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Personal Computing Today

APRIL 1983
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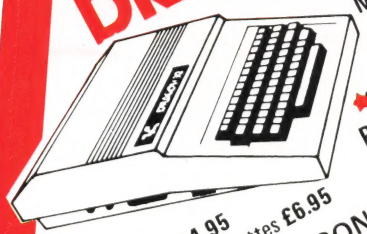
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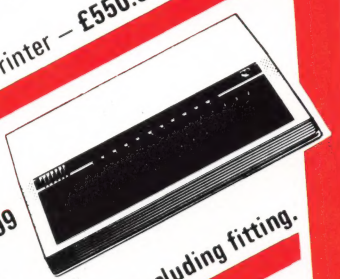
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April, it seems, has heralded the start of the computer 'silly season'. New micros are popping up all over the place.

This plethora of announcements has been caused mainly by the electronics industry finally realising that home computers are going to be THE consumer product of the eighties. It looks very likely that by the end of the year, any prospective buyer will have twice as much choice in which micro he buys than he already has now.

The situation is already balanced on the edge of absurdity with Sharp planning to release their X1 range of computers in different colour schemes. At last you will rid yourself of the computer that clashes horribly with the curtains, and get your interior designer to advise you on the best micro to buy!!

Enough of this levity, there are some more serious implications arising from this computer explosion.

As we all know, a computer is only as good as the software that is written for it, and with the chances of an industry standard being adopted for the home computer market about as likely as porcine aviation, we might have a software crisis on our hands. For as the selection of micros increases, the total number of software titles available for each will decrease, purely because software companies will not have the time to write different versions of the same piece of software for each micro. This will be offset to a certain degree by the creation of new software houses, although the overall trend will be towards less titles for all but the biggest selling machines.

In the home video game market this effect has already been realised, and one company, CBS Electronics, have taken steps to make sure that their Coleco Vision machine is not left out in the cold. The machine is offered with its own range of cartridges, but in addition you will be able to buy a 'converter' module which will allow you to run cartridges from the Atari VCS, or Intellivision ranges. If somebody produced a system for doing this simply on a micro then they could be on to a winner.

With these facts in mind make sure that you choose your next micro, not on what colour, shape or size it is, but on what software will be available for it.

Turn over the page for a full contents list of this issue.

CONTENTS APRIL



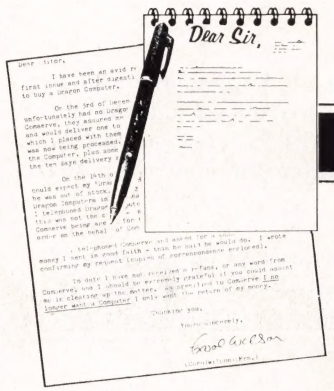
NEWS

News 10
Brief yourself on the latest comings and goings in the computer world.

PROGRAMMING

Gamesboard 40
Recreate the ancient game of GO on your micro.

NEXT MONTH



Next Month 16
What PCT will be doing in the merry month of May.

LETTERS

Micro Answers 20
Report any deviation in your computer to us and we will attempt to pacify it.

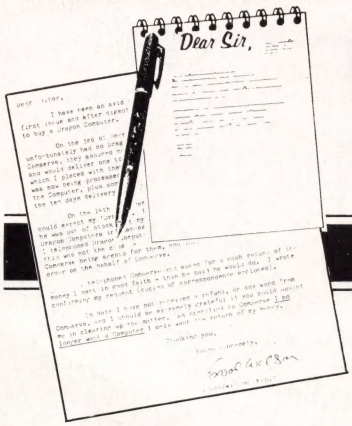
TI99/4A



Code Cracker 24
Solve the code and win a prize in this challenging Texas program.

ZX81 SOFTWARE

Digital Clock 28
Explore the intricacies of time with your very own silicon timepiece.



SHARP SOFTWARE

El Alamein 32
Recreate this famous battle in the comfort of your own computer.

LETTERS

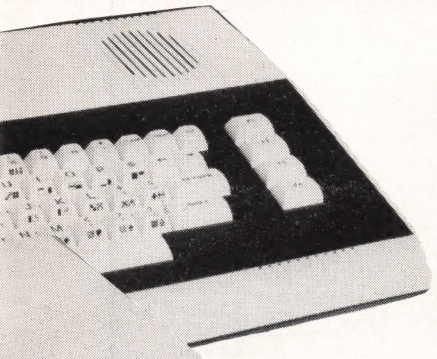
Your Letters 36
If you have something bothering you then write to PCT and get it off your chest.

BBC SOFTWARE

Serpents 13
Pit your snake against the computer's in this high speed surround game.

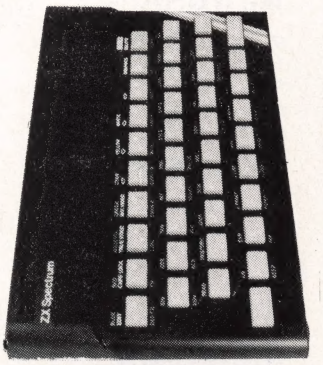


1983 CONTENTS



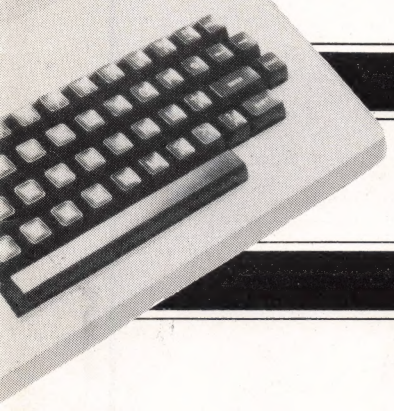
REVIEW

Software Reviews 46
This month our review team penetrate the heart of the Spectrum along with other software safaris.



FEATURE SOFTWARE

Computer Peripherals 53
Add-ons for the BBC, Spectrum and the VIC feature in the first part of our peripheral survey.



SPECTRUM

Spectrum Big Screen 62
Enhance your Spectrum's screen with this invaluable program.

REVIEW

Dragon vs Genie 70
PCT pits these two computer newcomers in a fight to the death.



ATARI SOFTWARE

Cassette Index 78
There is no need for you to spend hours looking for a particular piece of software when you can let the Atari do it for you.



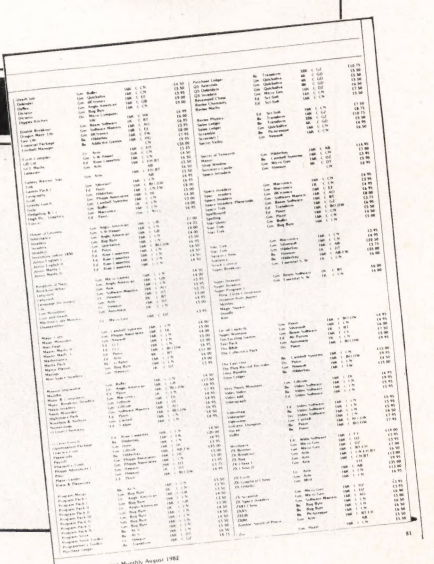
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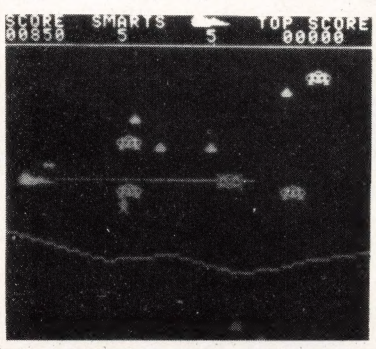


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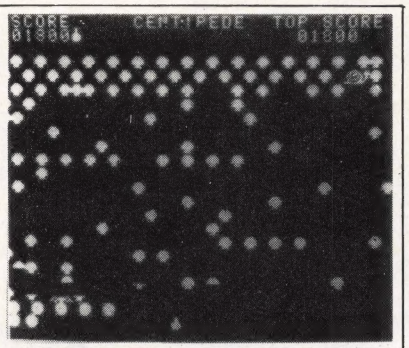


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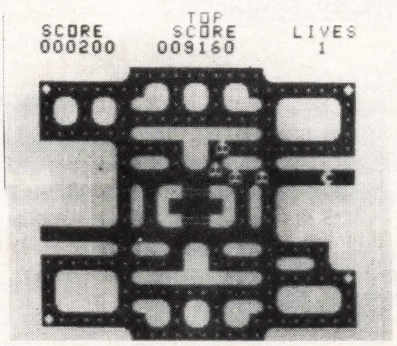


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NEWS

Computers On The Move

Following the success of the London Home Computer Show the exhibition picks up its bags and heads north. On the 21st of April the Midland Hotel opens its doors to the First Manchester Home Computer Show. The exhibition will run for three days until Saturday the 23rd.

On show will be a complete cross section of hardware and software available for the home user, with emphasis on the lower end of the market featuring computers from £50 to £400.

Industry estimates say that over a million people in the UK now own a microcomputer — the majority of them in the home — then there are several million people who want to know about home computers.

With these people very much in mind, there will be a Computer Advice Centre at the exhibition where the uninitiated can try out machines in a demonstration area, and see programs in operation covering educational, games and small business applications with a team of experts on hand to provide impartial advice.

Two home computers will be given away in the show competition, entry forms for which are available with advance tickets with the show guide.

Advance tickets are £1 from the organisers, Manchester Home Computer Show, ASP Ltd, 145 Charing Cross Road, London WC2 0EE. Children under eight and OAPs free entrance, and there is a 25% discount on groups of twenty or more.

Subatomic Stirrings

It looks like the much prophesied, much speculated, Acorn Electron will be gracing the shops sometime in March. Essentially the Electron will be a scaled down BBC Micro, offering a similar screen format although without the highest resolution mode. The keyboard also will be a slightly scaled down version of the BBC's, but every key on it will be able to accept a user defined function, thus increasing the flexibility of the unit and increasing its power for dedicated tasks.

The resident language in the machine will be BBC BASIC and Acornsoft intend to make most of their BBC computer titles available for the Electron. It is hoped that the majoirty of these titles will be available in time for the machine's launch.

In order to produce the machine at such a competitive price — around £150 — the Electron will lack most of the interfaces that the BBC computer has. Part of the reason for this is that Acorn see the market into which they are launching the Electron has already adapted to the idea of upgrading existing machines by plugging in add-on modules.

The Electron will be sold both by mail order from Acorn and through high street stores, although which stores has not yet been named.

Dragon Dilemma

We have had a lot of people writing to us asking about the compatability of Tandy Color Computer software with their Dragon. One computer software company has been monitoring this exchange and has decided to produce a remedy.

Elkan Electronics are now distributing a wide range of books, magazines and software for both the Dragon 32 and the Tandy Color Computer. Most of these were originally produced for the Tandy machine, but they have all now been tested by an expert to make sure of their Dragon compatability. Whereas a large number of the programs will run on the Dragon without modification, any that don't will include a sheet which outlines the changes to be made.

Elkan also offer a free advisory service on the Dragon and Color Computer, provided that you include a stamped addressed envelope with your enquiry.

You can contact Elkan Electronics by either writing to: FREEPOST, 11 Bury New Road, Manchester M25 6LZ, or by telephoning their 24 hour service on 061-798-7613.

Also in with the new releases for the Dragon is Audiogenic's GOLF program. This program is a double first, not only is it the first software tape for the Dragon that Audiogenic has produced, it is the first software product from an independant supplier that has been awarded the seal of approval from Dragon Data, the manufacturers of the Dragon 32.

The game offers the full range of variables for any golf match, including bunkers, water, greens and a full selection of golf clubs. In addition, wind strengths and direction play an important part in making each hole play differently each time.

Dragon Golf is available from Audiogenic or from any Audiogenic stockist.

Newbrain Software

The Grundy Newbrain computer, which we reviewed in our October 1982 issue, is finally getting some software.

Kuma computers Ltd have just announced the first program in a range of application and entertainment software. The program, called GOBBLER, makes good use of the Newbrain's high resolution graphics to provide yet another variation on the theme of Pacman.

It costs £9.20 and is available through Newbrain dealers, or direct from:

Kuma Computers Ltd,
11 York Road,
Maidenhead,
Berks SL6 1SQ
Tel: 0628 71778

Spectrum Sound Problem

It seems that up until now a previously undiscovered bug in the Spectrum's ROM has been causing a lot of grievance to users of Quicksilva's Timegate program. Quicksilva have been receiving complaints from their customers saying that the Timegate program crashes as soon as they try to run it. The people at Quicksilva took these complaints very seriously and



set about locating the cause of this malfunction. After a series of exhaustive tests they discovered the problem lay not in the



software, but in a bug in the ROM.

This bug only manifests itself when the program being run contains a lot of fast screen and sound routines, and unfortunately this meant Timegate. Subsequent to this discovery the following paragraph has been added to the program's instructions:

'The program should RUN automatically once LOADed. If the program LOADs then crashes, then your Spectrum may be at fault and should be returned to Sinclair Research for examination. If this is the case, the crash will occur immediately, but on some machines, problems may only appear when they warm up. This problem will not generally show up on programs written in BASIC or small machine code programs which lack sound.'

So if your machine is exhibiting this behaviour then do not leap to the phone and accuse Quicksilva because it may be your Spectrum's doing.

The Modular Micro

Nowadays it seems that new computer releases are almost reaching the level of new video releases. Hardly a week goes by without there being a whisper on the computer grapevine that there is a new micro marvel approaching.

Along with the rumours of the new Atari 1200 computer and the imminent arrival of the Texas TI 99/2, comes a new modular computer/video game system from a company called Video Technology Ltd.

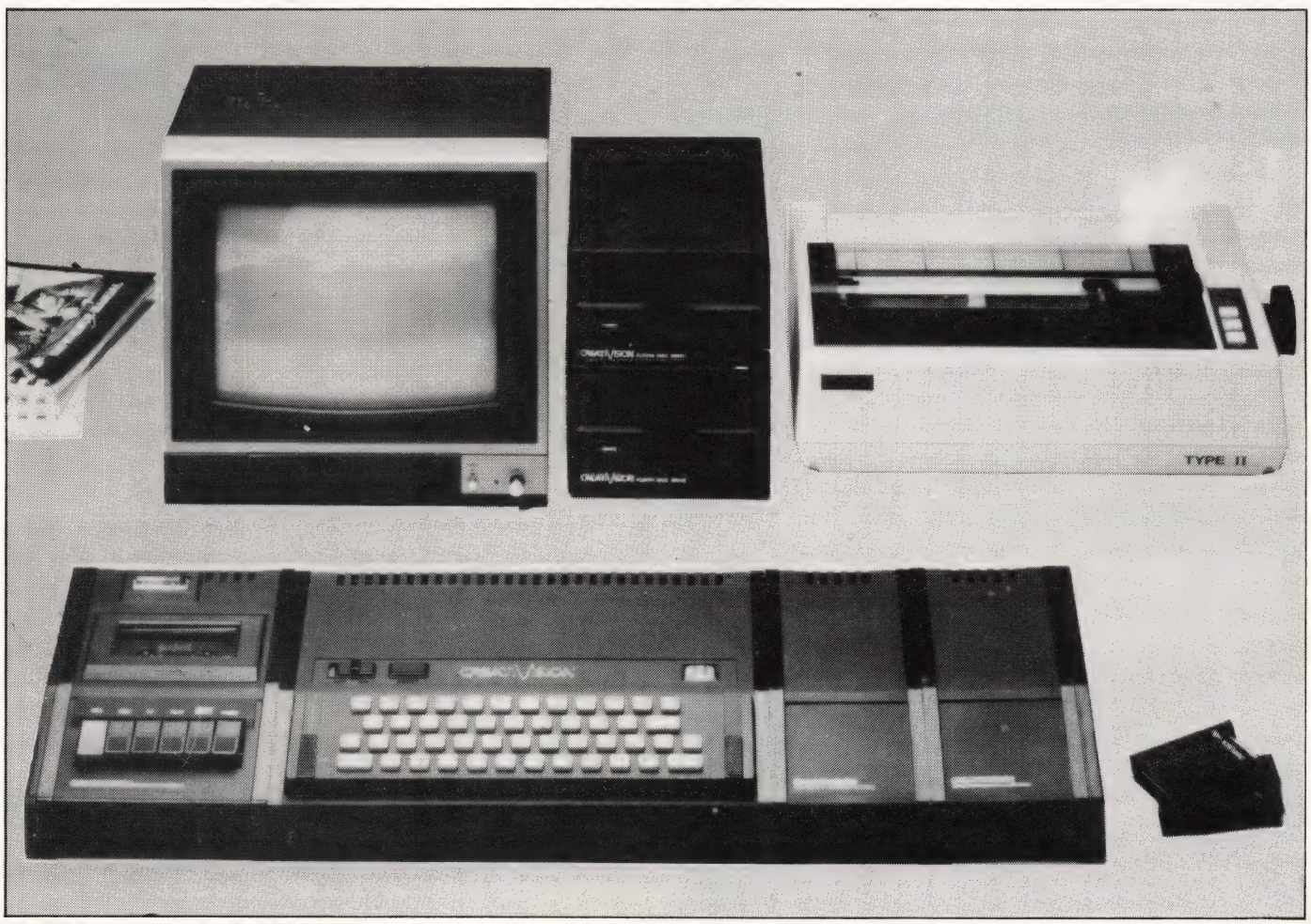
This machine looks set to open up a whole new sector of the market for those people who want the power of a dedicated video game system, combined with the flexibility of a properly designed computer system.

The Creativision computer is based around the tried and trusted 6502A CPU chip, and features in-built high resolution graphics, 4 channel sound and a standard 16K memory, all for under £100. The system comes supplied with a full moving-key keyboard, although high quality video game controllers can be bought by people wanting to use its video game aspect to the full.

It has been designed as a modular system so that its peripherals can be plugged into it to make up a complete unit. The peripherals that should be available for it at its launch are a dedicated cassette deck and a 16K memory pack, both retailing for about £39.95, and a Centronics interface. Following towards the end of the year will be a disk drive and a telephone modem.

Software for the Creativision will be available in both cartridge and cassette form, with the titles covering all aspects of small business, education and games. The cartridges will cost £19.95 and the tapes will sell for around £4.95.

The Creativision system should be available through high street retailers sometime in May or June.



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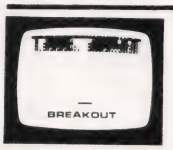


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SOFTWARE

GO 碁

Discover the world of the oriental strategy game GO

You might think that if chess, the aristocrat of board games, is taped, any game must be prey to the computer. But have you heard about the most popular board game in the world? No, not chess but Go! It's fast becoming popular in the West but is extensively played in the East, especially in Japan, China and Korea.

The origins of Go are lost in the mists of antiquity but it is thought to have surfaced some 4000 years ago in China (2000 years before chess). It might have been invented as a primitive abacus but more likely it was used as a method of divination. The board can represent the universe, the black and white stones (playing pieces) standing for the positive and negative forces, yin and yang. But equally the board can be regarded as a map of the battlefield and the stones as soldiers. In an earlier age it was popular with in the civil wars of Japan. In modern times Go was used to devasting effect in the military training of Vietcong officers. The game was introduced into Japan before the reign of the Tang dynasty more than 1300 years ago probably via Korea. During the Edo period, late in the sixteenth century, the Japanese Government promoted the spread of Go throughout the Japanese nation.

To Get Going

The game is essentially very simple. Play consists of the two contestants (black and white) taking it in turn to place a single stone on the intersections of a 19x19 grid (initially empty). Each player attempts to surround territory, first sketching it out, then fighting to hold it and capture the opponent's areas, until finally the boundaries are completed. The player with the most territory and captive stones combined, wins.

The simplicity of the rules belies the subtleties hidden in the game. Children learn to play in ten minutes flat — they have few preconceptions. Adults take much longer — they have to be convinced that a) the pieces do not move! b) yes! you do play on the intersection! and c) the only way to learn how to play well is to make moves — plenty of them, the faster the better. Go is a game that can be played at many levels of skill. There are always new, surprising and profound strategies to discover. It can be played trivially but beware! Once you are set on improving your play (a bit like improving your score at Space Invaders) you are hooked for life.

The techinique that is proving so successful in taming chess is merely the one of lookahead. A chess program that can work out the effects of all plausible moves for 9 moves ahead is difficult to beat. Not because it possesses superior strategy — it doesn't — but simply because it doesn't make blunders. The lesson seems to be that even chess masters make several demonstrably bad moves per game.

Lookahead

Lookahead severely tests the capabilities of even the fastest computer. If at every turn there are 10 plausible moves, to look 2 moves ahead means considering 10x10 combinations of moves. To look 6 moves ahead a computer must evaluate 10x10x10x10x10x10 ie one million moves. In Go, at each turn, there are usually at least 200 possible moves. There are roughly 200 moves in a game but, more importantly, significant sequences of moves of 50 or more are typical. Suppose we could, at each turn, cut the 200 possible moves down to 50 plausible moves. The number of moves our computer would have to consider is fifty lots of 50 multiplied together. This is an incredibly large number. In fact it is more than the estimated total number of atoms in the entire universe. Obviously, Go is positively not susceptible to the "number-crunching" technique even with the fastest conceivable computer.

How do humans play? Professional Go players in Japan take 18 hours over championship games but can if called upon play excellent Go with just a few seconds a move. Just how this is achieved nobody really knows. But whatever else they do, humans do not use extensive calculations in order to play.

There are two major schools of thought as to how to program Go. The first is to base your program on game knowledge. There are hundreds of books and magazines written on how to play Go but there is a snag. Try as you might it seems that crystallising the concepts into something usable causes them to evaporate. All the good advice is based on yet more good advice and is couched in terms that are vague and woolly — undeniably useful to us human players (somehow) but no good for a program. New, simpler, more concrete concepts are needed. Indeed some excellent work has already been done in this area by an American — Bruce Wilcox. However there seems considerable scope for improvements.

Pattern Recognition

The second school of thought is to base your program on the elusive concept, "Artificial Intelligence". Your program must somehow learn what is good and what is bad. The most promising approach in this area is one of recognising patterns of stones to trigger the program responses. Such techniques, if proven successful, would be of immense value. However, the same thoughts were voiced in the infancy of chess programming. Perhaps because number-crunching techniques seem to be obviously out of the question, someone will make more progress in ▶

GO

this challenging area?

Coming down to earth, and injecting a personal note into the proceedings: What can be achieved on personal computers? Given that we aren't going in for number-crunching, the answer is great deal. BASIC is slow but bearable although it's probably wise to write critical subroutines in machine code if you can. The biggest problem is that you can easily run out of RAM. You need quite a lot to hold arrays of the board position, evaluation of groups and so forth. This can be alleviated somewhat by shrinking Go to "micro-Go", reducing the board to a 9x9 grid giving just 81 intersections to worry about instead of 361.

Writing a Go playing program can't be done in five minutes. It's best to take it in easy stages, each stage providing a useful program. The first step is to set up the display of the board and the input of moves. The simplest scheme is to use "X"s for black stones, "O"s for white, and "+"s for vacant intersections. Once completed you can use your VDU or TV screen as a board not only as for Go but for other games too eg Gomoku.

The second step is to include rejection of the invalid moves and automatic removal and tallying of captured stones. The major problem — sorry! — opportunity for solution — here, is to detect all the stones in each group of connected stones without missing any or counting the same stone twice or, even worse, infinitely many times! A basic technique is to copy each stone examined, from the board array onto another 9x9 array. As each stone is copied the adjacent intersections are examined for the next stone in the group. If there is now a new stone to be copied it doesn't mean that all the stones have been found.

