropriate keys until the login status is displayed. Dial up the 1200/75 local database you wish to access. When the bar over your's modem answers, back down the line switch (green light should come on). Register telephone number. Select option 1 (manual log-on) and the title page should appear. If you try using a file 'r' character, we've used it and it worked. Here are a few databases for you to try for us—C-view - Tel (0783) 348773 Password: try OPTEL - Tel

(0908) 875811 password 000000000 pub Windows SW - Tel (0752) 661600 password 054531445

More databases and useful information will appear on the Microsoft paper which explains what the user Prims has to access "Microsoft" on "80081100". This won't work for CA88 as it is not Prims compatible.

## SPECTRUM COMMUNICATIONS SOFTWARE

John Vaughan has written an in-depth manual of communications software for the Spectrum. It includes the Spectrum to act as a dumb terminal system, to run BBS70 communications. The software was designed to work with the re-Colex (More Model BBS70) interface to other 1200/75 or 300/300 baud rates. We haven't thoroughly tested it yet, but as many developments in this file transfer is not by Christiaan.

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## 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—oops). It should have read—

```
1407 = 0; Parms 24270 70 24270 = 1400
2427 = 0; PMS = 0; 0;
2470 = checksum = "y; 2027
4 024 checksum check sum 27027
```

The real checksum should have been 17767F, since an 'F' was accidentally substituted for the 100 instead of the correct 'y'. To make sure

you've got it exactly right type QUA8 2447F, before loading the machine code.

The good news is that we have a slightly revised edition of Specterm off ready for production. As soon as we have found a 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 log it will have discovered. At the time of writing, copies of the Micro Models 2420 interface was complete. For this reason we hope to follow up with slightly extended versions of Specterm for other 80210 interfaces.

(Standard protocols from... according to Frank, John's software is virtually compatible with the VT220/240, so you could store 1200 79 databases either than Pooled (for various CAAS) and use the file transfer features. John is selling the windows and communications program separately for £30 each, but software plus the 80210 interface costs £15. Frankly it is rather expensive although available quite now. We'd recommend writing for Andrew Glasson to adapt Specterm to 1200 79 based use if you can, as it will have benefits.

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### OTHER AFFAIRS NEWS

The Association of Free Public Access Systems (AFPAS), which covers 500 local bulletin board systems as the UK, is continuing to expand. The

latest additions are given in *Big Future*.

### 82282 INTERFACE NEWS

The number of notices kept out of bulletin boards through lack of a suitable 82282 interface is rapidly declining. Good news for ZX01 owners is that an interface is now available from Microcomputer Resources. A 12K RAM pack from Sander is necessary to use the interface, but most owners will already possess this. Called the ZX01 universal modem adapter, it was originally intended to give ZX01 users access to Prestel at 1200 79 baud. However, it can also be configured for 1200 1200 and 300 300 baud use. We tested an adapter ourselves and found that there were a few bugs in 300 baud operation, but hopefully its designer, Chris Johnson, will have sorted them out by the time you read this. The good news is that the adapter—82282 port and communications interface together—can all on the same board contain 28 281ms VAT David Boulton is Micro-

computer Resources also talks to the developers of a modem interface for Desque. It wasn't completed. Garuda is a only configured for 1200 75 baud communications which will enable users to access Mircron but not the APPAS boards. Expected price will be £49.95 (see VATE) which includes software and interface. Details are still scarce, but communications software for the Commodore 64 and Lynx models are available.

### COMING UP

We've had a chance to play around with Comstar, which is a communications ROM for the BBC written by Andy Hood. The format that impressed us most was the clock function displaying the elapsed time while using Comstar. This was a great discovery given that 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 provide our own program

(published in June) to load from tape. Comstar also has the necessary Comstar 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 format of Comstar is somewhat set. Not having a built-in facility for changing baud rate, it did have Non/Shift, which means that you can download text files from a bulletin with a greater standard without the bulletin being corrupted.

An updated version of Comstar will have the Pooled facility as advertised but again won't on our test ROM. One word of advice, to ensure Comstar works correctly with a modem, the CTS and RTS pins on the Ser's 8250 port (not normally used) must be shorted.

At £24 (inc. VAT), Comstar may sound pricey but the license it removes when compared to various based software are well worth the money. Even the standard 200ms, price for C and you are away! The documentation that goes with Comstar is also very worthy. Comstar is available from Fax.