The second array must be "swept" to look for any stone that does have a new adjacent stone for copying. If there is one, the process is repeated. When there are none, the whole group has been transferred. If, on the board array, it is found that there are no vacant intersections next to any stone in the group this means it is closely surrounded by enemy stones and is therefore captured. Using the second array for reference, it is then an easy task to remove the stones from the board array.

The third step is to get the program to play. The crudest method is to pick moves at random but this would mean your program would never properly finish a game. The simplest successful method is to formulate a boundary approach. Apart from spreading a few moves around at the start of the game, moves are restricted to those intersections next to both black and white stones. This naturally forms groups and surrounds territory. But the standard of play leaves a lot be be desired.

Be Creative

So the subsequent steps are to progressively include your latest and greatest stratagems into you program. Most progams suffer from predictability. Once a human player has discovered a program's weak points he or she can exploit it mercilessly. However, there seems no fundamental reason why a micro based program shouldn't reach a respectable standard of play even if not up to the standard of experienced human players. Also for limited parts of the game, eg the endgame, there are good prospects that a computer program could play very well indeed. And then of course it is always possible that someone will discover a new devastating way for a computer to humiliate its human opponents!

The Rules Of Go

Major Rules:

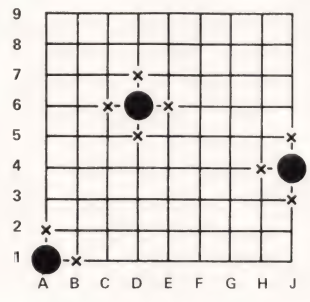
1. One player uses black stones, the other white
2. The board starts empty. Play consists of the contestants placing, in turns, a single stone on the intersections of a 19x19 grid. Black starts first. Once placed, stones are not moved unless captured.
3. The object of the game is to surround territory, 1 point is awarded for each vacant intersection surrounded and also for each opponent stone captured.
4. Suicide (capturing your own stones) is forbidden!
5. A player may pass his turn
6. A game is ended by resignation or by three consecutive passes
7. The player with the most points wins. (Draws are possible)

Rules In Detail

Liberties:

Unoccupied intersections adjacent to stones are called "liberties". A single stone in the middle of the board has 4 liberties. At the edge it has 3 and at the corner only 2 liberties. The liberties on the diagram are marked with crosses.

LIBERTIES

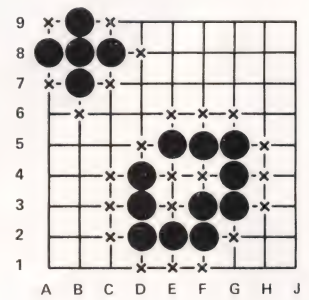




Connecting Stones:

Stones of the same colour, placed on adjacent intersections, are solidly connected and act as a unit. The diagram shows two groups of solidly connected stones along with each group's liberties.

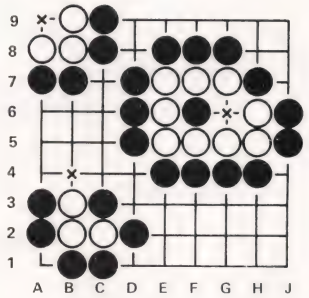
CONNECTED STONES



Capture:

A single stone or an entire group is in danger when it has but one liberty left. An opponent's stone placed on the liberty captures that stone or group. All captive stones are removed from the board. Assuming it's his turn, black can capture any one of the three white groups shown in the diagram.

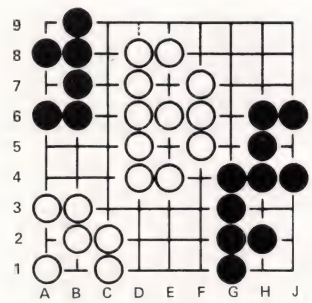
CAPTURE



Eyes:

A space within a group is called an *eye*. As a consequence of the suicide rule, groups with two or more separated eyes can never be captured. Groups that can be reduced to a single liberty, internal or not, are doomed. Each group in the diagram is invulnerable. Try as you might, the suicide rule will prevent you from removing that last liberty.

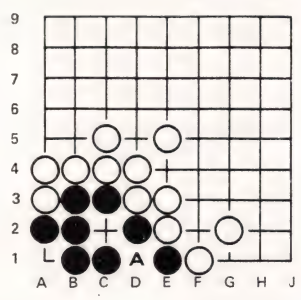
EYES



The KO Rule:

KO is Japanese for "eternity", which is the time a game might take but for the KO rule. This rule forbids the immediate recapture of a single stone if the previous board position is repeated. In the diagram black has just captured a white stone at A. White is not allowed to play back at A immediately, He must play elsewhere. Then black can play at A giving life to his group. Unresolved KOs are filled at the end of the game.

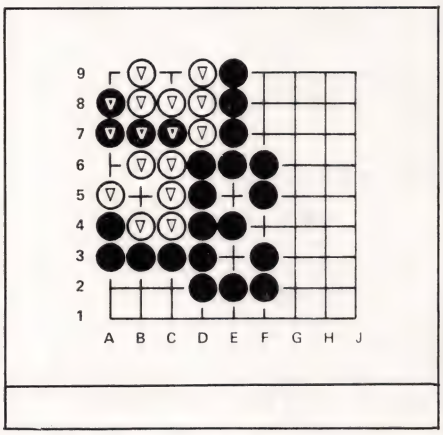
THE KO RULE



Seki:

Occasionally you may stumble on a "seki", an example of which is shown in the diagram. Neither player has two eyes but neither can afford to play first. In this "Mexican standoff", neither player scores points for territory within those groups "in seki" (marked)

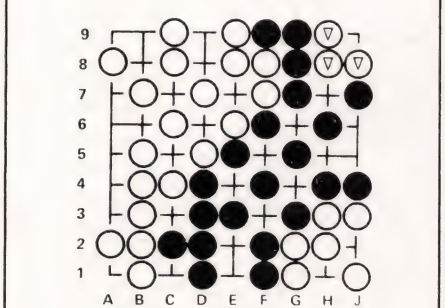
SEKI



At The End:

Play ends when no further territory can be gained by either player. Stones that cannot make two eyes are deemed dead and are removed without further ado. (If there's disagreement about what should live or die, continue play until mutial agreement is gained). The diagram shows the result of a game. The one-eyed group (marked) is dead. Assuming two captives each gained previously the final score is — white 18 + 2 and black 15 + 5. A draw!

AT THE END





COMING NEXT MONTH ON SALE FROM APRIL 1

Personal Computing Today

In our merry, merry, month of May issue we have the second part of our look at computer peripherals. In this we scrutinise add-ons that are available for the Atari, Atom and TRS 80 computers. So if you own one of these popular micros then make a point of ordering your copy of PCT now.

Win a Computer

Our main review feature next month highlights the latest and greatest from the world of video games. We will be looking at some of the new releases from Parker, Spectravision, and Atari, amongst others. So if you are a games enthusiast make sure you read this feature.

To tie with our games feature we have organised a special competition in conjunction with Atari. This competition could be the chance of a lifetime, and whats more you don't need any special knowledge to enter it.

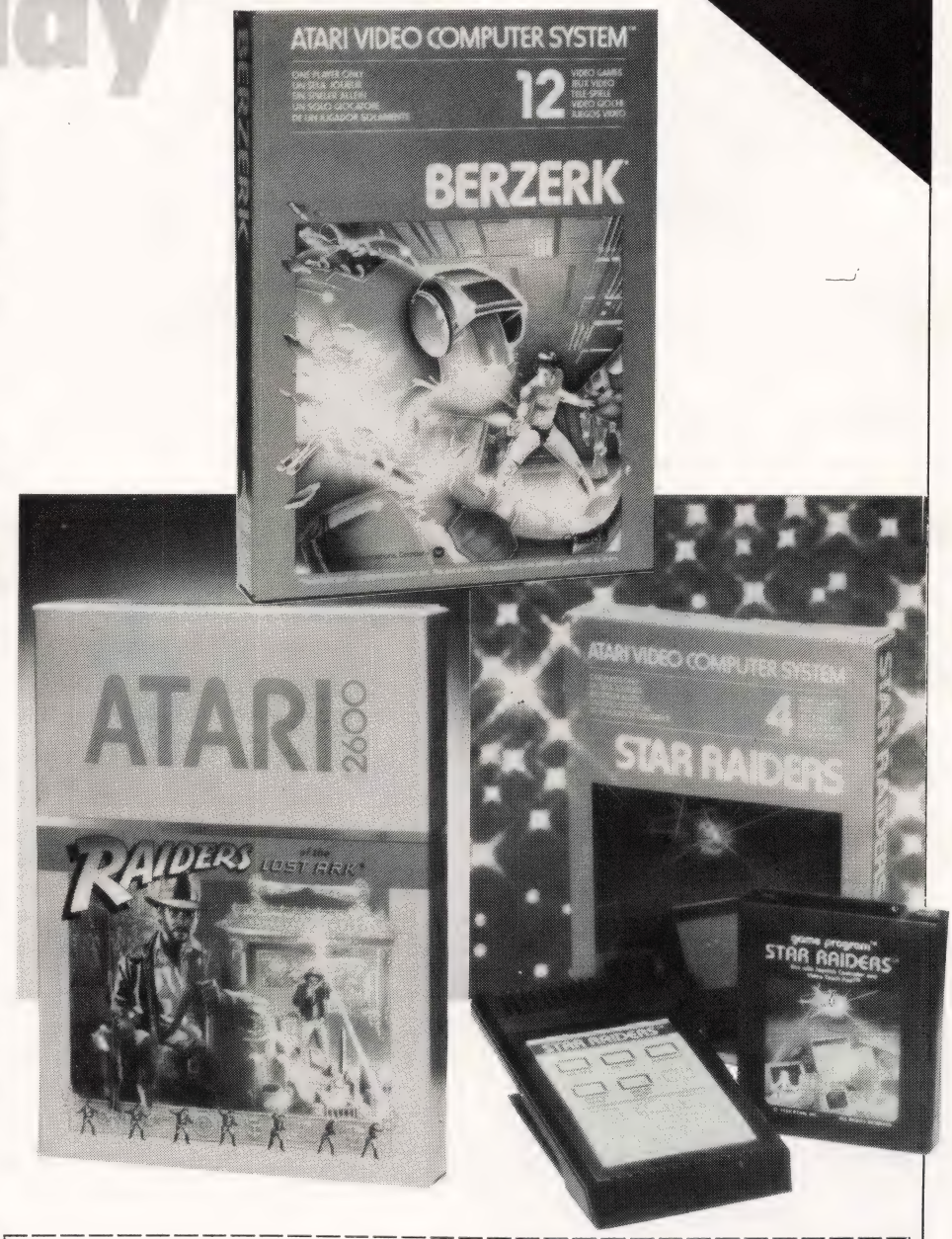
What you have to do is simply let your imagination run riot and come up wtih an idea for a game. Obviously we do not want another Pac-Man or a Space Invaders, so the more original it is the better.

If the thought of fame and immortality isn't enough for you then there is also the matter of an Atari 400 computer to be won. Start thinking now and who knows, you might dream up something that will beat Pac-Man in the popularity stakes.

Stunning Software

For those of you who have already got computers, we have a great selection of software, ranging from a mortgage and savings program for the PET, to a chase program for the VIC, and if you fancy a quick break then we have a game of teacups for the Atom.

Note: At the time of going to press this information is correct but may be altered for reasons beyond our control.



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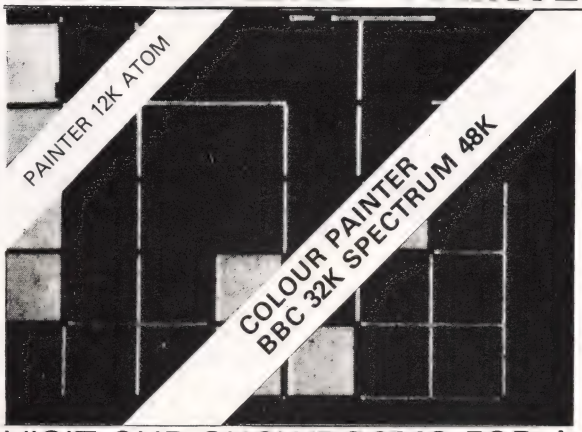
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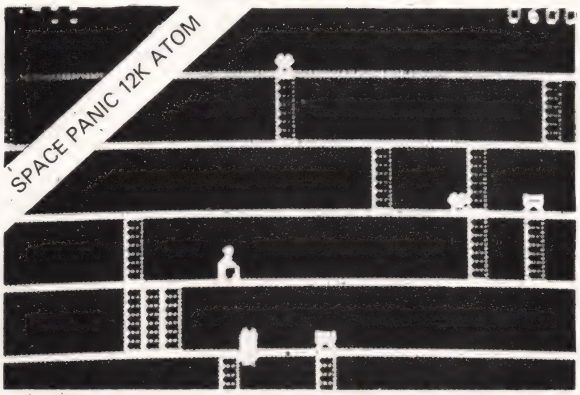
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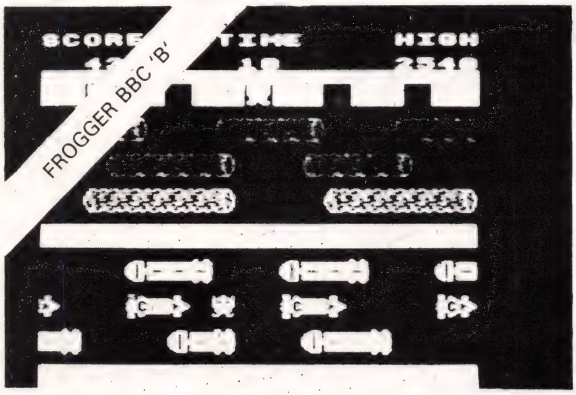
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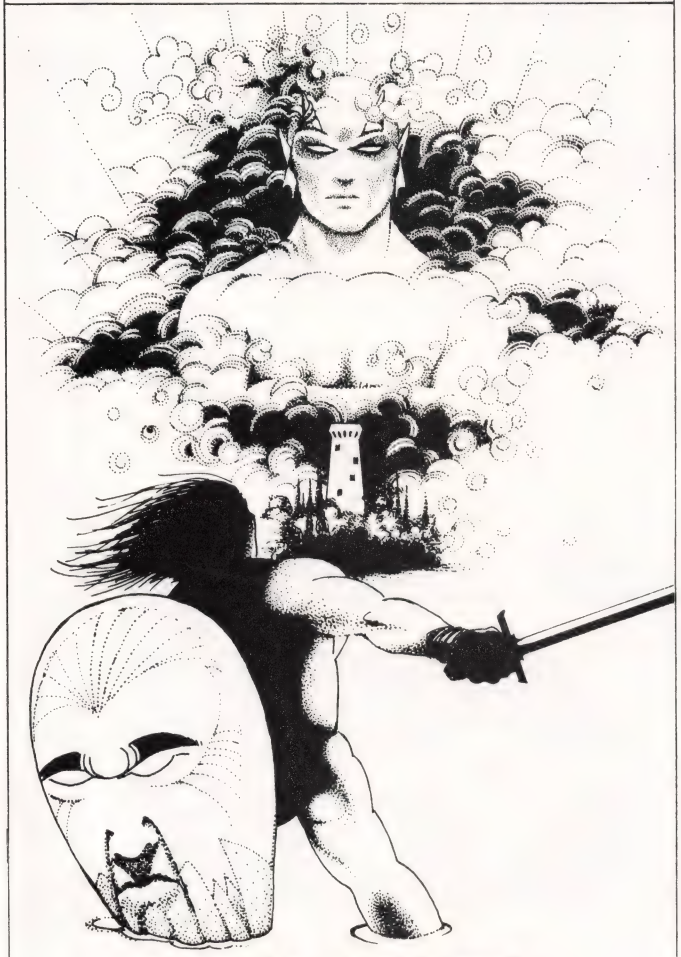
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If you wish a personal reply, please enclose a stamped addressed envelope *and the reply coupon from this page*. This is to enable us to give priority to regular readers of PCT.

Dear PCT,
I own a VIC-20 computer and have recently bought a Commodore 16K Ram Pack. I have three queries regarding the additional memory:
1. The instructions with the pack state that when it is in use the preliminary message on the screen will show "19965 Bytes Free.". In fact, mine shows 19967. Is this a misprint in the instructions or has the pack been modified, giving the two extra bytes?
2. Now that I have the extra memory, available I wish to send for some more advanced games than those which have previously been available to me. However, reading through the advertisements I am confused by some of the expressions used.

Some games are advertised as being for the "6.5K" Vic, which is obviously for a standard Vic plus 3K RAM expansion. Will these games work with my 16K pack or once again is it necessary for me to buy a separate 3K pack?
3. I am considering buying a "Super Expander" cartridge which I understand contains 3K Ram. Will my present 3.5K games work with the 3K cartridge in place or will it be necessary for me to remove it as I have found I must do with my present 16K pack?
R.G. Russell
Gwent

When powered up with a 16K RAM pack our office VIC shows 19967 bytes free on the screen, so I suggest that the other figure is a misprint in the packs instructions.

The VIC-20 has two different configurations when you expand it. The first is for a VIC with 3K expansion fitted. The only thing that has shifted in the VIC's memory is the start of BASIC, so most programs for the unexpanded VIC will run, except maybe some of the more advanced machine code programs. The second configuration occurs when either an 8K, 16K or 24K expansion has been fitted. When anyone of these expansions are fitted, the addresses of the start of screen, start of colour memory and start of BASIC all change. So when tapes indicate that they need a VIC + 8K expansion to run it means that this is the minimum amount of exansion memory that the system needs in order for the program to load and function correctly. Programs written for a standard VIC or for a VIC + 3K will require alteration to make them run on a VIC with 8K+, unless they are just straight BASIC and contain no PEEKs, POKEs or machine code.

Dear PCT
The operating instructions for our Panasonic television contain the following warning about the use of TV Games: "The extended use of 'TV Games' with any television set can cause a permanent 'shadow image' on the television picture tube. This background image is viewable on normal programs in the form of stationary TV Game objects."

Is this true? Will it affect our rented 22" colour TV when my new Spectrum arrives?
Peter Bevan
Cheshire

This sort of warning refers mainly to the old type of TV games that were available about 3/4 years ago. These games were usually in black and white. Because this caused very sharp areas of contrast on the picture and the fact that a lot of images remained stationary throughout a game often caused the phosphor coating on the inside of the picture tube to 'burn out'. This then leads to permanent shadow image which remains when the TV is returned to its normal use.

This is not such a problem nowadays, as the picture quality produced by home computers and game systems is a lot better. However, it is still possible to 'burn out' the television if you leave a very bright display running for any length of time without it moving.

Some computers have overcome this problem. One such is the Atari, which, if you leave the same display running for any length of time, will start to change the background and foreground colours, so as to stop any part of the display being damaged.

With your Spectrum if you follow these rules, then you should have no problems with your TV set:
1) If you need to work on the computer with a display that includes bright colours for any length of time, then turn down the brightness control on your television set.
2) Do not leave the computer running for any great length of time when connected to your television set if you are not going to be using it. If you do then disconnect the TV from the computer.

Dear PCT
Thank you for an excellent magazine which I have

read avidly since its first issue. There are a couple of points I want to make about it but first of all could you help me with a problem.

I acquired a Commodore 64 two days before Christmas and have been fascinated ever since. I soon managed to write an arithmetic program for my youngest daughter. My eldest daughter had written a geography quiz program for her within the week so it was a true family present.

As there were no games available for the 64 I tried my hand at converting 'Breakout' and after many hours did produce a working version although it is still only possible to hit certain of the bricks so further work is required! But after the exercise I certainly knew a lot about the graphics and colour screen memories of both VIC and 64! It is in fact an excellent way to learn.

I then tried to convert 'Solgor' (October Issue). I had trouble with line 190 but on the 64 it should I think be:-

```
X = INT(10 * RND(1)) + 1
```

When I'd programmed it, it ran alright. I then SAVED it, VERIFIED it, cleared the machine (NEW), LOADED and RAN it again. I happily put the machine to bed.

Next day I tried to reload and one of two things happened. Either it didn't load at all. I just a quick ghost image of the title as the machine was searching through the cassette. Or if I started the cassette at the very beginning it loaded but showed the message:-

?LOADING ERROR

When I tried to run it, it showed:-

UNDEF'D STATEMENT IN 200

I cannot understand what has happened as I had verified the program and all seemed well. Can you help please?

And on the more general question, will a syntax error in the program if stored on cassette prevent it from reloading? Incidentally I went through the above procedure twice so it's not just a one off. I am of course using the recommended Commodore Datassette Cassette Player.

That was the problem. Just a few other thoughts. I discovered a useful tip when I was converting 'Breakout' which I haven't seen in your magazine. When I was debugging I had the greatest difficulty in seeing why the ball was changing direction at the wrong time. What I did in the end was to get the 64 to tell me! In other words I typed in a line like "PRINT A: PRINT B". I also put in a delay loop to slow things down and then stopped the program just after it had gone wrong. From the print variable values I was able to immediately understand where the problem lay.

The other thing I discovered in converting this program is that if words or individual letters start disappearing from the program when you run it doesn't mean the machine is broken! The explanation (in my case) was that I was POKEing into BASIC.

Finally can you advise me of any 64 Software on the market (expect for Llama Soft which I see in this month's issue). Finally, finally do you know if the Atari joysticks can be used on the 64. I've heard they are better (more movement) then Commodore's own (which aren't yet available anyway).

A.R. Davies
Wirral

This is a very odd problem that a program should fail to load after it has been SAVEd and VERIFYed. The problems you are getting sound very much like that tape itself could have been corrupted.

This could have been caused by a number of things, the most likely being that after removing it from the cassette player you placed it near a magnetic field, such as a coil of wire or the back of your television.

If this is the case then your program has been corrupted for good and you will have to start again. The moral of this story is to look after your tapes and, if it is a particularly valuable program, make a back up copy, making sure that you store it in a different place to your working copy.

To deal with your second point, saving a program that contains syntax or other errors should not affect loading. The only time where this could be a contributing factor to any problems is if when the program was run it POKEd into a part memory where it shouldn't have therefore disrupting the SAVE. The solution to this is to always save any program under development before you run it.

To round up; by the time you read this the first of Commodore's 64 titles should be on the market. The Atari joysticks are compatable but having tried the new CBM joysticks I should wait for them because, for my money, they are better.

PRIORITY REPLY

April 1983 Issue

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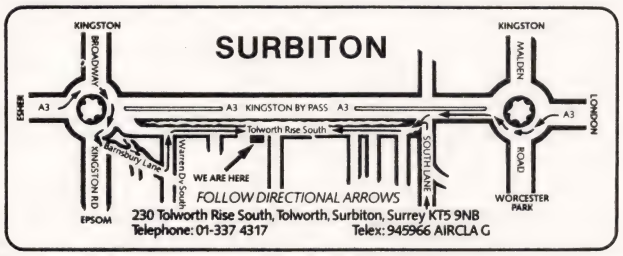
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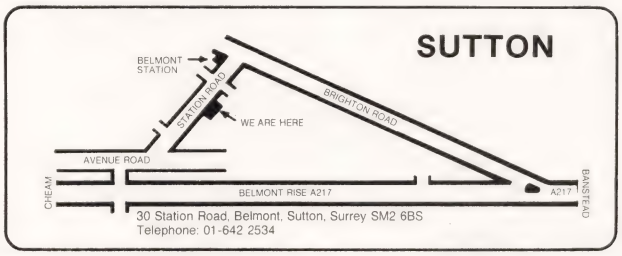
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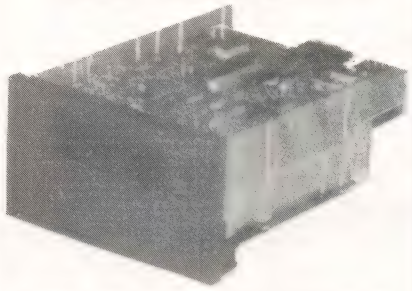
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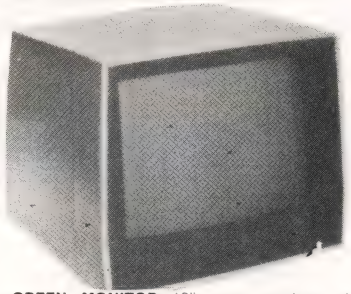
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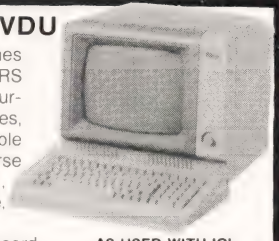
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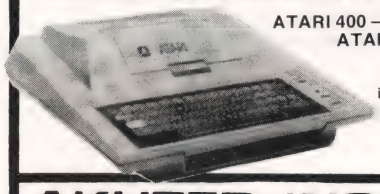


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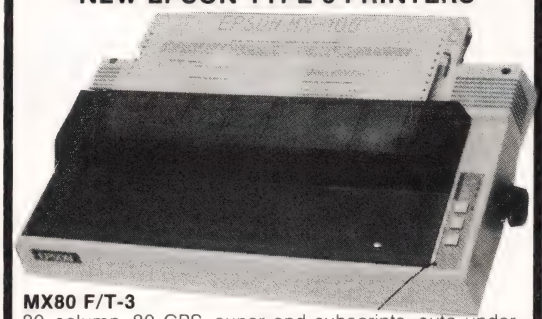
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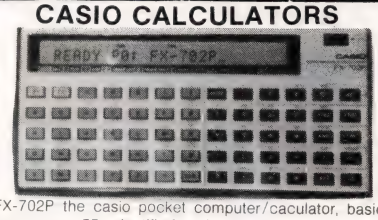
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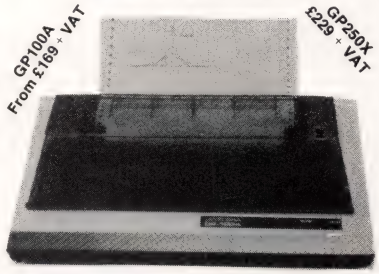
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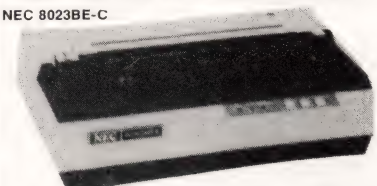


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This code cracker program is no ordinary one. David Vincent has set you what he believes to be an impossible task. Within his program is a message which you must decode. If you can do it David will send £10 to anyone who sends him the decoded version of his message by the end of the month of publication, i.e. the end of April.

The system is based on using a word, phrase or series of letters (previously agreed with your correspondent), each letter of that "Codebreaker" then being used to start the code "alphabet" of the corresponding letter of the message being coded. Sounds confusing! Perhaps a simple example will clarify things.

I chose as my "Codebreaker" the word "DAVID". My message is simply "HELLO". The first letter of my message ("H") is coded by starting the alphabet with the letter D (the first letter of "DAVID"). Thus "H" is represented by "K" when coded. The second letter ("E") is coded using "A" as the start of our code alphabet, thus "E" remains unaltered. The third letter ("L") is dealt with differently inasmuch as, "L" being the 12th letter of the alphabet and, starting our code alphabet at "V" (the 3rd letter of our "Codebreaker") we run out of letters when we reach Z! But, continuing again at "A", "L" in this case will be represented by the 7th letter, "G". The alphabet is therefore used as an endless loop. We continue in this manner, our final coded message being written as "K E G T R".

When the message is longer than the "Codebreaker", then the series is repeated until the whole message has been coded.

David did not cheat in any way when coding his message (for example, by putting the spaces between the words in the wrong places, or by leaving them out altogether!) and the "message" is as follows:

WMGCY TLCFU RERWQ

RKECX JAEGK.

HOW IT RUNS

Line 100	Sets up arrays to store character values of "Codebreaker", message and coded message.
Lines 110-120	Set up title screen.
Lines 130-160	Give option to receive instructions before proceeding.
Lines 230-320	Accept input of "Codebreaker" word/phrase, then assess each character in turn (by means of its ASCII number) eliminating any not in the range A-Z. The new string (minus spaces or illegal characters) is then stored in ASC number format in array CB.
Lines 330-410	Accept input of message (or coded message) then convert all characters into ASC numbers. No characters are eliminated in this stage. This string of ASC numbers is stored in array ML.
Lines 420-610	This section computes and stores the coded (or decoded) message in ASC number form in arrray CM.
(440 & 450)	Cause any character outside the range A-Z to be stored without alteration.
(480-500)	Cause the "Codebreaker" string to be used as an endless loop. (C is the length of the "Codebreaker" array CB; M pinpoints the character from the array currently being used).
(510-610)	Calculate the ASC numbers of the coded letters by adding (to code) or subtracing (to decode) the ASC number of the "Codebreaker" letter to or from the corresponding letter in the message, then subtracting or adding 65 (the ASC number for the letter A) to bring the number back into the required range.
(540 & 580)	Add or subtract 26 when necessary to ensure a contiuous loop in the alphabet is achieved.
Lines 620-710	Print out the coded or decoded message using the CHR$ function. This is a reversal of the ASC function, converting an ASC number back into character form.
Lines 720-860	Print out instruction when requested by pressing "Y" in response to line 130. The instruction total 3 screen "pages", each page being held on screen until any key is pressed by sub-routine 880-920.

HINTS ON CONVERSION

This program should run on almost any BASIC language micro, with very few alterations.

Most commands and functions on the TI99/4A are fairly standard, but a quick glance at the reference manual to confirm syntax requirements on other computers is advisable.

The only "non-standard" commands which may need clarification for non-Texas users are CALL CLEAR and CALL KEY. The first simply clears the screen, and is usually replaced by CLS on other machines. CALL KEY is used to get a character from the keyboard and can be replaced by either GET or INKEY.



PROGRAM LISTING

```
100 DIM CB(110),ML(110),CM(110)
110 CALL CLEAR
120 PRINT TAB(7);"ALPHA-GRID COD
E":TAB(7);"---------------": : :
 : : : :
130 PRINT "DO YOU REQUIRE INSTRU
CTIONS?": :TAB(7);"(PRESS Y OR N
)": : : : :
140 CALL KEY(0,KEY,STAT)
150 IF KEY=78 THEN 170
160 IF KEY=89 THEN 720 ELSE 140
170 CALL CLEAR
180 PRINT "SELECT MODE:": : : :T
AB(6);"1. ENCODE MESSAGE.": : :T
AB(6);"2. DECODE MESSAGE": : : :
 : : :
190 CALL KEY(0,S,STAT)
200 IF S<49 THEN 190
210 IF S>50 THEN 190
220 S=S-48
230 CALL CLEAR
240 PRINT "CODEBREAKER STRING:":
 : :
250 INPUT CB$
260 X=LEN(CB$)
270 FOR I=1 TO X
280 IF ASC(SEG$(CB$,I,1))<65 THE
N 320
290 IF ASC(SEG$(CB$,I,1))>90 THE
N 320
300 C=C+1
310 CB(C)=ASC(SEG$(CB$,I,1))
320 NEXT I
330 ON S GO TO 340,360
340 PRINT : : :"MESSAGE:": : :
350 GO TO 370
360 PRINT : : :"CODED MESSAGE:":
 : :
370 INPUT M$
380 Y=LEN(M$)
390 FOR J=1 TO Y
400 ML(J)=ASC(SEG$(M$,J,1))
410 NEXT J
420 FOR K=1 TO Y
430 L=L+1
440 IF ML(L)<65 THEN 600
450 IF ML(L)>90 THEN 600
460 M=M+1
470 CL=CB(M)
480 IF M<=C THEN 510
490 M=M-C
500 GOTO 470
510 ON S GO TO 520,560
520 CM(K)=ML(L)+CL-65
530 IF CM(K)<=90 THEN 610
540 CM(K)=CM(K)-26
550 GOTO 610
560 CM(K)=ML(L)-CL+65
570 IF CM(K)>=65 THEN 610
580 CM(K)=CM(K)+26
590 GO TO 610
600 CM(K)=ML(L)
610 NEXT K
620 CALL CLEAR
630 ON S GO TO 640,660
640 PRINT TAB(8);"CODED MESSAGE:
": : : : :
650 GO TO 670
660 PRINT TAB(7);"DECODED MESSAG
E:": : : : :
670 FOR L=1 TO Y
680 PRINT CHR$(CM(L));
690 NEXT L
700 PRINT : : : : :
710 STOP
720 CALL CLEAR
730 PRINT " THIS PROGRAM WILL CO
DE OR": :" DECODE MESSAGES USING
 THE": :TAB(8);"""ALPHA-GRID""."
: :" THE MESSAGE ";
740 PRINT "IS CODED USING": :"A
CODEBREAKER WORD OR PHRASE": :"(
UP TO 110 CHARACTERS), EACH": :"
 LETTER OF THE ";
750 PRINT """CODEBREAKER""": :"
BEING USED SEQUENTIALLY AS": :"T
HE FIRST LETTER OF THE CODE": :
760 PRINT TAB(9);"""ALPHABET"".
" : : :
770 GOSUB 880
780 PRINT " THE MESSAGE MAY BE U
P TO";' :" 110 CHARACTERS IN LENG
TH.": : :
790 PRINT "  WHEN THE CODEBREAKE
R IS": :" SHORTER THAN THE MESSA
GE,": :" THE CODEBREAKER ""SERIE
S""": :
800 PRINT " IS REPEATED UNTIL CO
DING": :TAB(8);"IS COMPLETE.": :
 : :
810 GOSUB 880
820 PRINT "THE COMPUTER IS PROGR
AMMED": :" TO ACCEPT ONLY UPPER
CASE": :"LETTER INPUT (A-Z) FOR
BOTH": :
830 PRINT "   CODEBREAKER & MESS
AGE.": :
840 PRINT " ANY OTHER CHARACTERS
 INPUT": :" (INCLUDING SPACES) W
ILL BE": :" IGNORED IN THE CODEB
REAKER": :
850 PRINT "OR RETURNED UNALTERED
 IN THE": :TAB(11);"MESSAGE.": :
 :
860 GOSUB 880
870 GOTO 180
880 PRINT " PRESS ANY KEY TO CON
TINUE"
890 CALL KEY(0,ANY,S)
900 IF S=0 THEN 890
910 CALL CLEAR
920 RETURN
```

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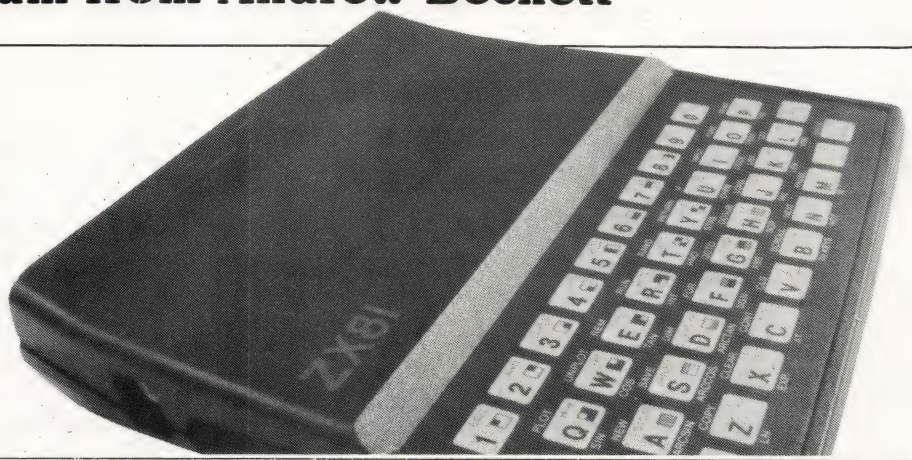
PCT

ZX 81 DIGI

Turn your ZX 81 into a most unusual clock with this machine code program from Andrew Beckett

This Digital Clock program has been written for the ZX81 and will fit on the unexpanded 1K machine. It is written in Machine Code because this language is far more memory efficient and much more accurate.

The program uses the system variable FRAMES to keep time. This is a two byte number in which bit 15 is always set and the other bits (0 – 14) are continuously decremented (according to the manual) every 1/50th of a second.



HOW IT RUNS

The Assembly listing (the Machine Code program) below consists of several parts, each of which is labelled. The first part (Part A) sets up the screen and puts the two colons of the clock in place.

Part B is a delay routine and it delays for a second. It does this by counting 50 changes in the system variable FRAMES. This method of counting 50 changes rather than 50 decrements was adopted due to a peculiarity of FRAMES which means that after what appears to be a random amount of time, FRAMES increases randomly to a much higher number, which would stop the clock.

Part C increments the seconds and when they reach 60 then they are reset and the hours are incremented. When the hours reach 13 they are reset to 1. The hours, minutes, and seconds are stored in three bytes just before the start of the program.

Part D takes these bytes in turn and converts them into two codes (for the tens and the units of each byte) and displays them on the screen.

Part E checks to see if the Break key has been pressed and returns to BASIC if it has, otherwise the program jumps back to the beginning of Part B.

To enter the program, first type in Listing 1, making sure that line 10 contains 120 X's. This is a machine code loading program which allows you to store a Machine Code program in the first line of the BASIC program.

RUN this program and enter the codes under "HEX OPCODES" in the Assembly listing, pressing newline after each code. The number displayed on the screen should correspond to the address that you are typing in (as shown in the Assembly listing). Should you make a mistake, just type in 'HH' and the bottom address shown on the screen will decrement by one, and you can retype that entry.

When you have typed in all 120 codes, enter 'GG', and the program will stop. If you then LIST the program you will see that line 10 is a jumble of Letters, graphics and keywords. Delete lines 20-160 by typing their line numbers.

Next add to the one line that remains the lines shown in Listing 2. This part of the program is used to set the time.

When you RUN the completed program, you will be ased to enter the hours, minutes, and seconds that you want the clock to start from. To start the clock press newline after you have finished entering the time. To stop the clock press Break.

The accuracy of the clock depends on the machine, as it depends on your hardware how near to 1/50th of a second FRAMES will be.

HINTS ON CONVERSION

This program is written specifically for the ZX 81 and contains a large section of machine code. This makes it virtually impossible to convert it to any other machine. Hopefully though, if you are conversant with assembly language programming for your own machine then the machine listing itself should give you some indication of how to go about writing a similar routine for your own micro.

TAL CLOCK

PROGRAM LISTING

Listing 1

```
10    REM XXXXXXXX(120 X's)
      (You can test if this line has 120 X's in it by typing
      PRINT PEEK 16511.  The number printed should be 122)
20    DIM A$(2)
30    LET A = 16514
40    PRINT AT 10,0;A:" = ";
50    INPUT A$
60    IFA$↑"HH" THEN GOTO 90
70    LET A = A - 1
80    GOTO 140
90    IF A$ = "GG" THEN STOP
100   IF CODE A$28 OR CODE A$↑43 OR CODE
      A$(2)↓28 OR CODE A$(2)↑43 THEN GOTO 50
110   PRINT A$
120   POKE A,16*CODE A$ + CODE A$(2) - 476
130   LET A = A + 1
140   SCROLL
150   IF A↓16514 OR A↑16634 THEN STOP
160   GOTO 40
```

Listing 2

```
20    PRINT "ENTER HOURS"
21    INPUT A
22    IF A↓ OR A↑2 THEN GOTO 21
23    POKE 16514,A
24    PRINT AT 0,6;"MINUTES"
25    INPUT A
26    IF A0 OR A↓59 THEN GOTO 25
27    POKE 16515,A
28    PRINT AT 0,6;"SECONDS"
29    INPUT A
30    IF A0 OR A↓59 THEN GOTO 29
31    POKE 16516,A
32    CLS
33    INPUT A$
34    RAND USR 16517
```

Assembly Listing

Address	Hex Opcodes	Mnemonic
PART A		
16514	00 00 00	DATA(HR's),(MIN's),(SEC's)
16517	3E 00	LD A,00
16519	06 20	LD B,20
16521	D7	RST 10
16522	10 FD	DJNZ to 16521
16524	2A OC 40	LD HL(D-FILE)
16527	01 OE 00	LD BC,000E
16530	09	ADD HL,BC
16531	36 OE	LD (HL),":"
16533	23	INC HL
16534	23	INC HL
16535	23	INC HL
16536	36 OE	LD (HL),":"
PART B		
16538	06 32	LD B,32(50-decimal)
16540	ED 5B 34 40	LD DE(FRAMES)
16544	E5	PUSH HL
16545	A7	AND A
16546	ED 52	SBC HL,DE
16548	E1	POP HL
16549	28 F5	JRZ to 16540
16551	EB	EX HL,DE
16552	10 F2	DJNZ to 16540
16554	E5	PUSH HL
PART C		
16555	21 84 40	LD HL,ADDRESS OF SECONDS
16558	34	INC HL
16559	3E 3C	LD A,3C
16561	BE	CP (HL)
16562	20 12	JRNZ to 16582
16564	36 00	LD (HL),00
16566	2B	DEC HL
16567	34	INC (HL)
16568	BE	CP (HL)
16569	20 OB	JRNZ to 16582
16571	36 00	LD (HL),00
16573	2B	DEC HL
16574	34	INC(HL)
16575	3E OD	LD A,0D
16577	BE	CP(HL)
16578	20 02	JRNZ to 16582
16580	36 01	LD (HL),01
PART D		
16582	2A OC 40	LD HL,(D-FILE)
16585	01 0C 00	LD BC,000C
16588	09	ADD HL,BC
16589	01 82 40	LD BC,ADDRESS OF HOURS
16592	1E 03	LD E,03
16594	OA	LD A,(BC)
16595	16 00	LD D,00
16597	A7	AND A
16598	FE OA	CP OA
16600	38 05	JRNC to 16607
16602	D6 OA	SUB OA
16604	14	INC D
16605	18 F6	JR to 16597
16607	F5	PUSH AF
16608	7A	LD A,D
16609	C6 1C	ADD A,1C
16611	77	LD (HL),A
16612	23	INC HL
16613	F1	POP AF
16614	C6 1C	ADD A,1C
16616	77	LD (HL),A
16617	23	INC HL
16618	23	INC HL
16619	03	INC BC
16620	1D	DEC E
16621	20 E3	JRNZ to 16594
PART E		
16623	E1	POP HL
16624	01 FE 7F	LD BC,7FFE
16627	ED78	IN A(C)
16629	1F	RRA
16630	DO	RET NC
16631	C3 9A 40	JP 409A



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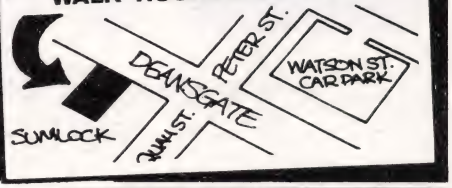
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Your objective is to occupy your opponent's headquarters. You have ten tanks available, two of which have specialised functions, tank number 1 lays mines at the end of each move and tank number 10 is able to repair damaged or otherwise inoperative tanks by being brought alongside it.

Each player takes it in turn to move, but before doing so he can ask for a report on any of his tanks. This command flashes the current position of the tank and prints out the fuel, ammunition and damage status. Four different graphics characters are used for each army to show on the battle plan tanks that are intact, gun damaged, engine out and both gun and engine out.

A move consists of moving any or all tanks a total distance of 30 squares. The distance and direction are input by the GET command and you are asked if you wish to open fire on your opponent. If this is the case, and you are within range of enemy tanks an exchange of fire occurs. The likelihood of a hit is dependant on distance and the presence of intervening trees!

Despite the length of this program, its structure is very simple. After setting up the screen there is one main loop with minor subroutines indicated in REM statements. Extensive use has been made of arrays which at first sight appear complicated but are in fact simple. For example the vertical and horizontal co-ordinates of each tank are stored in the form V(2,10) H(2,10), where the first dimension is the flag for which army we are dealing with and the second dimension is the number of the tank we are dealing with (1-10). Fuel, ammunition and damage sustained are F(2,10), A(2,10) and D(2,10).



HOW IT RUNS

5-90	Initialisation of arrays and game variables.
100-129	Prints up instructions and inputs players names.
140-220	Sets up game display on the screen.
225-285	Routines for printing river and trees.
290-630	Main program loop, includes keyboard detection and battle orders.
715-780	Routine for calculating distance between tanks.
790-850	Fire routine.
855-990	Defensive fire routine.
1900-3010	Battle status report.
3990-4020	Player wins.
4990-5100	Repair damaged tanks.
6990-7220	Full instructions.
9000-9200	Sets up and plays music strings.

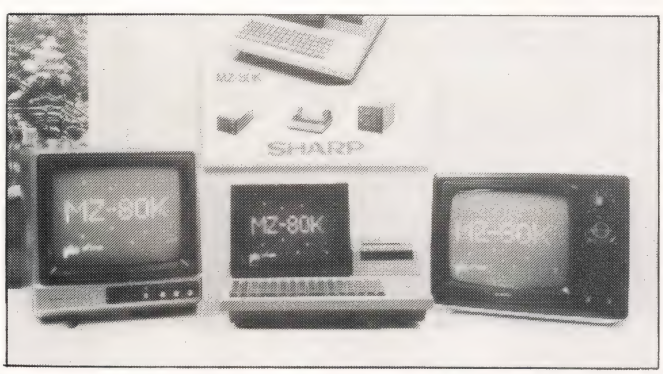
HINTS ON CONVERSION

This program takes advantage of the superb range of graphics characters on the Sharp MZ 80K but these can easily be improvised for other machines. Also, extensive use is made of two dimensional arrays where the first dimension is a flag for whose turn it is. eg tank symbols:

T$ (1,0) = " " T$ (2,0) = " "
T$ (1,1) = " " T$ (2,1) = " "
T$ (1,2) = " " T$ (2,2) = " "
T$ (1,3) = " " T$ (2,3) = " "

If your machine lacks the define function (DEF FNR (X)) then the expression Y = INT (RND(1)*X) must be used on each call of DEF FNR.

The Sharp screen is mapped starting at byte 53248 and is 40 characters by 25. My version of BASIC (SP 5025A) allows printing to a particular square on the screen by ? [Y,X] T$ where Y is the line number starting top left, X is the column number and T$ the character. Alternatively POKE (53248 + 40*X + Y), (display code of character) will do the same job. POKE 4514,I and calling USR(68) calls the routine which produces the noise of shells whining toward their target. USR (71) switches off the sound. Reverse field C,H and arrows are clear screen, cursor home, and cursor control characters respectively. The logical "and" and "or" are symbolised by " *" and " +" in this BASIC.