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**ISSUE 1**

(Nov/Dec 1982)

If you want a copy of an article from this issue, please send \$6 per article (not complete) plus the address, making the envelope "Copy service." We will send you photo copies of the appropriate page. Issues Are, IBM Business Computers #4 (revised), Z801 upgrade, 8031 bit clock, Z80 cards, ASCII code, Program wrapping, 140 concepts, Printer plug-in, Assembly issue (introduction), Program generators: Basic options, Graphics, Communications, Database management systems, The UCSD p-system, Multi-user systems, CP/M editors, Disk-quality software.

**ISSUE 2**

(Jan/Feb 1983)

CP/M Plus (CP/M 2.2), History (RAMS and ROMs explained), Basic explained, Configuration (WordStar as EPM), Program editors, Assembler issue (part 1), Low-level programs, Program generators, CP/M revisited, Computer Answers File No 1: Home Computing (database applications), Word-processing editors, Communications systems, Miscellaneous: Sales talk, Legal File (insurance-claims application).

**ISSUE 3**

(March/April 1983)

Words and Low (revised), Words upgrading (the Turbo), Changing your characters, Z80 workbooks, Assembler course (part 2), API, program language, CP/M editors and integrated data.

**MasterClass**, System experts, Review of selling type (Professional database?), Business graphics (revisited), Spreading and bookkeeping software, Copyright classes, Budget notes, More manufacturers answer back, Review software, Legal File (query problems).

**ISSUE 4**

(May 1983)

Page IV (revised), Marketing, Data preservation, Apple II (revised), Government's color of wires, Monitor, Slide-show controlling, Digital art, Random numbers, Assembler (part 3), Professional genealogy program.

Should we move? Stunned of that color information? Need to fill a hole in your entire database? Don't despair - each issue of Computer Answers can only do so far as your local post box. Here's a complete run-down of what you might have missed...

**Drawers and Texas Clinic**, Making music on music, Spreadsheets (Pharm-Card), Business graphics (revisited), Toolkits, Impromptu Legal File (local state president).

**ISSUE 5**

(June 1983)

Pinball Construction Set (revised), WinWord (revised), Power (what constitutes a master's master?), IBM (Class, Basic, Data structure), WordStar Workshop (part 1), Mashed beef computers, Random numbers, Dr. Ben, BBC Clinic, Business Operating Systems, Horace's Program Package (revised), MemoCard (revised), Classroom computers, Games simulation, Software security, Sorting up (what you see software), Legal File (database mail-order advertisers).

**ISSUE 6**

(July 1983)

New Outlook (revised) (revised), Lotus 1-2-3 integrated software package (revised), Photos, Memory expansion, User-friendly software, Turbo's conversion job, Classmates (the installation), Commodore Clinic, Lap language, WordStar Workshop (part 2), CP/M supervisors, Computer aided design, Spreadsheets (Multi-Plan), Macros in the master mode, Insurance, Computer holidays.

**ISSUE 7**

(August 1983)

System speed, Choosing a printer, Typewriter conversion, Moving on from Pro and Systems, Turbo's conversion (Part 3), Assembler course (final part), Programmers' Time Commitments, WordStar Workshop (part 3), Atari Clinic.

Exploring Operating Systems, General-based word processing, spreadsheets, and databases (revisited), Computer Aided Learning (CAL), Pilot (CAL language), Data management, Selling your program to companies, Legal File (the manager of copyright).

**ISSUE 8**

(September 1983)

AMR 3 such materials (revised), Computer Answers File No 2 (introduction), Making 3D images, WordStar Workshop (part 4), Office II Workshop, Numbers, Recursion, Game of Life, Programming logic structures, Data compression, Apple Clinic (Macintosh's needs, BCP), Language, Speech systems and recognition, Spreadsheets (revisited), macros in schools, Abstract computer, Am, High speed reading, Legal File (the rest of going to court).

**ISSUE 9**

(October 1983)

Gold's Amended robot (revised), Advanced VisiCalc, Coping with control, Tandy 100 versus Epson HX-20, Translating Basic into Assembly, Data Programming, WordStar Workshop (part 5), Office II Workshop (part 5), Bill Budge interview, Tour Number Number Generation.

**Legal Groupnet**, CP/M Clinic (Printing discrepancies, macro-debugging concepts, database errors), Spreadsheets (Simulation), computerized graphics on Rock albums, Disk power, Legal File reviews (shorter delays).

**ISSUE 10**

(November 1983)

ACTS Apocal (revised), Head data (revisited), The Good Mr. CIL (revisited), Spreadsheets (revisited), VisiCalc projects (BASIC code), Best use for Basics, Getting RAM, WordStar Workshop (part 6), Tandy, Degree, Goals Clinic.