EL ALAMEIN

PROGRAM LISTING

```
5 REM INITIALISATION
10 DIMG$(2),T$(2,4):R=1
20 T$(1,0)=CHR$(106):T$(1,1)="→":T$(1,2)=">":T$(1,3)=CHR$(101)
30 T$(2,0)=CHR$(107):T$(2,1)="←":T$(2,2)="<":T$(2,3)=CHR$(100)
40 T$(1,4)=" ":T$(2,4)=" "
50 DIMH(2,10),V(2,10),F(2,10),A(2,10),D(2,10),HQ$(2)
60 FORI=1TO10:FORG=1TO2:F(G,I)=400:A(G,I)=20:D(G,I)=0:NEXTG
70 NEXTI
80 D$=CHR$(190):HQ$(1)=CHR$(145):HQ$(2)="※"
90 L$="."
100 FORI=1TO10:H(1,I)=2:H(2,I)=38:NEXT
105 REM INSTRUCTIONS?
110 PRINT"■■■■■■■■■■■■■EL ALAMEIN (MJM)"
115 PRINT"■■■DO YOU WANT INSTRUCTIONS? Y/N"
120 INPUTL$
125 IFL$="Y"THENGOSUB7000
126 PRINT"■INPUT NAME OF FIRST PLAYER"
127 INPUTG$(1)
128 PRINT"■■■INPUT NAME OF SECOND PLAYER"
129 INPUTG$(2)
140 REM SET UP SCREEN
150 PRINT"■"
160 PRINT"■■■■■.....................................";
170 FORI=1TO19:PRINT".":NEXT
180 PRINT"■"
190 FORI=5TO9 :PRINT[I,1]HQ$(1):NEXT
200 FORI=18TO22:PRINT[I,39]HQ$(2):NEXT
210 FORI=1TO10:V(1,I)=I+4:PRINT[V(1,I),2]T$(1,0):NEXT
220 FORI=1TO10:V(2,I)=I+13:PRINT[V(2,I),38]T$(2,0):NEXT
225 REM TREES
230 DEF FNR(X)=INT(RND(1)*X)
240 FORI=10TO30:Z=FNR(5):V=FNR(14)+5
245 FORK=0TO2
250 PRINT[V+K,I]D$
260 NEXT:NEXT
265 RI=20:B=FNR(8)+5:FORI=5TO23:REM RIVER
270 IF(I=B)+(I=9+B)THEN285
275 PRINT[I,RI]"■■"
280 RI=RI+FNR(3)-1
285 NEXTI
290 REM MAIN LOOP
295 R=R+1:G=R-(2*INT(R/2))+1
300 PRINT"■":FORI=1TO120:PRINT" ":NEXT
305 PRINT"■IT IS ";G$(G);"'S MOVE"
310 GETX$:IFX$=""THEN310
320 IFX$="R"THENGOSUB2000
330 GOSUB3000
335 X=0:T=0
340 FORN=1TO10
345 IF(D(G,N)>1)+(F(G,N)<10)THEN590
350 PRINT"■INPUT DISTANCE OF TANK ";N;T
355 PRINT[V(G,N),H(G,N)]" ":FORJ=1TO150:NEXTJ
357 PRINT[V(G,N),H(G,N)]T$(G,D(G,N)):FORI=1TO10
360 GETX$:IFX$=""THENNEXTI
365 IFX$=""THEN355
370 X=VAL(X$):T=T+X
380 IFT>30THEN600
390 PRINT"■INPUT DIRECTION OF TANK ";N;T
400 GETX$:IFX$=""GOTO400
430 V=V(G,N):H=H(G,N)
432 IF(N=1)*(X>0)THENPRINT[V,H]"*":GOTO440
435 PRINT[V,H]" "
440 FORI=1TOX
445 IFX$="W"THENV=V-1
450 IFX$="E"THENV=V-1:H=H+1
455 IFX$="D"THENH=H+1
460 IFX$="C"THENV=V+1:H=H+1
465 IFX$="X"THENV=V+1
470 IFX$="Z"THENV=V+1:H=H-1
475 IFX$="A"THENH=H-1
480 IFX$="Q"THENV=V-1:H=H-1
485 IF(V<5)+(V>23)+(H<0)+(H>39)THEN560
490 Z=PEEK(53248+V*40+H)
495 IFZ=67THEN560
500 IFZ=107THEND(G,N)=4:MUSIC"_C0":PRINT[V,H]" ":GOTO585
540 V(G,N)=V:H(G,N)=H
550 NEXTI
560 PRINT[V(G,N),H(G,N)]T$(G,D(G,N))
570 F(G,N)=F(G,N)-(10*X)
575 IF(G=0)*(V>4)*(V<10)*(H=1))+((G=1)*(V>17)*(V<23)*(H=39))THEN4000
580 IFN=10THENGOSUB5000
585 IFT=30THEN600
590 NEXTN
600 PRINT"■IF YOU WANT TO OPEN FIRE PRESS (F)"
610 GETX$:IFX$=""THEN610
620 IFX$="F"THEN700
630 GOTO295
700 IFG=1THENO=2:P=-1:U=1
710 IFG=2THENO=1:P=1:U=-1
715 REM CHECK DISTANCES BETWEEN TANKS
720 FORAT=1TO10
730 IF(D(G,AT)=1)+(D(G,AT)>2)THEN770
740 FORDE=1TO10:IFD(O,DE)>3THEN760
745 Q=ABS(H(G,AT)-H(O,DE))+ABS(V(G,AT)-V(O,DE))
750 IFQ<10THENGOSUB790
760 NEXTDE
770 NEXTAT
780 GOTO295
790 REM EXCHANGE FIRE,ATTACKER FIRST
795 IFA(G,AT)<1THENA(G,AT)=0:RETURN
800 D=FNR(Q)+2
801 IFPEEK(53248+40*V(O,DE)+H(O,DE)+P)=188THEND=D+2:REM TREE INFRONT?
803 FORI=0TO100:POKE4514,I:USR(68):NEXT:USR(71)
805 A(G,AT)=A(G,AT)-1
810 IFD>4THEND=4
820 D(O,DE)=D(O,DE)+4-D
845 IFD(O,DE)>4THEND(O,DE)=4
847 PRINT[V(O,DE),H(O,DE)]T$(O,D(O,DE))
850 IF(D(O,DE)=1)+(D(O,DE)>2)THENRETURN
855 REM DEFENDER RETURNS FIRE
860 IFA(O,DE)<1THENA(O,DE)=0:RETURN
861 IFPEEK(53248+40*V(G,AT)+H(G,AT)+U)=188THEND=D+2
863 FORI=0TO20:POKE4514,I:USR(68):NEXT:USR(71)
865 A(O,DE)=A(O,DE)-1
870 IFD>4THEND=4
```




```
880 D(G,AT)=D(G,AT)+4-D
905 IFD(G,AT)>4THEND(G,AT)=4
907 PRINT[V(G,AT),H(G,AT)]T$(G,D(G,AT))
910 RETURN
990 GOTO295
1900 REM REPORT
2000 PRINT"■";G$(G);" WHICH TANK DO YOU WANT DATA ON?"
2010 INPUTX$
2020 X=VAL(X$)
2030 IFX=0THENRETURN
2035 IFX>10THEN2000
2040 IFF(G,X)<0THENF(G,X)=0
2041 IFD(G,X)=0THENK$="O.K."
2042 IFD(G,X)=1THENK$="GUN"
2044 IFD(G,X)=2THENK$="ENGINE"
2046 IFD(G,X)=3THENK$="GUN & ENG"
2048 IFD(G,X)=4THENK$="DEAD"
2050 PRINT"■No.      FUEL      AMMO.     DAMAGE    "
2060 PRINTX,F(G,X),A(G,X),K$
2070 FORI=1TO10:PRINT[V(G,X),H(G,X)]" ":FORJ=1TO150:NEXTJ
2075 PRINT[V(G,X),H(G,X)]T$(G,D(G,X)):NEXTI
2080 PRINT"■":FORI=1TO120:PRINT" ":NEXT
2090 GOTO2000
2990 REM CLEAR TOP 3 LINES
3000 PRINT"■":FORI=1TO120:PRINT" ":NEXT
3010 RETURN
3990 REM A WIN
4000 GOSUB3000
4010 PRINT"■WELL DONE ";G$(G);" YOU HAVE WON!!!!!"
4015 FORU=0TO1000:NEXTU
4020 GOTO30
4990 REM REPAIR TANKS
5000 FORI=1TO9
5010 IF(H(G,I)<H(G,10)+2)*(H(G,I)>H(G,10)-2)THEN5040
5020 GOTO5100
5040 IF(V(G,I)<V(G,10)+2)*(V(G,I)>V(G,10)-2)THEN5055
5050 GOTO5100
5055 IFD(G,I)=4THEN5100
5060 F(G,I)=400:A(G,I)=20:D(G,I)=0
5070 PRINT[V(G,I),H(G,I)]T$(G,D(G,I))
5100 NEXTI
5110 RETURN
6990 REM INSTRUCTIONS
7000 PRINT"■THE OBJECT IS TO OCCUPY YOUR OPPONENTS      HQ WITH ONE OF YOUR"
7010 PRINT"■TANKS.YOU EACH MOVE IN TURN.A TURN CONSISTS OF MOVING 30 SPACES"
7020 PRINT"■AND YOU CAN MOVE ANY OF 10 TANKS UPTO   9 SPACES EACH."
7025 PRINT"■THE DIRECTION IS INPUT USING THE USUAL    (QWEADZXC) KEYS."
7030 PRINT"■BEFORE YOU ENTER THE MOVE SEQUENCE YOU    CAN ASK FOR DATA ON ANY"
7040 PRINT"■TANK BY PRESSING (R).AFTER YOUR MOVE YOU  CAN OPEN FIRE (F)"
7050 PRINT"■THE TREES OFFER SOME PROTECTION FROM      SHELLS"
7060 PRINT"■IF YOU ARE HIT YOUR GUN IS MOST LIKELY  TO BE KNOCKED OUT."
7065 GOSUB9000
7070 PRINT"PRESS ANY KEY "
7075 GETW$:IFW$=""THEN7075
7080 PRINT"■■BUT YOU MAY LOSE THE TANK.THIS DEPENDS  ON THE   DISTANCE"
7090 PRINT"■CHECK DATA (R) TO LEARN THE SYMBOLS FOR  DAMAGED TANKS"
7100 PRINT"■THESE TANKS MAY BE PUT RIGHT AND FUEL   AND AMMO REPLENISHED BY"
7110 PRINT"■MOVING No.10 TANK WITHIN 1 SQUARE "
7115 GOSUB9000
7200 PRINT"HIT ANY KEY"
7210 GETW$:IFW$=""THEN7210
7220 RETURN
9000 MM$="A3":M1$="A5"#C3"D"E"#F"G"#F0"G"#F4"E3"D"#CB"
9030 M2$="A3"D2R0"D1"E2"D"#C3B"#C7"#C3"
9040 M3$="A3"#C2R0"#C1"D2"#CB3A"D7"D3"
9160 TEMPO5
9170 MUSICMM$,M1$,M2$,M1$,M3$,M1$,M2$,M1$,M3$
9200 RETURN
```

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Microware, 5 St Peter's Lane, Leicester.
Phillip Copley Hi-Fi, 7 Cliffard Court, Ossett, West Yorkshire.

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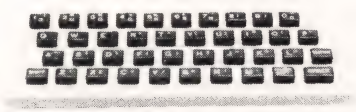
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YOUR LETTERS

This page is where you get the chance to put your opinions in print. Personal Computing Today welcomes letters from you on any aspect of microcomputing and views in general — as long as they're printable!

Please drop us a line to: The Editor, Personal Computing Today, 145 Charing Cross Road, London, WC2H 0EE.

Dear PCT,

I am considering buying an Arfon expansion board for my VIC-20. One things worries me, will the Arfon board accept differing ROM cartridges such as the super expander and the programmers aid cartridge? I've been told that it will not accept 'clashing' cartridges; if this is ture, how can I alter the situation.

Yours
C Pucci
Lichfield

Editor's reply: Apparently you shouldn't have any trouble using other cartridges with an Arfon expansion board for your VIC-20, but just to be on the safe side, check with your dealer before you buy a cartridge.

Dear PCT,

"What delivery problems?" I thought as I walked into Smith's. A few moments later I came out with a 48K Spectrum. Nothing could be simpler.

I rushed home and plugged it in. Two days later I awoke from a strange trance, my mind illuminated by wonderful colours and shapes. 'This is marvellous' I thought.

Alas, I am sorry to report that my programs have all been lost.

Brain Damage (as the computer affectionately became known to me) had been inadvertently fitted with 48K of RAM borrowed from an infirm parrot. "Tape Loading Error", it said to me, day after day, until finally I realised only one thing would cure it. I pulled out its plug.

Yours faithfully
Stephen Johnson
Selston

Dear PCT,

Owing to a long holiday in the summer, I missed the September and October issues of your wonderful magazine. Is there any way that I could buy these? I am now the proud owner of a new Commodore 64 which is a superb machine and I am very pleased with it. However, I am a little worried about the software that will be available for it. Will Commodore reproduce existing VIC games cartridges or will they just make business utilities?

I am also having problems converting software in your magazine as the POKE command still baffles me. Can anyone out there help me and how soon would you estimate before you begin to publish some programs for the 64?

Yours gratefully
G Bernatek
Leamington Spa

Editor's reply: Back issues can be obtained from the subscription department for £1.25 a copy. The address is at the front of the magazine on page 3.

Commodore plans to re-write both games and business software from current VIC-20 and PET titels, so don't worry, plenty will be about. As I said regarding the Colour Genie and publishing programs for it, the same applies to the Commodore. I will do so once people start sending us programs they have written.

Dear Sir,

I'm writing to tell you PCT is fantastic. I have a VIC-20 and find PCT very helpful because of the simple-to-follow step-by-step programs and advice. I think PCT is the best selling computer magazine on the market. Please could you tell me the address of Commodore and Audiogenic.

Thank you
Yours faithfully
M Cummins
Four Marks

Editor's reply: Glad to hear you enjoy PCT. You'll find Commodore's address in the Hardware Factfile and Audiogenic's telephone number is 0734 595296. The address is PO Box 88, Reading, Berkshire.

Dear PCT,

While reading the Hardware Factfile, I noticed that on the cards for the BBC Micro it often has the letters TBA next to the programs. Could you tell me what this means. I have been searching in dictionaries and encyclopaedias to find out, but to no avail.

Also could you tell me when is the new BBC computer coming out? I have heard rumours that they were bringing it out in October, but I have heard or seen nothing. I was thinking of getting this if it is good, or getting a BBC Model A.

Yours hopefully
Ajai Khattri
Coventry

Editor's reply: TBA stands for 'To Be Announced'. The BBC is not going to bring out a new computer. What you might be thinking of is the Electron which will be produced by Acorn Computers. Although the coming of this computer was announced getting on for a year ago the launch date has not yet been fixed. A few prototypes of the Electron have been floating about

but PCT has yet to see one. We'll keep you posted when anything official comes from Acorn.

Dear Sir,

Do you intend to produce some programs for the Colour Genie home computer in your magazine?

I purchased a Colour Genie at Christmas and I am pleased with it but find the lack of programs limiting.

I would like to request that you include some Colour Genie programs in your future issues, including some educational or study ones.

Thanking you in anticipation.

Yours faithfully
Ken Handley
Glossop

Editor's reply: If anyone sends us a good program listing for the Colour Genie I would be more than happy to publish it. So get cracking all you Colour Genie owners, yourself included Ken, and put your programming powers into action.

Dear Sir,

REPUTABLE COMPANY VS COWBOYS

I hope that my experience will help some of your readers from falling into the hands of cowboys.

First the good news, I have found a reputable computer dealer. I phoned up Maplin on a Friday afternoon, gave them a credit card number and I got my Le Stick the next morning. If only ALL computer shops, Uncle Clive, etc gave service like that, then your letters pages could be filled with reader's tips and notes and computer club notices instead of letters from badly treated fellow computer enthusiasts.

After a plea from me, Maplin sent me my upgraded Atari BEFORE they received my hire purchase form. I sent my *H.P.* form off on Monday and got my disc drive on Thursday. What is even more amazing, is that it was the week before Christmas!! And the Maplin telephone girls were really wonderful, both polite and efficient. However, it is still prudent to phone up and check if they have the goods in stock.

Unfortunately, here comes the bad news. The attached letter to Silica Shop describes some of the treatment that I have endured. It has been over a month now and Silica Shop have not yet refunded my $50 deposit, despite Richard Hawe twice promising that the cheque will be in the post. They even have the cheek to tell the H.P. company that the goods had been delivered to me. I do not think that these cheats ever had any intention of returning my money, I will now have to take them to the Small Claims court.

I implore you to crusade against cowboys by printing both my letters.

Yours sincerely
Lim Ack Leong

Editor's reply: Thanks for the good and bad news Lim. Unfortunately, I haven't the space to print your other letter too but sympathise with you over the incident with the Silica Shop's inefficiency. Let's hope they have learnt their lesson. Incidentally, I have received several letters of praise to other dealers up and down the country. They are not all bad.

PROGRAMS SUBMITTED PROGRAMS SUBMITTED

Submitting Programs to Personal Computing Today

Have you written a program or article and would like to tell the world about it? Everyone likes to have a go at programming and we would love to look at your programming works of art to consider them for publication.

Why not send them to us, no matter what machine you have written it for and regardless of its length and complexity. Not all complex programs are good ones so don't be put off if you think your program appears too simple to come up to scratch.

If you would like to submit a program for publication send it to: The Editor, Personal Computing Today, 145 Charing Cross Road, London WC1.

So that you know how we like you to submit programs for use in the magazine printed below are guidelines which we would like you to follow.

What To Do

There are two kinds of program features carried within our pages. The first is the brief "Micro-Spot": A page in total containing a brief description of the software, notes on its usage and a full listing.

These are designed to be short and to the point and are not primarily intended for the beginner in programming.

The second method of presentation is that of a full article. This can run anywhere in length from two pages to five pages and is formatted to a rigid style of presentation.

Because PCT is aimed at the newcomer to computing, our main software has to be well documented and explained.

1. The article is broken into four parts.
(a) Introductory Text
(b) Program Listing
(c) How It Runs
(d) Hints on Conversion

2. The Introductory Text should contain an explanation of what the program is designed to do, what is to be expected on-screen when it is run, any problems the author overcame in producing the program and any background necessary to enable our readers to use the listing.

3. Programs should preferably be run out on a printer straight from the computer. In this way less errors creep in. Otherwise typed or handwritten is acceptable but must be double-spaced and DOUBLE CHECKED!

4. How it Runs should be as near to a line-by-line, or block-by-block description of the program as is possible.

5. Each computer on the market has its own little foibles and oddities. No one knows those of your machine better than you. How would someone wishing to adapt your program go about untangling them? What special use have you made of your computer's special abilities? Graphics?

Always include a full list of variables, too.

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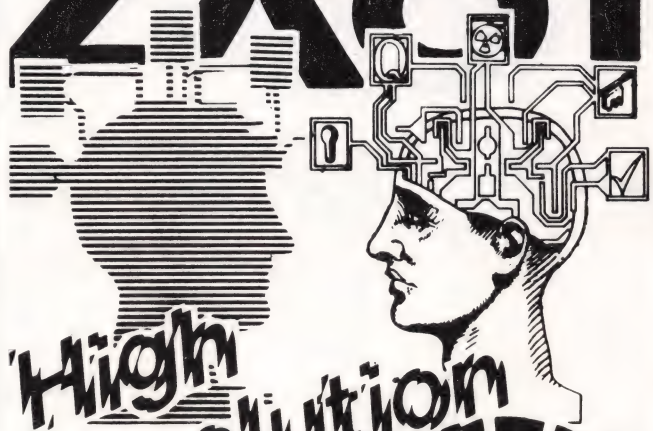
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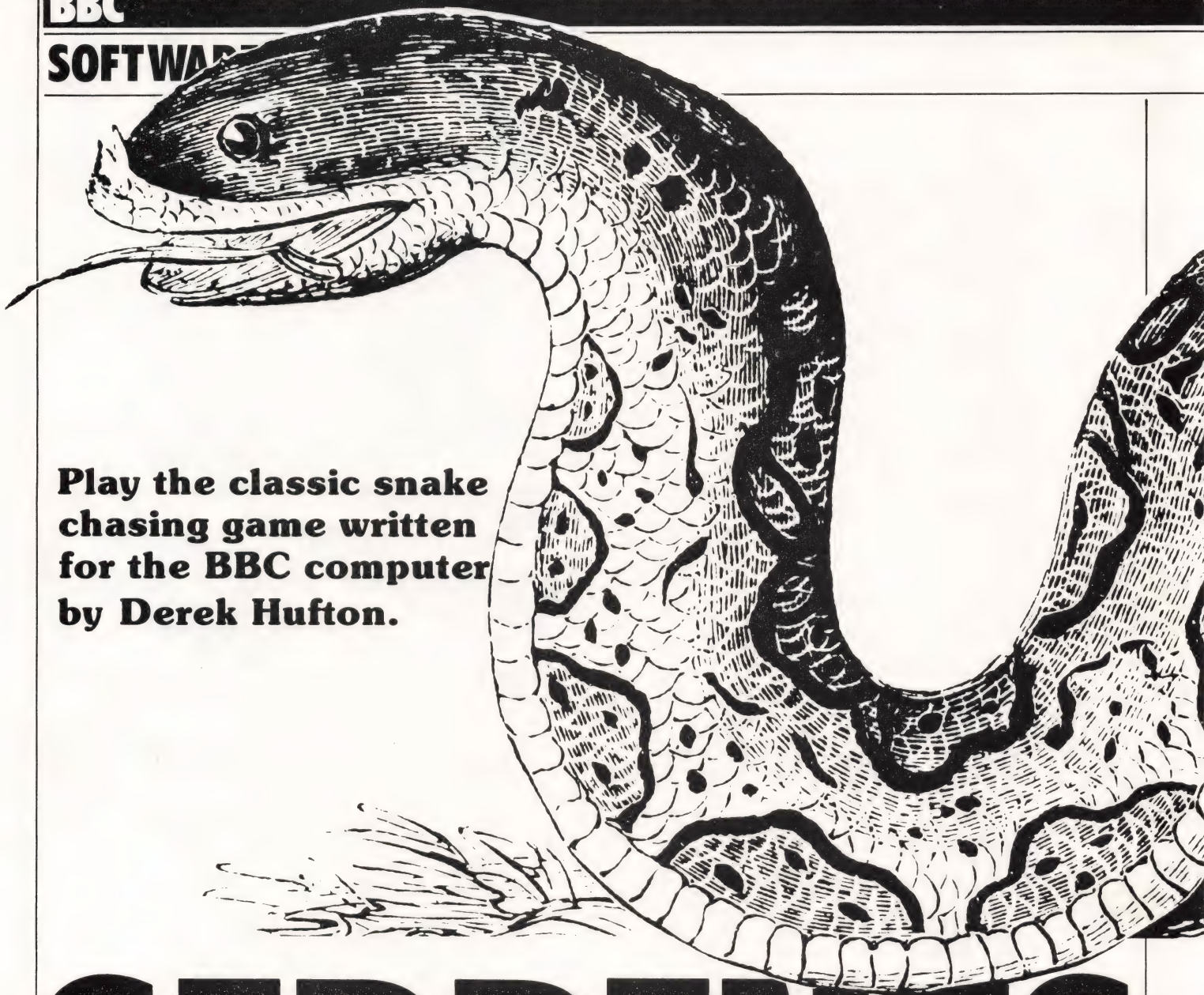
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SERPENTS

Serpents is a very simple but addictive two player same. Each player controls the movement of a snake within the screen border. These snakes can be moved up, down, left or right by the use of the following keys:

The basic aim is simple, do not bump into anything. You must not hit the trail. If you do, your opponent scores one point, the first player to reach ten is the winner. If the top snake crashes a high tone is sounded, if the bottom snake crashes a lower tone is sounded. In the event of a head on collision, the lower is decided randomly. At the end of a game press the space bar to play again.

Full use is made of the BBC's impressive colour graphics and sound to give a game that requires quick thinking and dexterity, and is also pleasing to watch. At the start of each game the colours are chosen randomly, so most games will be visually different, and a speed level between 1 and 5 can be selected, 1 being fastest. The listing given is for a 32K BBC machine, but for those with only 16K suggested changes are given in **Hints On Conversion** to enable the program to run in 16K.

Player 1 (top)

W

A S

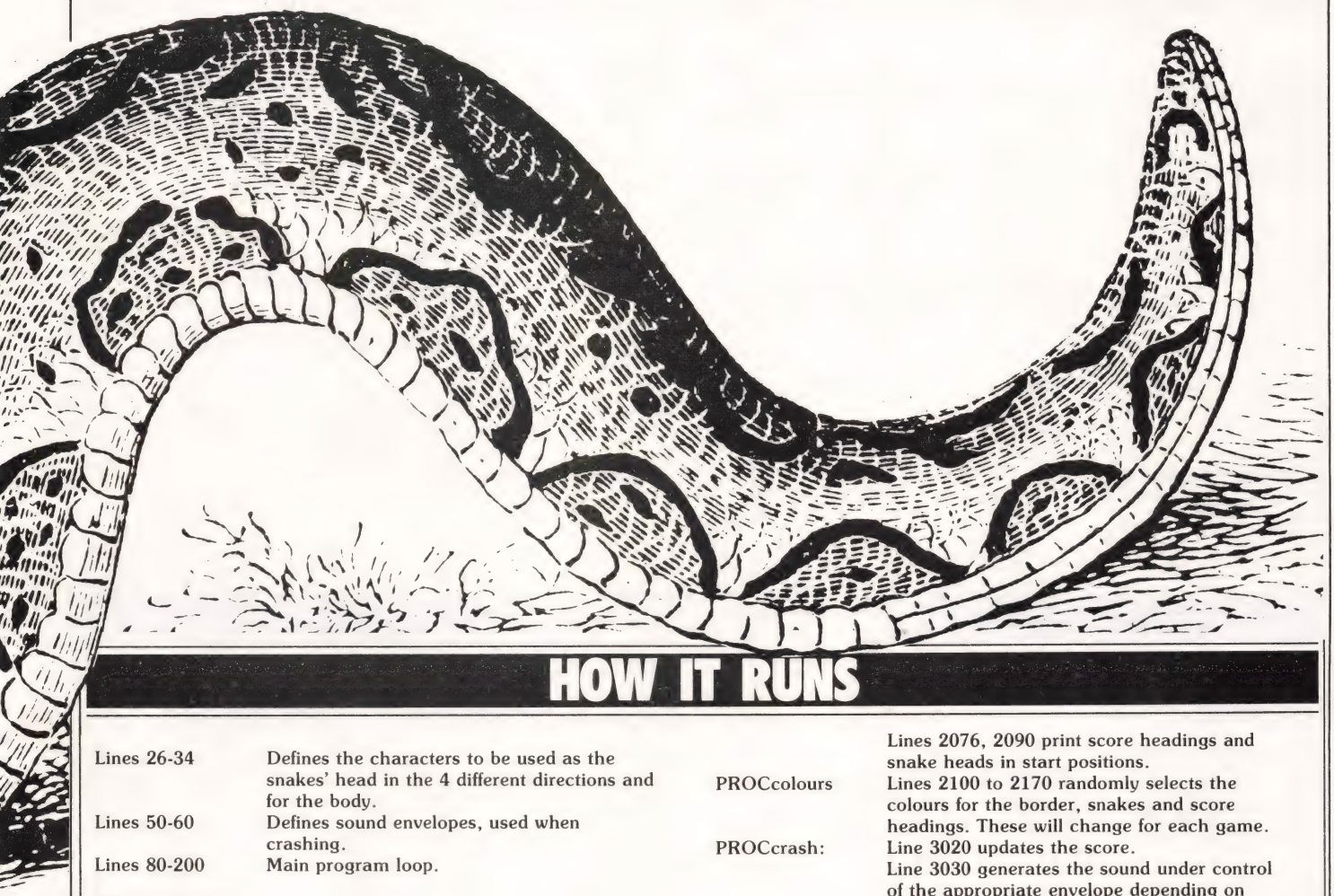
Z

Player 2 (bottom)

— (underscore)

] RETURN

DELETE



HOW IT RUNS

Lines 26-34	Defines the characters to be used as the snakes' head in the 4 different directions and for the body.
Lines 50-60	Defines sound envelopes, used when crashing.
Lines 80-200	Main program loop.

Procedures

PROCmove	Lines 1020 to 1130 check to see if specific keys have been pressed at that instant and sets the appropriate user defined head character and the amount to advance on the X and Y axes. In Mode 2, one position horizontally corresponds to 64 graphics positions, one position vertically corresponds to 32 graphics positions. The keys used generate the following for INKEY: W = −34, A = −66, S = −82, Z = −98 _ = −41,] = −89, RETURN = −74, DELETE = −90 Line 1210 checks to see if the next position for player 1 is already occupied (ie if the colour is not black). Line 1220 does the same for player 2. Lines 1240, 1250 set the colour of snake 1 and moves on one position. Lines 1260, 1270 repeat the above for snake 2. Lines 1280, 1290 update the screen co-ordinates for each snake head. Lines 1300, 1310 perform the time delay depending on the chosen speed. Line 1320 flushes the keyboard buffer.
PROCborder	Lines 2015, 2017 set colour for border and clear screen. Lines 2020 to 2065 draw the border. Lines 2072, 2074 set start positions and increments for snake heads. Lines 2076, 2090 print score headings and snake heads in start positions.
PROCcolours	Lines 2100 to 2170 randomly selects the colours for the border, snakes and score headings. These will change for each game.
PROCcrash:	Line 3020 updates the score. Line 3030 generates the sound under control of the appropriate envelope depending on which snake crashed. High tone is player 1 (top snake), low tone is player 2 (bottom snake). Lines 3040 to 3050 pause until sound has played.
PROCend	Line 5004 resets the screen and prints final score. Lines 5010, 5020 selects a flashing colour to print "GAME OVER". Line 5030 waits until the Space Bar has been pressed before continuing with another game.
PROCspeed	Lines 6000 to 6040. Sets colour green, clears the screen and asks for a speed value in the range 1 to 5. Line 6030 then sets a delay factor based on the selected speed. This is used in conjunction with lines 1300 and 1310 in PROCmove. Line 6010 CHRS(7) generates a beep.

VARIABLES USED

A%	Colour of player 1 snake
B%	Colour of player 2 snake
F%	Selected speed number
H1%	Character number of player 1 snake head
H2%	Character number of player 2 snake head
I%	X-axis position of player 1 snake
J%	Y-axis position of player 1 snake
K%	X-axis position of player 2 snake
L%	Y-axis position of player 2 snake
K1%	Increment in X-axis position of player 2 snake
L1%	Increment in Y-axis position of player 2 snake
M%	Time delay factor (hundredths of a second)

SERPENTS

HINTS ON CONVERSION

Change the following lines as indicated and the program will then run on a 16K machine:

15	Change to MODE 5
2120 to 2150	Only 4 colours are available in Mode 5, one of these is normally black, so lines 2120 to 2150 become: 2120 C% = RND(3) 2130 A% = RND(3):IF A% = C% GOTO 2130 2140 B% = RND(3):IF B% = A% OR B% = C% GOTO2140 2150 D% = B%
5010	GCOLO,3 (In Mode 5 logical colour 13 is not in range)

Other Machines

To help with conversion to other micros, the following notes may be helpful:

MODE 2	This selects one of the BBC's graphics modes. MODE 3 has sixteen colours available, colours 1 to 7 can be used for the game display, where: 1 = Red 2 = Green 3 = Yellow 4 = Blue 5 = Magenta 6 = Cyan 7 = White
VDU24	This sets the co-ordinates for the graphics window.
CLG	Clears the graphics screen.
VDU5	Followed by the character code and eight further numbers defines a graphics character as the bit pattern of the decimal characters.
*FX15,1	Flushes the keyboard buffer.
%	The % on the end of a variable indicates on integer.

PROGRAM LISTING

```
10   REM Serpents - D Hufton 3 Dec 1982
15   MODE2
20   VDU5
26   VDU23,231,0,62,103,255,15,255,126,60
28   VDU23,232,0,124,230,255,240,255,124,60
30   VDU23,233,40,108,238,234,250,254,126,60
32   VDU23,234,60,126,254,250,234,238,108,40
34   VDU23,241,255,255,255,255,255,255,255,255
50   ENVELOPE1,1,30,20,0,50,6,50,2,1,0,-2,100,126
60   ENVELOPE2,1,100,-30,0,50,6,50,2,1,0,-2,100,126
70   VDU24,0;0;1245;1023;
80   PROCcolours
85   PROCspeed
100  PROCborder
110  PROCmove
120  PROCcrash
130  IF S%=10 OR T%=10 THEN PROCend:GOTO 80
140  GOTO 100
200  END

1000 DEF PROCmove
1010 REM check keys and move snakes
1012 Z%=0
1015 REPEAT
1020 IF INKEY(-34) J1%=32:I1%=0:H1%=233:GOTO 1100
1030 IF INKEY(-66) I1%=-64:J1%=0:H1%=231:GOTO 1100
1040 IF INKEY(-82) I1%=64:J1%=0:H1%=232:GOTO 1100
1050 IF INKEY(-98) J1%=-32:I1%=0:H1%=234
1100 IF INKEY(-41) L1%=32:K1%=0:H2%=233:GOTO 1200
1110 IF INKEY(-89) K1%=-64:L1%=0:H2%=231:GOTO 1200
1120 IF INKEY(-74) K1%=64:L1%=0:H2%=232:GOTO 1200
1130 IF INKEY(-90) L1%=-32:K1%=0:H2%=234
1200 REM test crash and move
1210 IF POINT(I%+I1%,J%+J1%-12) <> 0 Z%=Z%+1
1220 IF POINT(K%+K1%,L%+L1%-12) <> 0 Z%=Z%+2
1230 IF Z% GOTO 1350
1240 GCOLO,A%
1250 MOVE I%,J%:PRINT CHRS(241):MOVE I%+I1%,J%+J1%:PRINT
CHRS(H1%)
1260 GCOLO,B%
1270 MOVE K%,L%:PRINT CHRS(241):MOVE K%+K1%,L%+L1%: PRINT
CHRS(H2%)
1280 I%=I%+I1%:J%=J%+J1%
1290 K%=K%+K1%:L%=L%+L1%
1300 W%=TIME
1310 REPEAT UNTIL TIME > W%+M%
1320 *FX15,1
1350 UNTIL Z%>0
1400 ENDPROC
1999 ****************************
2000 DEF PROCborder
2010 REM draw perimeter etc.
2015 GCOLO,C%
2017 CLG
2020 MOVE10,0:PLOT85,0,1023:PLOT85,10,1023
2030 MOVE5,1018:PLOT85,1245,1023:PLOT85,1245,1013
2040 MOVE1235,1013:PLOT85,1245,0:PLOT85,1235,0
2050 MOVE1235,53:PLOT85,10,0:PLOT85,10,53
2055 MOVE11,963:DRAW1234,963:PLOT85,1234,953:
DRAW11,953:PLOT85,11,963
2065 MOVE150,1012:DRAW150,964:PLOT85,1088,1012:
PLOT85,1088,964
2072 I%=22:J%=950:I1%=64:J1%=0
2074 K%=1173:L%=85:K1%=-64:L1%=0
2076 GCOLO,D%
2080 MOVE215,1000:PRINT"****SCORE****":MOVE20,1000:
PRINT;S%:MOVE1100,1000:PRINT;T%
2082 GCOLO,A%
2084 H1%=232:H2%=231
2085 MOVEI%,J%:PRINT CHRS(H1%)
2087 GCOLO,B%
2090 MOVEK%,L%:PRINT CHRS(H2%)
2098 ENDPROC
2099 ****************************
2100 DEF PROCcolours
2110 REM set colours for border & snakes
2120 C%=RND(7)
2130 A%=RND(7):IF A%=C% GOTO 2130
2140 B%=RND(7):IF B%=A% OR B%=C% GOTO 2140
2150 D%=RND(7):IF D%=A% OR D%=B% OR D%=C% GOTO 2150
2170 ENDPROC

3000 DEF PROCcrash
3010 REM crash routine
3015 IF Z%=3 THEN Z%=RND(2)
3020 IF Z%=2 THEN S%=S%+1 ELSE T%=T%+1
3030 SOUND1,Z%,53,40
3040 W%=TIME
3050 REPEAT UNTIL TIME>W%+150
3100 ENDPROC

5000 DEF PROCend
5004 PROCborder
5010 GCOLO,13
5020 MOVE350,650:PRINT"GAME OVER"
5030 REPEAT:I%=GET:UNTIL I%=32
5050 ENDPROC

6000 DEF PROCspeed
6002 GCOLO,2
6004 REPEAT
6006 CLS
6010 PRINTTAB(2,4);"SPEED (1 - 5) ";CHRS(7);:INPUT F%
6020 UNTIL F%>0 OR F%<6
6030 M%=(F%-1)*5
6035 S%=0:T%=0
6040 ENDPROC
```



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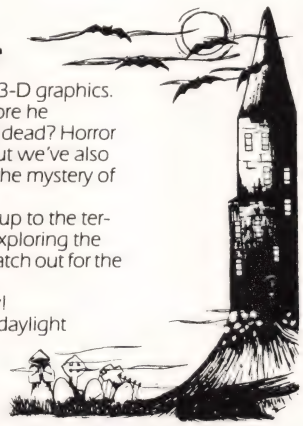
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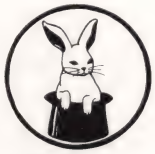
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SOFTWARE REVIEWS

This is the place to find out more about the software for your micro. Each month we review a hat-full of tapes and bring you the results.

Each month PCT will be presenting pages of reviews of the computer programs currently available. We have engaged a team of reviewers, each of whom is a seasoned user of his/her particular machine — and has the crazy streak that means they enjoy playing computer games!

All types of software will, however, be reviewed in these pages; but with around 85% of all home-computer software being of the playful variety, you will be seeing more games than anything else!

Our 'Ratings Table' headings are:

Program Quality

Here we're looking to see how well written the program is, and how well it exploits the computer's capabilities. Also, how logical is the structure of the program? Does it require the user to make guesses to use it?

Crashproofing

We all hit the wrong key sometimes, do we not? Go on, admit it. If the program has been well written, all should not be lost. If, for example, the machine is asking you to enter "Yes" or "No", then any other key except Y or N should illicit no response whatsoever. In other words, how tolerant is the program of us humans?

Value For Money

Quite frankly, some software on sale today is vastly overpriced. With the low cost of cassette tapes, why *should* simple games cost up to £12 per tape? We judge this one on an overall basis — how much work have the suppliers put into the program and is the price reasonable?

Presentation On-screen

How good are the graphics used in the program? If the instructions are provided on screen, are they both readable and easy to understand? This section examines the visual aspects of the package — vital for games!

Ease Of Use

If the program is for, say, an 'action' game, then the author's choice of keys is very important. Try playing "Invaders" with the movement keys reversed, and the "Fire" button right next to 'Reset'! There are many, many ways in which life can be made easy for the program user. We want to see them *all* used!

Supplied Instructions

Regardless of whether the instructions come on sheets of paper, or are presented as text on-screen, they should be as clear and as concise as possible.

Ratings are done on a "Five stars is excellent, one is hopeless" basis, with the reviewer then scoring the supplied package as a whole on a percentage scale.

Title: Arcadia
Type: Tape
Supplier: Imagine
Machine: Spectrum/Vic-20
Price: £5.50

The most original twist yet to the basic theme of shooting holes in alien hordes. Arcadia is what you'd perhaps expect to get from turning a pack of interior designers loose to write an "Invaders" program.

The creatures are mostly beautiful graphic shapes glowing with colour — and quite determined to kill you. Once past the fairly ordinary missiles on Level 1 things get very artistic indeed! Pulsating circles, rotating deltas and stately birds, (amongst others) all descend upon you in turn, raining death and destruction as they go. (Even your spacecraft bears more than a passing resemblance to a Gothic cathedral!)

It's all quite dazzling at first and you die quite regularly whilst trying to master the graphic hordes. To stay alive you have the inevitable laser cannon, and a thrust option which moves you up the screen, seemingly against gravity of some kind, since once you release the control you fall back to the screen base.

You advance to each new level by surviving long enough on the old one — not an easy task. Arcadia calls for nimble fingers and quick reactions. It is well balanced and gets progressively harder in a suitably infuriating manner.

Well recommended — if for no other reason than that this is the ONLY game in which you're ever gonna get to shoot down a multi-coloured centipede with a Gothic cathedral!

Ratings Table

Program Quality	* * * *
Value for Money	* * * *
Presentation On-screen	* * * *
Ease of use	* * *
Crashproofing	* * * * *
Supplied Instructions	* * * *
Overall	87%

R.H.

Title: Penetrator
Type: Tape
Supplier: Melborne House
Machine: Spectrum
Price: £6.95

So you thought you could play "Scramble" type games? Well this program may change your mind. Penetrator is DIFFICULT to do well at and well-nigh IMPOSSIBLE to defeat. That's the beauty of the game, however, almost impossible, but NOT QUITE...

The graphics are superb. The radar bases are endowed with 3-D revolving dishes and the ground-to-air missiles come complete with burning exhaust fumes. (Never mind, its probably an airless world we're battling on. Lets not be churlish, shall we?)

There are four levels to contend with, before you reach your target on the fifth — a neutron bomb store, no less. In order to destroy it you must release two bombs down a vertical shaft to hit two very small targets. Miss even one and your harrowing trip through the tunnels has been for nothing. There is no way out as the cave narrows rapidly to nothing... and it's goodnight from him.

If you succeed in hitting both targets, the program goes into a quick spasm of pyrotechnics and then turns your ship around to start out again...

In addition to the basic game there is a training facility provided (which you'll need) and this allows you to practise any of the levels with unlimited lives. The instructions don't tell you this, but you can go straight into level five and practise hitting the bomb store. The programmer wants you to earn that bomb-run with blood.





Title: The Hobbit
Type: Cassette
Supplier: Melbourne House
Machine: Spectrum 48K
Price: £14.95 inc.VAT

One of the latest offerings in the 'adventure games stakes', The Hobbit has several features that make it a game by which future games will be judged. The combination of features that make it stand out are:-

1) The Spectrum's graphic capabilities are used to very good effect to illustrate pictorially a number of the scenes as you reach them on your travels. 2) It has what is called 'artificial intelligence', whereby characters within the game are moving and acting independently throughout the game. This feature is difficult to assess and whether it is purely to add variety or whether it can materially alter the outcome *sensibly* has yet to be ascertained. Certainly some of the characters can be killed without you knowing it until you stumble across their bodies, and in a colleague's game Gandalf walked off with Bilbo's front door!

3) The range of commands you may give is impressive, not only the obvious GO SOUTH, but also GO SOUTH AND TAKE ROPE AND GET SWORD are acceptable. You must keep your wits about you, as a number of adverbs and prepositions are not only admissable but in some cases vital, for instance: CAREFULLY THROW THE ROPE ACROSS THE RIVER might do the trick whereas QUICKLY THROW THE ROPE ACROSS THE RIVER might not! You may also talk with or instruct other characters: SAY TO THORIN "THROW THE ROPE ACROSS".

The game has provision for you to SAVE your current position and status and re-LOAD it at a later date. You may also dump your moves to a ZX Printer to analyse at your leisure! A current score may be displayed in the form: You have completed 12.5% (!) of the game.

A copy of J. R. R. Tolkien's "The Hobbit" is included in the price of the game, and if you have not read this . . . you should before you start as many tips are hidden within its pages.

Ratings Table

Program Quality	****
Value for Money	****
Presentation On-screen	*****
Ease of Use	****
Crashproofing	****
Supplied Instructions	*****
Overall	87%

Another special feature allows you to customise your own landscape to fly through — and provides your radar defences and missiles. Great fun this — a must for all masochists and suicidal maniacs.

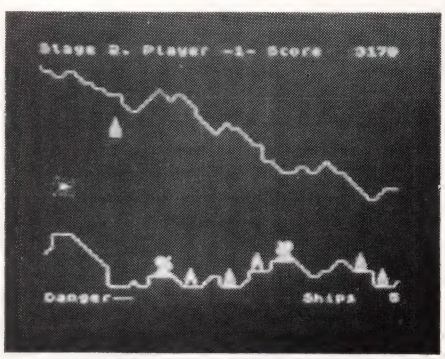
I have only two criticisms of Penetrator, both concerned with the controls you have to use to wreak havoc and cause carnage. Your laser is operated by the same key as the 'accelerate' facility.

Hold it down a fraction too long and instead of shooting out a menacing missile your flyer takes a decidedly Kamikaze view of life and accelerates straight into it. Cute that.

In addition the controls are ideally placed — for an ambidextrous octopus. The rest of us semi-sentient species will have trouble getting used to them. A great game nonetheless and probably *the* version of this particular arcade game.

Ratings Table

Program Quality	****
Value for Money	****
Presentation On-screen	*****
Ease of use	**
Crashproofing	*****
Supplied Instructions	***
Overall	92%



Title: Skramble
Type: Tape
Supplier: Rabbit Software
Machine: Vic-20
Price: £9.99

Skramble is developed from the Arcade game Scramble and is a Terminal Software product, marketed by Rabbit Software. There are eight levels within Skramble which range from overland to homing slot. But I have yet to find anyone who has reached the homing slot. It can be difficult.

GAMES

With Skramble you first run the instructions and then you have to run the program. But once you have learned the instructions, you can go straight to the program.

You have a choice of joystick or keyboard operation, I found the joystick let me play faster and was less wear and tear on my fingers.

As you start Skramble you are flying over enemy territory and you need to drop bombs and use your lasers to add to your score. To keep flying you need fuel and your situation is shown all the time at the bottom of the screen. You can lose just by running out of fuel. So to keep up your fuel supply you must hit every fuel dump with a laser or bomb. This is the only way to have sufficient fuel to continue through the game and reach the higher levels. The points for the use of bombs and lasers vary between 10 and 100, depending on what you hit. Assuming you live through the first level and don't run out of fuel, on the second level it looks the same.

But there are rockets coming up at you and you must be quick to evade them. At the same time you must hit more fuel dumps to replenish your tanks. If you pass this test, the wiggly tunnel comes next. Here your navigation must be very slick, otherwise you will find yourself splattered all over the walls of the tunnel. At the same time you must keep an eye on those fuel dumps.

Passing through this tunnel you come to the next level where there is the cavern. Here your steering ability is really stretched, otherwise you crash against the wall. If you reach this far, you have done very well. But there are more levels to reach.

Next you have the meteor trail which is followed by rocket city and the city maze. And finally the Homing Slot which is your final landing. But I couldn't find anyone that had reached that far. Even at the distributors . . .

You have a choice of keyboard operation, where CTRL L is laser, CTR B for bomb, @ for Up and / for down. : is used for left and = for right.

Though the instructions were on tape and had to be run separately, you only needed to run them once. Next time you could go straight to the program.

If you've tried space games and found them easy, try Skramble instead. It's a completely different type of game and you really need to be on your toes. If you actually reach level eight and the homing slot please tell me. I only reached level four — the cavern. But I've high hopes of doing better next time.

Ratings Table

Program Quality	* * * *
Value for Money	* * * *
Presentation On-screen	* * * * *
Ease of use	* * *
Crashproofing	* * * *
Supplied Instructions	* * * *
Overall	80%

N.A.

Title: Arcade Action
Type: Tape
Supplier: Apex Trading
Machine: Dragon 32
Price: £3.95

The Arcade Action tape contains two games for the Dragon, Meteor Run and Breakout. The first game I expected to be an attempt at Asteroids or something similar, I was however, sadly disappointed. Not only did the game bear no resemblance to Asteroids, but it had little resemblance to a game at all.