Memory Mapping, Peripherals chips, MSX Compatibility, War game (revised), An Epson in Turkey (machine review), Keyboard editors, Computer timing course, Business TPC (revised), Buying second hand systems, Legal File (importance of writing up software ideas).

**ISSUE 11**

(December 1983)

New generation of clock systems, printer buffers, WordStar Editors disk filing system, Disk bootstrapping via, Micro-life operating device, Communications software, Using arrays, Scissors (Log) Paper (revisited), Programmers' Workshop ("What Power Algorithms" (introduction)), Words, Nic-

otin Clinic, Device drivers, Bulletin boards, office version 2.4 (BBC III), Spreadsheet DTP facility, Choosing a user group, Character sets course in computing, GOSU-the Guide of Software Flowers, Legal File systems on going to court.

Also incorporating the **Computer Answers Upgrade Supplement** (gratis), which contains full information on the upgrading possibilities of the 13 most popular micro-computers.

**ISSUE 12**

(January 1984)

Eric Katzman, Alan GIBEL, Spectroscopy, Cheap duty-free printers, New system of W, Personal CP/M, Getting up on Basic with words, BBC/Electron Clinic (General editors and associates), Game programming with open products, Best Source Writer word processor, Software VisiCalc, Best your own user group, Fantastic to keep your users busy.

**ISSUE 13**

(February 1984)

Inside the New IBM, IBM PC (revisited), Super (printer review), International printer notes, special offers from do-it-yourself printers, Newsletter problems, Revised Basic, Getting Sound Effects, Game of Go (Part 1), Game of Not (Part 1), Programming Workshop (part 6), Commodore H/Via 20 Clinic, database package, Business databases, Everyman database package, Disk corruption, General observations, Second-hand peripherals, Getting-up-a-bulletin board, Legal File (second-hand more sites).

**ISSUE 14**

(March 1984)

Mastering ATN, Degree 44, Via 20 add-on boards, advanced game writing package, busy bees for the BBC, RISC machine revealed, Staff (game), Go (Part 2), BBC disk file expansion, Not (Part 2), Pig (data game), Workshop (game), Assembler Workshop, Basic Workshop, Spectroscopy/2861 Clinic (Operating systems, Business accounts packages, scientific image-databases, weekend training course).

# NEXT ISSUE



Your questions answered on the Commodore Vic and 64, plus a game that will run on two Vics connected together, upgrading the 64, and converting Vic programs to run on the 64

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Our Japanese correspondents explore links with some of the new generation of MSX micros, and find that there's much worth working for

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The 85088 chip is set to offer a new order of processing power, thanks to the Sinclair QL. We measure the difference it will make

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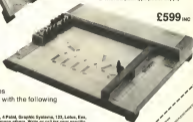
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Enjoy the hilarious antics of the Comical Mouse as he overcomes all dangers to win the heart of the lovely princess by collecting her lost diamonds. He must climb ladders, slide down the chutes, use transporters and trampolines to jump across divides to escape and outwit his pursuers. Six screens with three levels of difficulty.

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# BREATHTAKING IMAGES FROM DISC OR CASSETTE



# BREATHTAKING IMAGES FROM DISC OR CASSETTE



## - SPOT THE DIFFERENCE

... Happily for prospective purchasers of the innovative CUB (CUB/PA) colour monitor there is no difference.

This superb machine provides brilliant picture quality when used with a colour computer thanks to a screen resolution of 640 pixels by 480, plus a bandwidth in excess of 10MHz. For the CUB-PA also gives the highest quality pictures from laser discs, VHS and video cassettes. This is because the signal is not

modulated and then demodulated as happens with an ordinary TV set.

Add to this an audio facility and the result is a colour monitor which sounds as good as it looks.

Finally, perhaps the best reason for

purchasing a high quality CUB when you are upgrading your computer is however disappointingly simple. In video systems the image on the screen is not stable. It wobbles and blurs. But a monitor is unlikely to deteriorate and improve over the time.

Find out just how impressive quality can be by asking at your local computer dealer. Alternatively, contact Microware direct for full details of the breathtaking range of CUB-PA products.

MICROWARE  
**CUB**  
COLOUR DISPLAYS

Microware Ltd, P.O. Box 10, Bay Station Road, Brackley NN34 7JG, Tel: 0779 50911, Telex: 43110

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