The idea of the game is to pilot your spacecraft past hoards of 'meteors' which move up the screen towards you. The spaceship is constructed out of two graphics characters and the meteors out of one block, showing immense lack of imagination on behalf of the programmer.

Scattered about the screen are other characters which have to be destroyed in order to increase your score. The keyboard controls are Left, Right, Fire and Hyperspace. None of these keys featured a repeat, which meant that dodging meteors on the screen was a difficult and clumsy task. The hyperspace key had a limited use, its action being to place you randomly across the screen. Suffice to say that I was not impressed by Meteor Run and found it tedious in the extreme by the end of the first go.

The Breakout program faired little better, being a standard implementation of the original game. It suffered also from the lack of a key repeat which made returning the ball an act of luck as opposed to skill.

On the whole this tape reminded me of the faltering first attempts of a slow school pupil, so I shall reserve my comment to one of 'could do better'.

Ratings Table

Program Quality	* *
Value for Money	*
Presentation On-screen	*
Ease of use	*
Crashproofing	* * *
Supplied Instructions	* *
Overall	30%

Title: Cylon Attack
Type: Tape
Supplier: A&F
Machine: 12K Atom
Price: £4.95

An exciting title and a reasonably exciting game, being yet another of those kill or be killed variants dominating the market. In this offering you are the pilot of an interceptor defending Earth from attack.

As is usual, the more of the enemy you kill, the higher your score reads, details of which are displayed in the top section of the display along with HI SCORE, LASER AND FUEL LEVELS plus a LONG RANGE SCAN.

The main display gives quite an effective 3D simulation of the view from your cockpit, with a cross hair sights, so you can line up the enemy prior to firing. The game only makes limited use of the Atom's high resolution graphics by using only the bare line technique of PLOT and DRAW. The limitations of these routines becomes evident in the slowness of action as the screen fills with ships and laser blasts.

The control keys are quite well chosen although with having two keys for up-down and two for right-left one really needs another hand to fire with the space bar.

All in all a good game, quite addictive and marred only by the ineffective use of the machine's graphic facilities.

Ratings Table

Program Quality	* * * *
Value for Money	* * * *
Presentation On-screen	* * * *
Ease of use	* * * *
Crashproofing	* * * *
Supplied Instructions	* * * *
Overall	87%

P.S.


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ZX Spectrum
BLUE EDIT
RED CAPS LOCK
MAGENTA TRUE VIDEO
GREEN INV. VIDEO
CYAN
YELLOW
WHITE
GRAPHICS
BLACK DELETE
1 ! DEF FN
2 @ FN
3 # LINE
4 $ OPEN #
5 % CLOSE #
6 & MOVE
7 ' ERASE
8 (POINT
9) CAT
0 _ FORMAT
SIN COS TAN INT RND STR$ CHR$ CODE PEEK TAB
Q PLOT ASN
W DRAW ACS
E REM ATN
R RUN VERIFY
T RAND MERGE
Y AND RETURN
U OR IF
I AT INPUT IN
O POKE OUT
P PRINT
READ RESTORE DATA SGN ABS SQR VAL LEN USR
A STOP NEW
S NOT SAVE
D STEP DIM
F TO FOR
G THEN GOTO
H GOSUB CIRCLE
J LOAD VAL$
K LIST SCREEN$
L LET ATTR
ENTER
LN EXP LPRINT LLIST BIN IN KEY$ PI
CAPS SHIFT
Z COPY BEEP
X CLEAR INK
C CONT PAPER
V CLS FLASH
B BORDER BRIGHT
N NEXT OVER
M PAUSE INVERSE
SYMBOL SHIFT
BREAK SPACE

Sinclair ZX Spectr

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

From only £125!



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

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

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

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

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

You have the facility to support separate data files.

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

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

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

Ready to use today, easy to expand tomorrow

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

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

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



Key features of the Sinclair ZX Spectrum

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

um



ZX Spectrum software on cassettes – available now

The Spectrum software library is growing every day. Subjects include games, education, and business/household management. Flight Simulation...Chess...Planetoids...History...Inventions...VU-CALC...VU-3D ...Club Record Controller...there is something for everyone. And they all make full use of the Spectrum's colour, sound, and graphics capabilities. You'll receive a detailed catalogue with your Spectrum.

ZX Expansion Module

This module incorporates the three functions of Microdrive controller, local area network, and RS232 interface. Connect it to your Spectrum and you can control up to eight Microdrives, communicate with other computers, and drive a wide range of printers.

The potential is enormous, and the module will be available in the early part of 1983 for around £30.

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

The ZX Printer – available now

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

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

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

The ZX Microdrive – coming soon

The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing by providing mass on-line storage.

Each Microdrive can hold up to 100K bytes using a single interchangeable storage medium.

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

A remarkable breakthrough at a remarkable price. The Microdrives will be available in the early part of 1983 for around £50.





How to order your ZX Spectrum

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

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

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

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

Please tick if you require a VAT receipt ☐

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

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

*Please delete/complete as applicable

Signature

PLEASE PRINT

Name: Mr/Mrs/Miss

Address

PCT 904

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

Sinclair ZX Spectrum–technical data.

Dimensions

Width	233 mm
Depth	144 mm
Height	30 mm

CPU/ memory

Z80A microprocessor running at 3.5 MHz. 16K-byte ROM containing BASIC interpreter and operating system.

16K-byte RAM (plus optional 32K-byte RAM on internal expansion board) or 48K-byte RAM.

Keyboard

40-moving-key keyboard with full upper and lower case with capitals lock feature. All BASIC words obtained by single keys, plus 16 graphics characters, 22 colour control codes, and 21 user-definable graphics characters. All keys have auto repeat.

Display

Memory-mapped display of 256 pixels x 192 pixels; plus one attributes byte per character square, defining one of eight foreground colours, one of eight background colours, normal or extra brightness and flashing or steady. Screen border colour also settable to one of eight colours. Will drive a PAL UHF colour TV set, or black and white set (which will give a scale of grey), on channel 36.

Sound

Internal loudspeaker can be operated over more than 10 octaves (actually 130 semitones) via basic BEEP command. Jack sockets at the rear of computer allow connections to external amplifier/ speaker.

Graphics

Point, line, circle and arc drawing commands in high-resolution graphics.
16 pre-defined graphics characters plus 21 user-definable graphics characters. Also functions to yield character at a given position, attribute at a given position (colours, brightness and flash) and whether a given pixel is set. Text may be written on the screen on 24 lines of 32 characters. Text and graphics may be freely mixed.

Colours

Foreground and background colours, brightness and flashing are set by BASIC INK, PAPER, BRIGHT and FLASH commands. OVER may also be set, which performs an exclusive–or operation to overwrite any printing or plotting that is already on the screen. INVERSE will give inverse video printing. These six commands may be set globally to cover all further PRINT, PLOT, DRAW or CIRCLE commands, or locally within these commands to cover only the results of that command. They may also be set locally to cover text printed by an INPUT statement. Colour-control codes, which may be accessed from the keyboard, may be inserted into text or program listing, and when displayed will override the globally set colours until another control code is encountered. Brightness and flashing codes may be inserted into program or text, similarly. Colour-control codes in a program listing have no effect on its execution. Border colour is set by a BORDER command. The eight colours available are black, blue, red, magenta, green, cyan, yellow and white. All eight colours may be present on the screen at once, with some areas flashing and others steady, and any area may be highlighted extra bright.

Screen

The screen is divided into two sections. The top section – normally the first 22 lines – displays the program listing or the results of program or command execution. The bottom section – normally the last 2 lines – shows the command or program line currently being entered, or the program line currently being edited. It also shows the report messages. Full editing facilities of cursor left, cursor right, insert and delete (with auto-repeat facility) are available over this line. The bottom section will expand to accept a current line of up to 22 lines.

Mathematical operations and functions

Arithmetic operations of +, −, ×, ÷, and raise to a power. Mathematical functions of sine, cosine, tangent and their inverses; natural logs and exponentials; sign function, absolute value function, and integer function; square root function, random number generator, and pi.

Numbers are stored as five bytes of floating point binary – giving a range of $+3 \times 10^{-39}$ to $+7 \times 10^{38}$ accurate to $9\frac{1}{2}$ decimal digits.

Binary numbers may be entered directly with the BIN function. =, >, <, >=, <= and <> may be used to compare string or arithmetic values or variables to yield 0 (false) or 1 (true). Logical operators AND, OR and NOT yield boolean results but will accept 0 (false) and any number (true).

User-definable functions are defined using DEF FN, and called using FN. They may take up to 26 numeric and 26 string arguments, and may yield string or numeric results.

There is a full DATA mechanism, using the commands READ, DATA and RESTORE.

A real-time clock is obtainable.

String operations and functions

Strings can be concatenated with +. String variables or values may be compared with =, >, <, >=, <=, <> to give boolean results. String functions are VAL, VAL$, STR$ and LEN. CHR$ and CODE convert numbers to characters and vice versa, using the ASCII code.

A very powerful string slicing mechanism exists, using the form a$ (x TO y).

Variable names

Numeric – any string starting with a letter (upper and lower case are not distinguished between, and spaces are ignored).
String – A$ to Z$.
FOR-NEXT loops – A-Z.
Numeric arrays – A-Z.
String arrays – A$ to Z$.

Simple variables and arrays with the same name are allowed and distinguished between.

Arrays

Arrays may be multi-dimensional, with subscripts starting at 1. String arrays, technically character arrays, may have their last subscript omitted, yielding a string.

Expression evaluator

A full expression evaluator is called during program execution whenever an expression, constant or variable is encountered. This allows the use of expressions as arguments to GOTO, GOSUB, etc.

It also operates on commands allowing the ZX Spectrum to operate as a calculator.

Cassette interface

The ZX Spectrum incorporates an advanced cassette interface. A tone leader is recorded before the information to overcome the automatic recording level fluctuations of some tape recorders, and a Schmitt trigger is used to remove noise on playback.

All saved information is started with a header containing information as to its type, title, length and address information. Program, screens, blocks of memory, string and character arrays may all be saved separately.

Programs, blocks of memory and arrays may be verified after saving to confirm successful saving.

Programs and arrays may be merged from tape to combine them with the existing contents of memory. Where two line numbers or variables names coincide, the old one is overwritten.

Programs may be saved with a line number, where execution will start immediately on loading.

The cassette interface runs at 1500 baud, through two 3.5 mm jack plugs.

Expansion port

This has the full data, address and control busses from the Z80A, and is used to interface to the ZX Printer, the RS232 and NET interfaces and the ZX Microdrives.

IN and OUT commands give the I/O port equivalents of PEEK and POKE.

ZX81 compatibility

ZX81 BASIC is essentially a subset of ZX Spectrum BASIC. The differences are as follows.

FAST and SLOW: the ZX Spectrum operates at the speed of the ZX81 in FAST mode with the steady display of SLOW mode, and does not include these commands.

SCROLL: the ZX Spectrum scrolls automatically, asking the operator "scroll?" every time a screen is filled.

UNPLOT: the ZX Spectrum can unplot a pixel using PLOT OVER, and thus achieves unplot.

Character set: the ZX Spectrum uses the ASCII character set, as opposed to the ZX81 non-standard set.

ZX81 programs may be typed into the ZX Spectrum with very little change, but may of course now be considerably improved. The ZX Spectrum is fully compatible with the ZX Printer, which can now print out a full upper and lower case character set, and the high resolution graphics; using LLIST, LPRINT and COPY.
ZX81 software cassettes and the ZX 16K RAM pack will not operate with the ZX Spectrum.

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ZX Spectrum

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PROGRAM LISTING

```
100 DIM CB(110),ML(110),CM(110)
110 CALL CLEAR
120 PRINT TAB(7);"ALPHA-GRID COD
E":TAB(7);"---------------": : :
 : : : : :
130 PRINT "DO YOU REQUIRE INSTRU
CTIONS?": :TAB(7);"(PRESS Y OR N
)": : : : :
140 CALL KEY(0,KEY,STAT)
150 IF KEY=78 THEN 170
160 IF KEY=89 THEN 720 ELSE 140
170 CALL CLEAR
180 PRINT "SELECT MODE:": : : :T
AB(6);"1. ENCODE MESSAGE.": : :T
AB(6);"2. DECODE MESSAGE": : : :
 : : :
190 CALL KEY(0,S,STAT)
200 IF S<49 THEN 190
210 IF S>50 THEN 190
220 S=S-48
230 CALL CLEAR
240 PRINT "CODEBREAKER STRING:":
 : :
250 INPUT CB$
260 X=LEN(CB$)
270 FOR I=1 TO X
280 IF ASC(SEG$(CB$,I,1))<65 THE
N 320
290 IF ASC(SEG$(CB$,I,1))>90 THE
N 320
300 C=C+1
310 CB(C)=ASC(SEG$(CB$,I,1))
320 NEXT I
330 ON S GO TO 340,360
340 PRINT : : :"MESSAGE:": : :
350 GO TO 370
360 PRINT : : :"CODED MESSAGE:":
 : :
370 INPUT M$
380 Y=LEN(M$)
390 FOR J=1 TO Y
400 ML(J)=ASC(SEG$(M$,J,1))
410 NEXT J
420 FOR K=1 TO Y
430 L=L+1
440 IF ML(L)<65 THEN 600
450 IF ML(L)>90 THEN 600
460 M=M+1
470 CL=CB(M)
480 IF M<=C THEN 510
490 M=M-C
500 GOTO 470
510 ON S GO TO 520,560
520 CM(K)=ML(L)+CL-65
530 IF CM(K)<=90 THEN 610
540 CM(K)=CM(K)-26
550 GOTO 610
560 CM(K)=ML(L)-CL+65
570 IF CM(K)>=65 THEN 610
580 CM(K)=CM(K)+26
590 GO TO 610
600 CM(K)=ML(L)
610 NEXT K
620 CALL CLEAR
630 ON S GO TO 640,660
640 PRINT TAB(8);"CODED MESSAGE:
": : : : :
650 GO TO 670
660 PRINT TAB(7);"DECODED MESSAG
E:": : : : :
670 FOR L=1 TO Y
680 PRINT CHR$(CM(L));
690 NEXT L
700 PRINT : : : : :
710 STOP
720 CALL CLEAR
730 PRINT " THIS PROGRAM WILL CO
DE OR": :" DECODE MESSAGES USING
 THE": :TAB(8);"""ALPHA-GRID""."
: :" THE MESSAGE ";
740 PRINT "IS CODED USING": :"A
CODEBREAKER WORD OR PHRASE": :"(
UP TO 110 CHARACTERS), EACH": :"
 LETTER OF THE ";
750 PRINT """CODEBREAKER""": :"
BEING USED SEQUENTIALLY AS": :"T
HE FIRST LETTER OF THE CODE": :
760 PRINT TAB(9);"""ALPHABET"".
" : : :
770 GOSUB 880
780 PRINT " THE MESSAGE MAY BE U
P TO";' :" 110 CHARACTERS IN LENG
TH.": : :
790 PRINT "  WHEN THE CODEBREAKE
R IS": :" SHORTER THAN THE MESSA
GE,": :" THE CODEBREAKER ""SERIE
S""": :
800 PRINT " IS REPEATED UNTIL CO
DING": :TAB(8);"IS COMPLETE.": :
 : :
810 GOSUB 880
820 PRINT "THE COMPUTER IS PROGR
AMMED": :" TO ACCEPT ONLY UPPER
CASE": :"LETTER INPUT (A-Z) FOR
BOTH": :
830 PRINT "   CODEBREAKER & MESS
AGE.": :
840 PRINT " ANY OTHER CHARACTERS
 INPUT": :" (INCLUDING SPACES) W
ILL BE": :" IGNORED IN THE CODEB
REAKER": :
850 PRINT "OR RETURNED UNALTERED
 IN THE": :TAB(11);"MESSAGE.": :
 :
860 GOSUB 880
870 GOTO 180
880 PRINT " PRESS ANY KEY TO CON
TINUE"
890 CALL KEY(0,ANY,S)
900 IF S=0 THEN 890
910 CALL CLEAR
920 RETURN
```

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PERIPHERALS

ADD ONS

With the cost of home computers dropping like a rock and and the availability of peripherals for them increasing at an alarming rate, we thought it was time to gather as many peripherals together as possible in order to give you an overall picture of what was available for your micro. This is the first part of the review and it covers the VIC 20, ZX Spectrum and the BBC computers. We have not been able to review every peripheral that is available for these machines, partly because of lack of space and partly because of unavailability of certain items. However we have tried to cover as many different aspects of the machines as possible in an effort to give a balanced view.

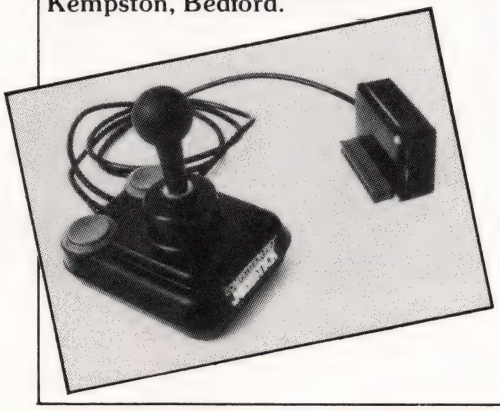
So without further ado we kick off with the ZX Spectrum.

ZX Spectrum Competition Pro Joystick

This joystick comes fitted with a special interface which allows it to be plugged straight in to the expansion connector on the back of the Spectrum. It has definately been built to last. Mounted on top of the solid steel shaft is a heavy duty plastic knob. Its large dimensions make it easy to grip, even in the most slippery of situations. The unit features dual fire buttons on the front of its base, making it usable by either right of left handed players.

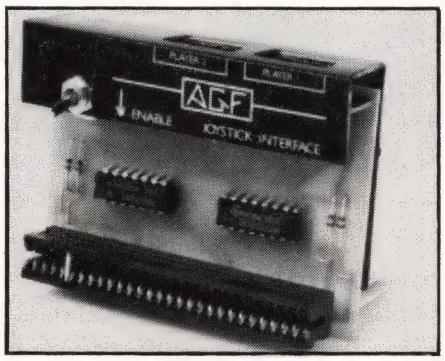
The one problem I found with this joystick was that because of the amount of leverage generated by pressure on the shaft, it was easy to prise the joystick out of your hand. This problem could be overcome by either placing the joystick on a flat surface when in use, or re-educating yourself to exert less pressure when using the joystick.

The Competition Pro Joystick costs £25-00 and further details are available from: Kempston Micro Electronics, 180a Bedford Road, Kempston, Bedford.



AGF Joystick Interface

The AGF interface provides two 9-pin D type connectors that will accept Atari switch type joysticks. The interface comprises a bare PCB shielded on one side which plugs directly into the expansion port on the Spectrum. Mounted on the front of the interface is an enable switch. This allows you to have the interface active or inactive, without having to remove it from the expansion port. This feature is essential because the interface substitutes the joystick controls for the normal action of the cursor keys. In doing this it also disables a large part of the keyboard.



This system does have its benefits because any game that is written to use the cursor keys for its control will work with this joystick. It is also very easy to incorporate them into your own software by simply reading the joystick using the INKEY$ function.

The cost of the unit, including one Atari type joystick — is £23-50. Extra joystick can be bought for a cost of £7.45 each. Further details can be obtained from AGF Hardware, 26 Van Gogh Place, Bognor Regis, Wes Sussex PO22 9BY.

DCP Interspec

Like its brother the S-Pack, this unit offers a rugged construction and a high quality edge connector. The purpose of the Interspec is to provide a collection of interfaces that will cover almost all applications requiring computer control. The unit includes the following interfaces: 8-bit TTL input port, 8 channel analogue to digital converter, 8-bit TTL output port, four high current relay outputs and four switch inputs. On the rear of the unit is the DCP bus expansion connector. This data bus will allow you to connect other DCP peripherals to the Interspec.

This unit is the ideal starter for anybody who is interested in electronic control projects. The documentation supplied with the Interspec is good and contains examples of both software and hardware applications of the product.

Interspec costs £39-95 and you can obtain further information on this and the S-Pack from: DCP Microdevelopments Ltd, 2 Station Close, Lingwood, Norwich NR13 4AX.

DCP S-Pack

The first of two products for the Spectrum from DCP Electronics is this speech synthesiser. The unit is encased in a heavy duty plastic and features a high quality edge connector. It fits very firmly into the expansion connector, but unfortunately caused the Spectrum to rock backwards and forwards whenever the keyboard was touched.

Speech is created by calling data ▶

from 'word tables' and feeding it to the unit's internal loudspeaker. The system has the disadvantage of having a restricted number of words, but has the advantage of producing crystal clear synthesised speech.

The word pack which is fitted as standard to the basic model contains mostly numerics, along with a selection of beeps and pauses. Additional word packs are available to augment and expand the speech pack.

Of all the speech synthesisers reviewed for the Spectrum this one was the best, because it was simple to program and it offered the most usable quality speech. It costs £49.95.



Chatterbox

The Chatterbox is part of a speech system developed for the ZX range of computers by William Stuart Systems. This speech synthesiser uses a different method of speech production to the DCP S-Pack. Instead of having complete words stored in a look-up table it creates words out of smaller building blocks called phonemes. While this system is a lot more flexible than a word table it does result in a loss of clarity of the speech.

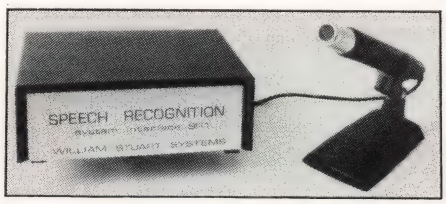
The construction of the unit left a little to be desired. Major points of worry were the exposed speaker and the poor quality edge connector. The documentation was also not as comprehensive as it should have been, given the slightly more complex way of producing speech that this unit employs.

On the whole this unit is better suited to people who want to explore speech synthesis as an idea, rather than just using it to enhance existing programs. Chatterbox costs £49-00 ready built, or £39-00 as a kit. Further details from: William Stuart Systems Ltd, Dower House, Billericay Road, Herongate, Essex, CM13 3SD.



Big Ears

Apart from being a Toytown character, Big Ears is the other half of William Stuart Systems speech system. This unit deals with the fascinating area of speech recognition. The Big Ears system comprises a speech digitiser unit, microphone, connecting leads, documentation and software. It connects to the Spectrum through either the Chatterbox or other makes of interface. The documentation contains enough information on interfacing to allow you to use it with most makes of interface.



The Big Ears works by sampling the spoken input of the microphone and passing this information in digital form to the Spectrum. The Spectrum then compiles this data into a table which is used as reference when you enter speech recognition mode. The demonstration program supplied with the unit shows how the system works and allows you to input up 10 words for the Spectrum to remember, although more words can be stored by the system if you use a 'cascading menu' technique.

The unit was well built and when tested managed to recognise words 7 times out of 10. The accuracy of Big Ears can be increased by sampling the target words more times, thus creating a better overall digital representation of the sound.

My one criticism was that the documentation did not give enough information about actually utilising the system within actual user programs.

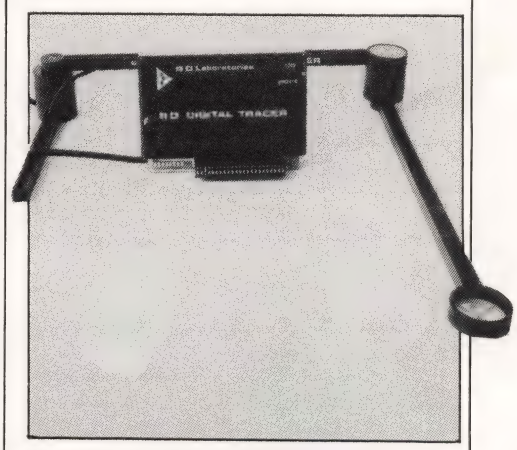
Big Ears retails for £49-00. Further details from William Stuart Systems Ltd, Dower House, Billericay Road, Herongate, Essex CM13 3SD.

Digital Tracer

RD Laboratories Digital Tracer is a device for transfering a picture or diagram off paper and on to the screen. The Tracer itself is a double jointed plastic arm with a cross hair sight attached to one end. Mounted in each joint is a rotary potentiometer, the values of which can be decoded by the software in the Spectrum and turned into a relative screen position.

The software supplied with the machine was quite accurate, making it possible to transfer complicated designs onto the screen. Unfortunately the shading routines were slow and inaccurate and this lead to a sloppy end result if you used them.

The arm was constructed well, although the joints would not take kindly to being overstressed. For the price of £49-95 this unit would be ideal for anybody who is tired of working out PLOT and DRAW coordinates on paper and then having to code them into the machine. For further information contact: RD Laboratories, 5 Kennedy Road, Dane End, Ware, Herts SG12 0LU.



VIC Chatterbox



The VIC Chatterbox comes in the form of a standard size VIC cartridge which plugs directly into the VIC's expansion port. The only other connections which you need make are replacing the 5 pin DIN plug from the modulator with the Chatterbox lead and then plugging the modulator lead into the 5 pin DIN socket from the Chatterbox. This ensures that the speech produced by the unit is fed to the television speaker, along with the VIC's normal output.

You produce speech on the Chatterbox by creating a string of allophones. For instance; to make the Chatterbox say 'HELLO' you would input the string H/E/L/K0/. The double 0 on the end makes the Chatterbox pronounce a long '0' instead of a short one.

The documentation concentrates heavily on the theory behind producing speech out of allophones and it offers plenty of examples to this end. For speech produced in this way the quality is superb. Once you understand the operating principles it is very easy to add to your own programs.

The Chatterbox costs £57-45. For further information contact Currah Computer Components Ltd, Graythorp Estate, Hartlepool, Cleveland TS25 2DF.

VICKIT II

The Vickit II is a single EPROM that can be added to the VIC via the Stack storeboard or the ROM expander. Its purpose is twofold. Firstly it gives you nine extra commands, such as Auto, Delete and Find, which help you with entering and debugging your programs. The second set of commands are used for creating high resolution screen displays.

The quality of both sets of commands are very good, being easy to use and powerful in their functions. This chip puts into a neat package most of the commands that any serious programmer would want.

Vickit II costs £29-00 + VAT. Further details from Stack Computers Ltd, 290-298 Derby Road, Bootle, Liverpool L20 8LN.

Storeboard

The Stack Storeboard is a flexible memory expansion unit for the VIC. The Storeboard plugs directly into the VIC's expansion port and comprises a PCB encased in tough plastic. It contains sockets to accept up to 27K of RAM chips. This total can be made up of three 8K blocks and one 3K block.

The beauty of this unit is that you can buy it with any of the memory combinations already installed and then upgrade it at a later date by plugging in extra RAM chips. The unit also features a duplicate expansion port on the back which allows you to use it with existing VIC cartridges. The memory addressing is switchable, therefore allowing you to return the VIC to its original memory size without having to unplug the connector. Also featured is an EPROM socket for use with the VICKIT EPROMS.

The Storeboard with 8K of RAM fitted costs £49-00 + VAT. For further details contact Stack Computers.

VIC FORTH

This is a cartridge based implementation of the increasingly popular FORTH language. The cartridge contains 8K ROM and 3K RAM. When plugged into a standard VIC you are left with about 3.5K in which to write your FORTH programs in. If the VIC is expanded then the extra memory will be available directly to the user.

The FORTH language used in the cartridge bears a very close resemblance to the widely used fig -FORTH. The documentation consists mainly of explanations of the functions of the FORTH words included in the dictionary and it would be best to supplement it with one of the FORTH books listed in the instructions.

This cartridge represents a cheap way for anybody to get aquainted with this popular language, VIC FORTH costs £38-95 and is available from Kobra Micro Marketing.



Super Expander

The Super Expander is Commodore's own high resolution graphics utility. It is supplied on cartridge, and apart from the ROM in which the utility is based the cartridge also contains 3K of memory. This cartridge will allow you to plot points, lines and circles on the VIC screen in high resolution. The commands are easy to use and are well documented in the manual which accompanies the unit.

Criticisms about this unit are that it was rather slow and the values used in the statements bear little relation to the actual screen resolution.

PERIPHERALS



The Super Expander costs £34-95. Review model supplied by Kobra Micro Marketing.

VIC GRAF

Another cartridge based utility that is designed to take the strain out of plotting graphical functions. It allows you to input the function you want to plot and the range of values you want it plotted over. Once it has these it will then draw the graph in high resolution on the screen. When it has drawn the graph you are then able to analyse the function to find its intersect, maximum/minimum etc.

This cartridge would be especially of interest to schools or anyone who has to work with graphs.

VIC GRAF costs £28-95. Further details from Kobra Micro Marketing.



Light Pen

Light Pens are a very useful means of entering data into a computer using the screen. By pointing at the screen with the light pen, the computer can decode its position on the screen and therefore enter the data you were indicating.

The Stack lightpen works reasonably well, although it is a little imprecise in its screen decoding. This problem can be overcome by making the target areas on the screen larger. Included with the pen is a cassette game which apart from being good fun also shows you how to program the light pen. It costs £25-00 + VAT. Further details from Stack Computers Ltd.

Joystick

This joystick is the official Commodore used repackaged Atari commodore used repackaged Atari joysticks and although this joystick is similar, on the whole it was better. Its small base fits snuggly in the hand and the centrally mounted fire button can be used equally well by both left and right handed people. It seemed slightly more sturdy than the Atari original and I found it more responsive when playing games.

Review model supplied by Kobra Micro Marketing, Duramark House, Farm Road, Henly on Thames, Oxon RG9 1EJ. Cost £7-50.

BBC COMPUTER

BBC Joysticks

These joysticks are the official ones for use with the BBC. The pair I reviewed were not as well finished as I would have expected, though this did not affect their function. The joystick takes the form of a large plastic hand grip with a fire button on the front, and a potentiometer type joystick control set into the top. The handgrip was decidedly chunky, which I found uncomfortable and would definitely be a problem in smaller hands.

The documentation was sparse although by working with this in conjunction with the BBC manual it should be easy to write software to utilise the joystick. I was surprised that the joystick was not sprung to make it return to centre, seeing as how this is going to find the majority of its use as a games joystick.

The joysticks are £13-00 a pair. Review model supplied by 3D Computers, 230 Tolworth Rise South, Tolworth, Surbiton, Surrey KT5 9NB

Midwich Joysticks

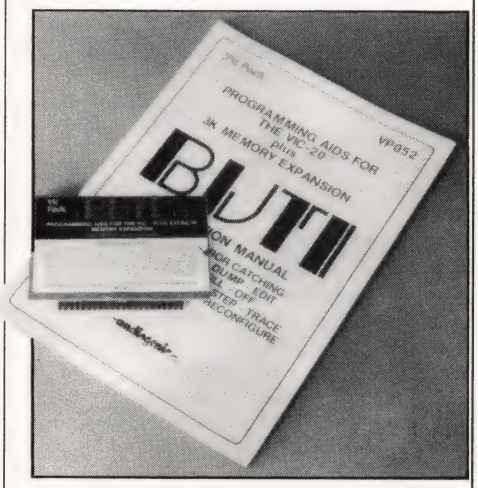
Another set of potentiometer joysticks for use with the BBC micro. The feel of these joysticks was slightly stiffer than the BBC's own make, and this made them easier to handle when playing games. Once again I found the design of the grip uncomfortable over long periods and the placement of the fire button did not lend itself to rapid fire techniques.

The joysticks cost £11-30 a pair. Further details from Midwich Computer Company, Rickinghall House, Rickinghall, Suffolk IP22 1HH.

BUTI

This highly flexible programmers utility comes supplied on a cartridge and features most of the normal debugging and fast entry utilities found on any programmers toolkit. Its special features include an extra 3K of RAM, a hexadecimal/decimal conversion command and a VIC reconfiguration utility. This last feature allows you to reconfigure your VIC's memory size by just typing a single command, very useful if you are running software that needs different memory sizes.

Review model supplied by Kobra Micro Marketing, BUTI costs £39-99.



Joystick

This joystick from Stack Computers is commonly referred to as a Plotting joystick. Instead of having four switches to indicate the four joystick positions, it has two potentiometers. This allows the computer to make a direct correlation between the position of the joystick and a position on the screen, making it ideal for drawing or plotting on the screen under joystick control.

Because of the way this joystick works, you cannot use it with any normal joystick games. The joystick costs £13.00 + VAT. For further details contact Stack Computers Ltd.



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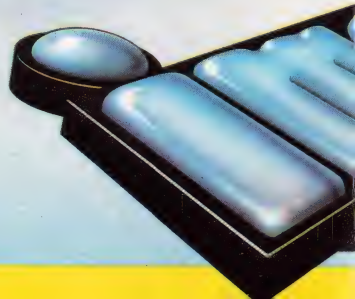
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it would be easy shifting the galaxy's rubbish.
Childs play, HUH!! They warned me of the weird packaging,
the trays, the rods, and all the rest.
But they didn't say I'd have to stop and control not just one but two
or even more garbage pods. Then prod them, push
them, toward that black hole, and oh, it's so very, very
black, and so lonely, so empty.
Panic, mustn't panic, but they won't stop, twirling and
spinning and turning, always turning, towards me, against
me, at me. And I'm alone.
No way out, nowhere to hide, on my own, my own . . . own . . .
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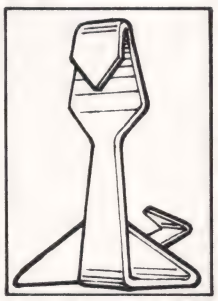


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SPECTRUM BIG-SCREEN

Feeling restricted by your Spectrum's screen? Philip Crawley has the answer.

If you have ever looked at the programs Horizons tape you get with your Spectrum and thought how useful it would be to have a similar system of large lettering in your own programs. If this is so, then the following program will be a Godsend to you.

By using this program in conjunction with the Horizons tape you will be able to create screen displays containing a multitude of different sized letters, as well as increasing your Spectrum's display capability to 51 characters a line.

By following the example programs you will soon be producing professional quality screen displays on your Spectrum.

First Steps

To begin, place the Horizons tape in your cassette recorder and rewind it to the beginning of side B. When this is done type the following:

CLEAR 32255: LOAD "c" CODE

When this has been correctly loaded, enter program 1 and run it.

When the program is run you will see that the string contained in line 40 has been printed in large red characters across the screen. If you now list the program you will see that the following variables control its size and position.

In line 10 the variables X and Y contain the coordinates for the start of the string. Note also that the Y coordinate is inverted from its normal high resolution notation, so that when Y = 0, the printing will start at the top of the screen.

Line 20 contains the variables for the scaling factor of the printing. XS is the scaling factor in the X axis and YS is the scaling factor in the Y axis. In this example the printing will be twice as wide and three times as high as a normal character.

CS in line 30 contains the value for the character spacing. This is normally left set at eight because it acts independantly of the value in XS. If it is decreased then the characters will overwrite each other.

Finally, the string to be printed is contained in D$. You must be careful that the length of this string doesn't cause the printing to scroll over the end of a line, because instead of the printing continuing on the next line, it will restart at the beginning of the same line, thus replacing the beginning of the string.

Now try using different values for the variables and see how you can position the string about the screen in different sizes.

The Squeeze Is On

When you have aquainted yourself with the way this routine works type NEW and type in the second program. Do not worry about losing the machine code, because even though you have NEWed the program, it will still be preserved above RAMTOP.

In the second program notice that the X and Y have replaced with PRINT AT coordinates in line 9999. This is done to make it easier to incorporate this routine into your own programs and, because decimals can be used, it still maintains the high resolution flexibility of the program.

The width and height have been reduced to one in order to give standard character size. However, the character spacing (CS) has been reduced to seven. When you run the program you will see that by using this routine another four characters have been squeezed onto the line, without any loss of clarity.

Now try reducing the value of CS to six. This will put even more characters on the line, but because they now start to overwrite each other, they are difficult to read.

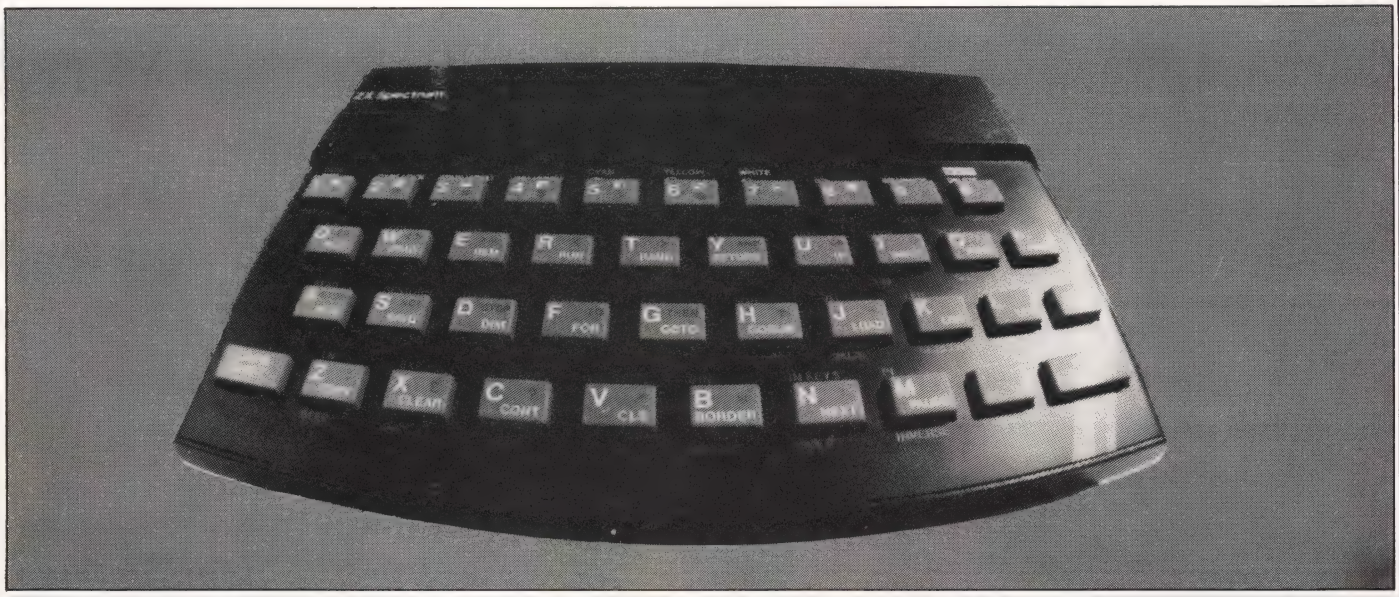
The problem now is how to progress beyond the 36 characters per line that we have achieved?

Going Deeper

It just so happens that in the Spectrum's memory is a location labelled 'CHARS'. In this address (23606) is a pointer which tells the computer where to find the data for its character set. This pointer can be changed to allow you to set up your own custom character set in memory.

Following on from this it becomes evident that if we design our own custom character set with more space around the letters then we should be able to place more characters on a display line. This is what program 3 does.

When run, the program redefines all the characters and symbols so that they have a larger gap around the outside, which means that when they are compressed by the machine code routine they still appear legible on the screen.



When you have entered and run program 3 you can switch the computer to use your custom character set by typing:

POKE 23607,122

If any of the characters look strange then you have most probably typed in some of the data incorrectly, if this is so then you can switch back to your original character set by typing:

POKE 23607,60

If any of the characters look faulty then it is easy to check the data to correct them. First, find out the ASCII value of the letter that is wrong, multiply it by 10 and the result will be the line number which holds the data for that character.

When you are happy with your character set, rewind the Horizons tape to the beginning of side B and type:

LOAD "c" CODE

Do not use the CLEAR instruction otherwise you will destroy your new character set. When the machine code has loaded you will have the machine code and the character set safely stored away above RAMTOP. Now you have these two in one place you will want to save them so that you can use them in your own programs. To do this insert another tape and type the following:

SAVE"mc + chr set"CODE 31488,1280

The End Result

When this has been SAVED properly then type NEW and enter program 4.

Before you run the program type:

POKE 23607, 122

This will activate your new character set. When you run this program you will see the real versatility of this routine. With CS set to 5 the Spectrum will produce a 51 character line on the screen. If you set CS to 6 then a 42 character line will be produced. The 36 and 32 character line options can be used with the original character set.

Some further modifications have been made to line 9999 in order to make it a more general purpose routine. The Y coordinate has been changed to LINE, which is incremented after every call, saving you the trouble of specifying it every time you call the routine. The X coordinate has been changed to TAB, so whenever you clear the screen use:

CLS: LET LINE = 0: LET TAB = 0

To reload the routine at any time use the following form:

CLEAR 31487:LOAD"mc + chr set"CODE
This will load the routine in safely above RAMTOP.

As with all these sort of routines you will only fully appreciate them when you have tried them in your own programs, so feel free to experiment.

PROGRAM LISTING

Program 1

```
  10 LET X=50: LET Y=60
  20 LET XS=2: LET YS=3
  30 LET CS=8: INK 2
  40 LET D$="SPECTRUM"
  50 GO SUB 9999
  60 INK 0
  70 STOP
9999 LET A=23306: POKE A,X: POKE
 A+1,Y: POKE A+2,XS: POKE A+3,YS
: POKE A+4,CS: LET A=A+4: FOR I=
1 TO LEN D$: POKE A+I,CODE D$(I)
: NEXT I: POKE A+I,255: RANDOMIZ
E USR 32256: RETURN
```

Program 2

```
  10 LET X=0: LET Y=0
  20 LET XS=1: LET YS=1
  30 LET CS=7
  40 LET D$="ABCDEFGHIJKLMNOPQRS
TUVWXYZ"
  50 PRINT AT 1,0;D$( TO 32)
  60 GO SUB 9999
  70 STOP
9999 LET A=23306: POKE A,(X*8):
POKE A+1,(Y*8): POKE A+2,XS: POK
E A+3,YS: POKE A+4,CS: LET A=A+4
: FOR I=1 TO LEN D$: POKE A+I,CO
DE D$(I): NEXT I: POKE A+I,255:
RANDOMIZE USR 32256: RETURN
```

PROGRAM LISTING

Program 3

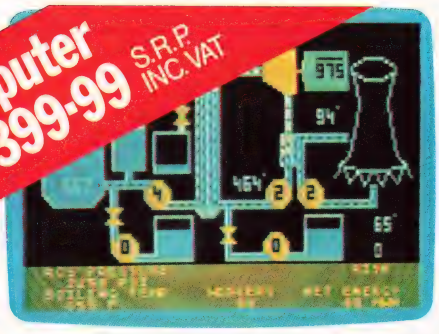
```
  840 DATA 112,32,32,32,32,32,32,
0
  850 DATA 144,144,144,144,144,14
4,96,0
  860 DATA 144,144,144,144,96,96,
96,0
  870 DATA 144,144,144,144,240,24
0,144,0
  880 DATA 144,144,96,96,96,144,1
44,0
  890 DATA 80,80,80,112,32,32,32,
0
  900 DATA 240,16,32,32,64,128,24
0,0
  910 DATA 96,64,64,64,64,64,96,0
  920 DATA 128,192,64,96,32,48,16
,0
  930 DATA 96,32,32,32,32,32,96,0
  940 DATA 32,176,168,32,32,32,32
,0
  950 DATA 0,0,0,0,0,0,0,248
  960 DATA 96,144,128,224,128,128
,240,0
  970 DATA 96,16,16,112,144,144,9
6,0
  980 DATA 128,128,128,224,144,14
4,224,0
  990 DATA 0,96,144,128,128,144,9
6,0
1000 DATA 16,16,16,112,144,144,1
12,0
1010 DATA 0,96,144,224,128,128,9
6,0
1020 DATA 96,144,128,224,128,128
,128,0
1030 DATA 96,144,144,176,16,16,2
24,0
1040 DATA 128,128,128,224,144,14
4,144,0
1050 DATA 32,0,32,32,32,32,32,0
1060 DATA 32,0,32,32,32,32,32,19
2
1070 DATA 0,160,192,128,192,160,
160,0
1080 DATA 64,64,64,64,64,64,32,0
1090 DATA 0,144,240,144,144,144,
144,0
1100 DATA 0,224,144,144,144,144,
144,0
1110 DATA 0,96,144,144,144,144,9
6,0
1120 DATA 0,0,224,144,224,128,12
8,0
1130 DATA 0,224,160,224,32,48,32
,0
1140 DATA 0,0,224,128,128,128,12
8,0
1150 DATA 0,0,96,128,96,16,96,0
1160 DATA 64,64,96,64,64,64,48,0
1170 DATA 0,144,144,144,144,144,
96,0
1180 DATA 0,144,144,144,96,96,96
,0
1190 DATA 0,144,144,144,240,240,
144,0
1200 DATA 0,144,96,96,96,144,144
,0
1210 DATA 0,80,80,112,16,16,16,0
1220 DATA 0,240,16,32,64,128,240
,0
```

Program 4

```
  10 CLEAR 31487
  30 FOR N=31488 TO 32215
  40 READ A: POKE N,A: NEXT N
 320 DATA 0,0,0,0,0,0,0,0
 330 DATA 0,32,32,32,32,0,32,0
 340 DATA 0,80,80,0,0,0,0,0
 350 DATA 0,80,248,80,248,80,0,0
 360 DATA 32,112,160,112,40,112,
32,0
 370 DATA 144,48,32,96,64,192,14
4,0
 380 DATA 96,144,144,96,144,176,
80,0
 390 DATA 32,64,0,0,0,0,0,0
 400 DATA 32,64,64,64,64,64,32,0
 410 DATA 64,32,32,32,32,32,64,0
 420 DATA 0,144,96,240,96,144,0,
0
 430 DATA 0,0,32,112,32,0,0,0
 440 DATA 0,0,0,0,0,0,32,64,0
 450 DATA 0,0,0,240,0,0,0,0
 460 DATA 0,0,0,0,0,0,96,96,0
 470 DATA 16,48,32,96,64,192,128
,0
 480 DATA 96,144,144,144,144,144
,96,0
 490 DATA 32,96,32,32,32,32,112,
0
 500 DATA 96,16,16,96,128,128,24
0,0
 510 DATA 96,16,16,96,16,16,96,0
 520 DATA 32,96,160,240,32,32,32
,0
 530 DATA 224,128,224,16,16,16,2
24,0
 540 DATA 96,128,128,224,144,144
,96,0
 550 DATA 224,16,16,32,64,64,64,
0
 560 DATA 96,144,144,96,144,144,
96,0
 570 DATA 96,144,144,112,16,16,1
6,0
 580 DATA 0,0,32,0,0,32,0,0
 590 DATA 0,0,32,0,0,32,64,0
 600 DATA 16,32,64,128,64,32,16,
0
 610 DATA 0,0,240,0,240,0,0,0
 620 DATA 128,64,32,16,32,64,128
,0
 630 DATA 96,144,16,32,32,0,32,0
 640 DATA 96,144,144,144,160,128
,112,0
 650 DATA 96,144,144,240,144,144
,144,0
 660 DATA 224,144,144,224,144,14
4,224,0
 670 DATA 96,144,128,128,128,144
,96,0
 680 DATA 224,144,144,144,144,14
4,224,0
 690 DATA 240,128,128,224,128,12
8,240,0
 700 DATA 240,128,128,224,128,12
8,128,0
 710 DATA 96,144,128,128,184,144
,112,0
 720 DATA 144,144,144,240,144,14
4,144,0
 730 DATA 112,32,32,32,32,32,112
,0
 740 DATA 112,32,32,32,32,160,64
,0
 750 DATA 144,144,160,192,160,14
4,144,0
 760 DATA 128,128,128,128,128,12
8,240,0
 770 DATA 144,240,240,144,144,14
4,144,0
 780 DATA 144,208,208,240,176,17
6,144,0
 790 DATA 96,144,144,144,144,144
,96,0
 800 DATA 224,144,144,224,128,12
8,128,0
 810 DATA 96,144,144,144,208,176
,80,0
 820 DATA 224,144,144,224,160,14
4,144,0
 830 DATA 96,128,128,96,16,16,22
4,0
```

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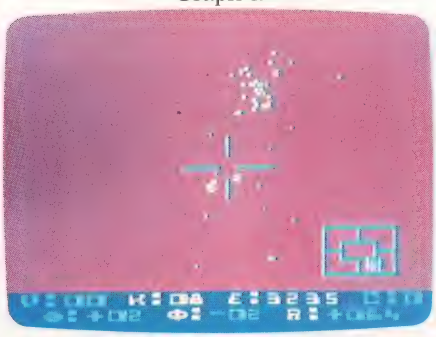

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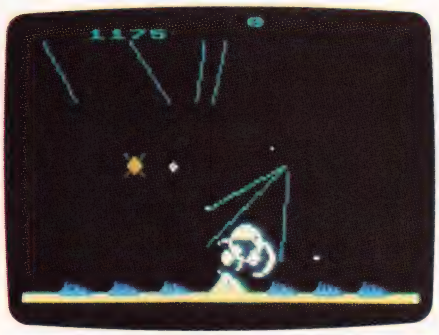


Intro to BASIC 1

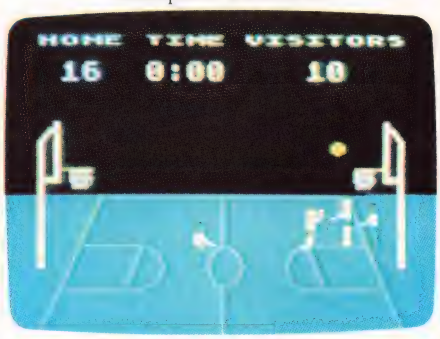

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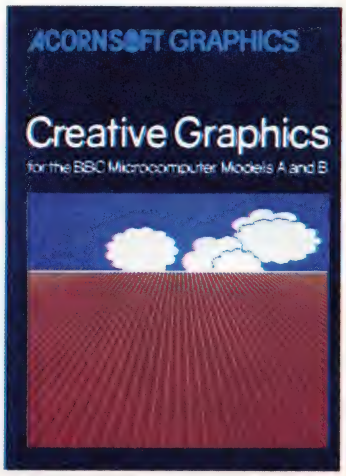
The BBC Microcomputer system is generally regarded to be the best micro in its price range you can lay your hands on. So, if you're thinking of buying one or already own one, you'll want to know about the software that's been specially designed for it.

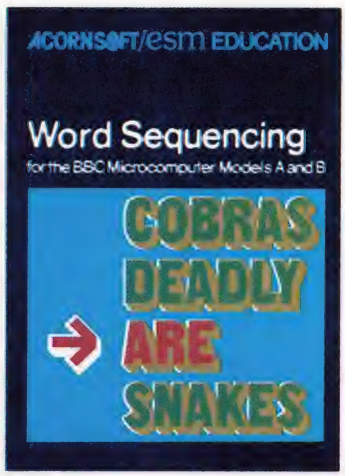
Not surprisingly, it's made by Acornsoft, the software division of Acorn Computers Ltd., who designed and built the BBC Microcomputer. So naturally you can expect the highest quality software with the built-in ingenuity to fully exploit the BBC Micro's potential.

Further education for everyone.

Creative Graphics, which includes the book 'Creative Graphics on the BBC Microcomputer' (price £17.45), provides 36 programs on cassette producing a spectacular range of pictures and patterns in full colour, including animated pictures, recursively-defined curves and three dimensional shapes.

Word Sequencing (price £11.90) contains three word sequencing programs on cassette. Each program presents a series of jumbled words which must be arranged on screen to form either a proverb, nursery rhyme title or a sensible sentence.

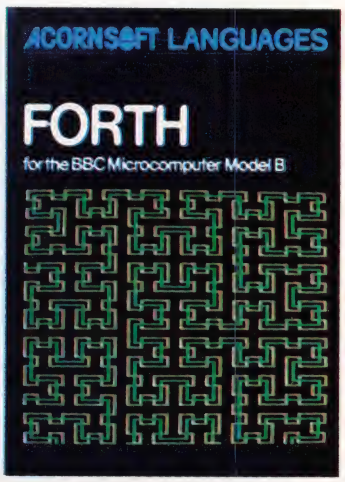




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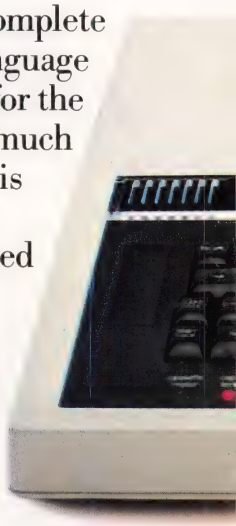
LISP (price £24.35) is the fundamental language of artificial intelligence research.





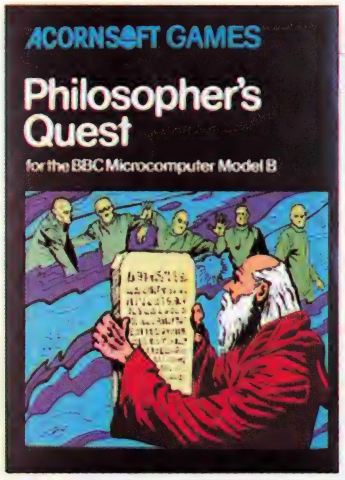
It consists of 5.5K of machine code interpreter, plus 3K of initialised LISP work-space containing utilities and constants. It comes complete with a book that introduces you to programming in LISP, as well as some fascinating applications.

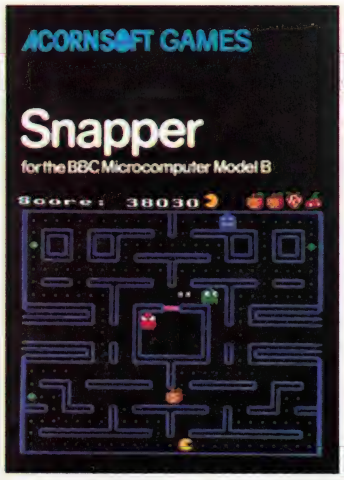
FORTH (price £24.35) is a complete implementation of the FORTH language to the 1979 standard specification for the BBC Microcomputer Model B. This much acclaimed programming language is also accompanied by a specially written book explaining all you need to know.

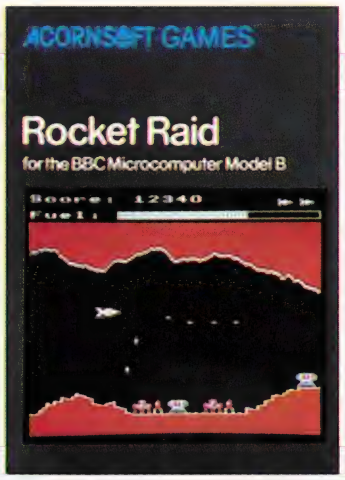


Mind-boggling games.

Philosopher's Quest (price £9.95) is an advanced adventure in which you tell the computer what you want to do and it







describes back in plain English your progress through a fascinating world of fiendish puzzles to be solved.

Snapper (price £9.95) is a colourful game where you guide your 'snapper' through the maze, eating dots and fruit and avoiding the creatures that chase you. Complete with full sound effects, score and a ladder of high scores.

Rocket Raid (price £9.95) sends you on a mission to raid a heavily guarded Martian fuel depot. You must fly your rocket over mountains and through caverns, avoiding enemy missiles and dodging convoys of deadly fizzers.

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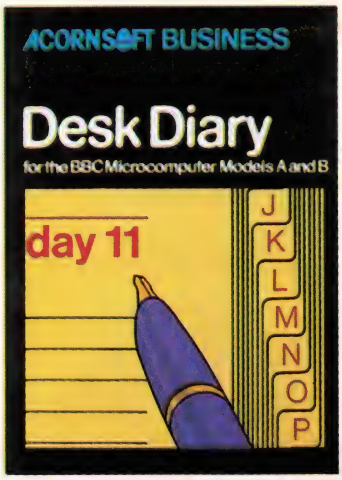
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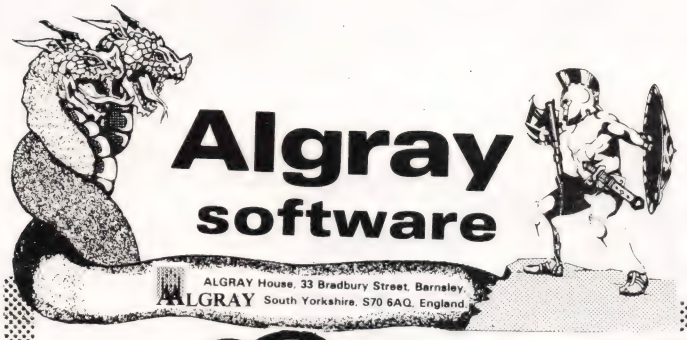
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DRAGON v GENIE

Chris Palmer investigates the facilities of these two recently released computers.

The Dragon 32 burst onto the computer market amid a blaze of publicity which has overshadowed a keen rival in the Colour Genie.

As both these machines have similar specifications we are comparing the two to see which machine offers you most.

Both machines sport full typewriter keyboards. The Dragon's keyboard felt very cheap and I had a lot of problems with its slow response. The keys also had an annoying habit of getting stuck down due to the poor quality case moulding. The Genie's keyboard was better, though not as good as a Commodore or BBC keyboard.

Both keyboards are laid out in QWERTY style and are clearly labelled. The Genie's keyboard also has its predefined character set silk-screened onto the front of the keys. The Genie also has four function keys on the right of the keyboard, giving it the appearance of a super VIC.

Super Tough

The Colour Genie is encased in tough moulded plastic and giving it the impression of being a very rugged machine. The Dragon does not look as long-lasting.

Both machines are well supplied with sockets and ports for connecting them to other hardware devices. On the Genie these are: parallel port, light pen (DIN), serial port (DIN), cassette port (DIN), expansion cartridge slot, audio out (Phono), TV lead and power supply. The Dragon offers the following connections: cartridge slot, power socket, monitor out (DIN), TV lead, joystick left/right (DIN), cassette (DIN) and printer I/O.

As well as the standard cursor, ESC and CTRL keys, the Genie has a couple of very useful function keys. The first are a pair of reset keys that are situated at opposite ends of the top keyboard row. If both of these keys are depressed simultaneously then the machine executes a 'warm start'. This is the same as turning the machine off and on, but without losing any program or data that is in memory. If, however, both keys are pressed in conjunction with the R key then the machine resets completely, saving great wear and tear on the on/off switch.

The second special key is the MOD/SEL key. This key has two functions, first it acts as a toggle between normal upper/lower case on the keyboard and the graphics character set. When this key has been depressed you can type the graphics characters directly into PRINT statements like any other character. The other function of this key occurs on power up. If this key is held down when the machine is switched on then the computer takes the memory it would usually reserve for the graphics screen and gives it to the user, thereby increasing the machine's capability for data handling and storage.

Microsoft BASIC is fitted as standard to both machines. The only significant difference between the two is found in the graphics, colour and sound commands.

Editing

Both machines have Microsoft line editors to handle any program editing, so if you have had any experience with Tandy computers then this should present no problem. One criticism that can be levelled at both machines concerns this form of screen editing. While the line editor does the job adequately, it relies on you remembering the various control mnemonics to carry out the functions.

Why these machines, both of which claim to be ideal for beginners, can't be fitted with a screen editor which allows you to move the cursor to any line on the scren and then edit it using the insert and delete keys is quite beyond me, as this method is far easier to learn and a lot more straightforward for a beginner to use.

Display Modes

The Genie has two display modes. The first is text, which offers a resolution of 40 characters per line and 24 lines per screen. The second mode is the high resolution graphics mode, which has a resolution of 160 dots horizontally by 96 dots vertically.

The Dragon offers five display modes to choose from. Its text screen has a resolution of 32 characters per line by 16 lines per screen. The highest graphics mode gives a resolution of 256 dots horizontally by 192 dots vertically.

Colour Control

The colour selection on both machines is limited, nine on the Dragon, eight on the Genie. This selection is further restricted by the way in which certain displays only allow certain colours to be used. On the whole I found that the Video Genie's colours were better produced and more pleasing to the eye, as opposed to the Dragon's which I found a little insipid.

On the graphics side both



machines perform adequately, although I found the Genie's graphics a lot easier to comprehend than the Dragon's. This may be partly the fault of the appalling manual which accompanies the Dragon, although the Genie's manual wasn't a lot better.

The Dragon graphics commands were comprehensive almost to the degree of absurdity and this could be very intimidating to the first time user. However when you have become more accustomed to them there is very little you cannot do. The Genie adopts a more simplistic approach and provides straight forward usable graphics.

Picture Making

Both machines have the facility to draw a picture on the screen, and then move it around. On the Genie this is achieved by setting up a shape table in memory. This table is 256 bytes long and each byte contains two movement and two colour commands. To program this table you do need to understand how to set up binary bit patterns within a byte, but as this technique stems directly from setting up definable characters then this shouldn't prove too much of a hinderance to novices. Once you have created the picture in the shape table then you can place it anywhere on the screen using the SHAPE command.

With the Dragon you can achieve the same results in two ways. One method is to draw the picture on the screen in the normal way and then use the GET command to transfer the picture data into an array, which can then be placed in a different screen location using the PUT command. The other method involves compiling a string, in a similar way to the Genie's shape table, and then using the Dragon's DRAW command to carry out the instructions contained in the string. This latter method has the advantage of being able to include a scaling factor into the drawing, so creating the impression of an image moving towards or away from the observer is possible.

One aspect of graphics where the Dragon falls down sharply is its inablity to create user-defined characters. This facility is included on the Genie and combined with the Genie's already extenisive predefined characters, make the creation of impressive screen displays for games very easy.

One commendable point about the Genie manual was that it included a large amount of information about the actual chips that produced the graphics and sound. So for the slightly more advanced user this gives them the information needed to add some extra special graphics and sound functions to their machine.

Sounding Out

The Colour Genie and the Dragon both have two sound commands, PLAY and SOUND and although their form is the same they have different functions on the machines. On the Genie, PLAY has four arguments: channel (1-3), octave (1-8), note (0-12) and amp (0-15). With these it is possible to create a full range of musical tunes and notes with up to three parts being played by the computer's three voices. The SOUND command will be of greater use to the slightly more advanced users because it allows you to write different values into the sound control registers within the sound chip. By using this command in conjunction with the chip data sheets at the back of the manual it is possible to create most of the special effect sounds that you would require.

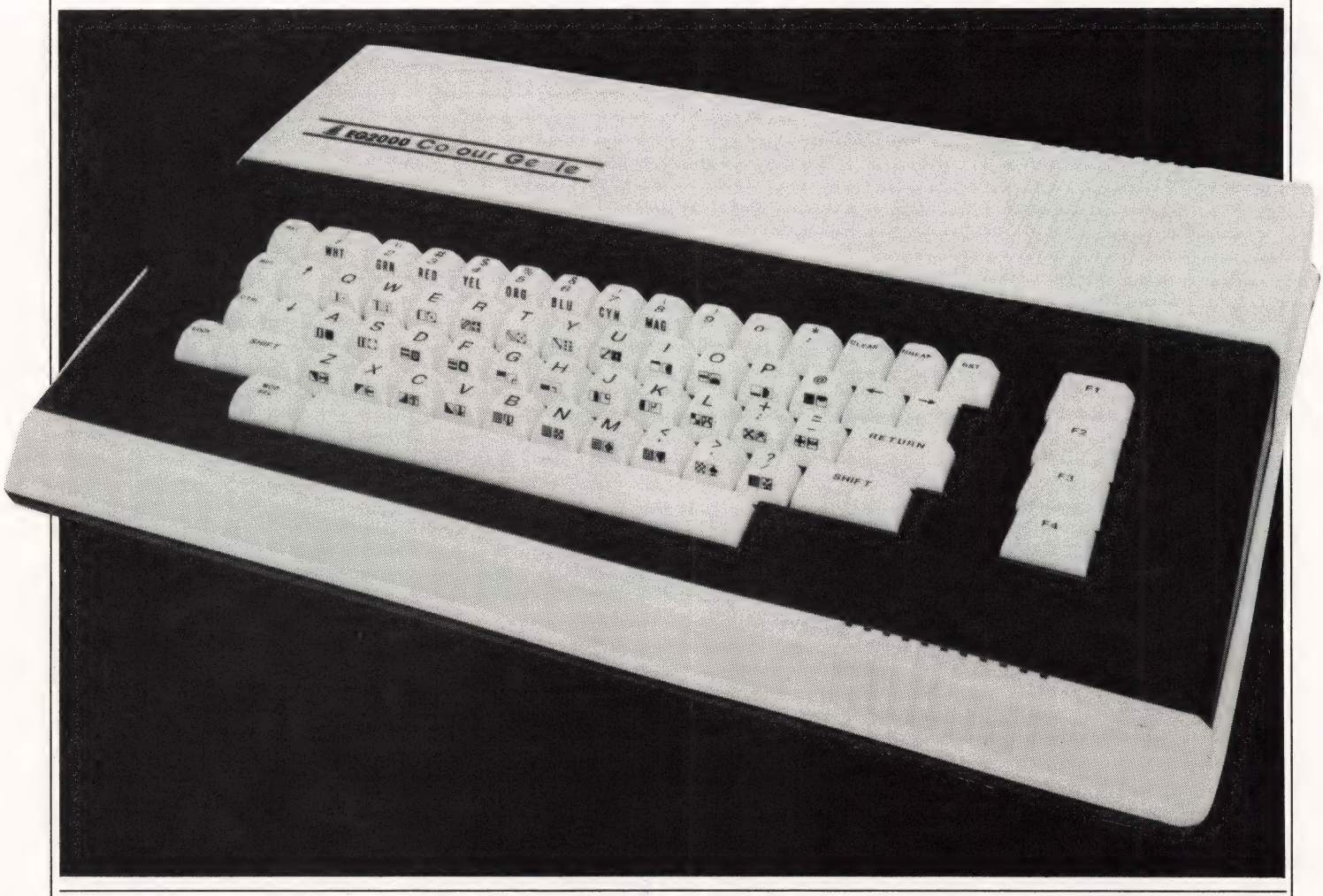
Poor Quality

On the Dragon the PLAY command contains a string of alphanumeric characters which tell the computer what notes to play, their volume, octave, length etc. Using the command it is possible to compile a complete tune into one PLAY statement. The SOUND command is used to produce single notes of a specified duration.

Both sound systems are adequate for normal computer use but it must be said that the sound quality on the Dragon leaves quite a lot to be desired. Suffice to say that the Dragon is more suited to playing an Eric Clapton lead solo, than it is to playing Mantovani, as the degree of distortion on our review Dragon was quite unacceptable.

On general critism that affects ▶

REVIEW



Machine Comparison

	DRAGON	COLOUR GENIE			
Price (approx)	£199-00	£224-50	High Resolution	256 X 192	160 X 96
Central Processor	6809E	Z80	Colours	9	8
Standard Memory	32K	16K	User definable Chars	No	Yes (128)
Character Resolution	32 X 16	40 X 24	Sound	Yes (5 octave)	Yes (8 octaves, 3 channels)

both machines was their inability to stay tuned into the television set. After 10 to 15 minutes the television had to be retuned into the new frequency that the computers had wandered to, any longer than this and the printing on the screen became indistinct and difficult to read. One possible cause for this is that both machines had their RF modulators inside the case, so it is possible that this drifting problem was caused by the computer heating up.

And Finally . . .

To bring this comparison to a close I think it is worth looking at a couple of points outside of the machines themselves that have a large bearing on which machine would be best to buy. The first point applies to all computers and that is the question of software.

One of the major reasons for buying a computer, apart from wanting to learn how to program, is to use them to run a piece of software. This software can be games, business or educational. Therefore, when buying a computer it is essential to know that there will be a large, varied and well written supply of software to complement it.

Because of the extensive advertising and marketing the Dragon has undergone there is a greater incentive for commercial firms, as well as individuals, to produce software for it. Without doubt it has paid off in sales terms. Because the Colour Genie's entrance into the market place has been a more low-key affair, people are less aware of its facilities and capabilities, so the Colour Genie owner might find himself without the same selection that a Dragon owner might have.

The same criteria also applies to the peripherals and expansion side of the industry. Take for instance the peripherals for the ZX81 and the Spectrum. Because there is a large market for peripherals for these products, a whole industry has established itself to supply the demand.

To sum up, I think that both machines are adequate home computers, but the Colour Genie is more suited to the person that wants to go a little beyond the usual constraints of a home computer, as it offers the user the facilities to pry into its internal workings and to customise its operation. The Dragon will suit the buyer that wants little more than a standard home computer. ■

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The BBC's choice too.

In choosing a machine to put their name to for their massive Computer Literacy Project, the BBC had the same set of priorities as the DOI. The BBC Micro is now an integral part of that project, which includes books, software, courses and a number of major television series, one of which, "Making the Most of the Micro" is now being broadcast.

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The BBC Micro is light and compact. It generates high resolution colour graphics, and is capable of synthesising music and speech using its own internal speaker. The keyboard uses a conventional layout and typewriter feel.

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Designed to grow.

Last year the magazine "Which Micro?" said that the most attractive and exciting feature of the BBC Microcomputer was its 'enormous potential for expansion'.

This is indeed one of the features that sets it aside from the competition.

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BASIC plus.

A sophisticated version of BASIC has been chosen for the BBC Micro, which incorporates features normally found only in more advanced high level languages. However, there is also a facility allowing access through a simple command to another language – for example, PASCAL, FORTH and LISP.

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51 × 24 DISPLAY

The DRAGON 32 is an incredibly powerful and versatile computer, but for text editing it has some major drawbacks. The small 32 character by 16 line screen format shows you too little of the text and, combined with its lack of lower case letters, bears little resemblance to the way text really looks on the page. Reverse video in place of lower case just adds confusion.

Telewriter eliminates these shortcomings with **no hardware modifications required.** By using software alone, Telewriter creates a new character set that has **real lower case letters,** and puts 24 lines of 51 characters on the screen. That's more on-screen characters than Apple II, Atari or TRS-80 Model III. That's more than double the DRAGON 32's standard display.

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You can print all or any part of the text buffer, abort the printing at any point, and there is a "Typewriter" feature which allows you to type straight to your printer. Because Telewriter lets you output numeric control codes directly (either from the menu or during printing), it works with any printer (Tandy, Seikosha, MX-80, Okidata, NEC 8023, C. Itoh 8510, Centronics, GE Terminet, Smith Corona TP-1, etc.). There's even a special driver for the Epson MX-80 that lets you simply select any of its 12 fonts and do underlining with a single underline character.

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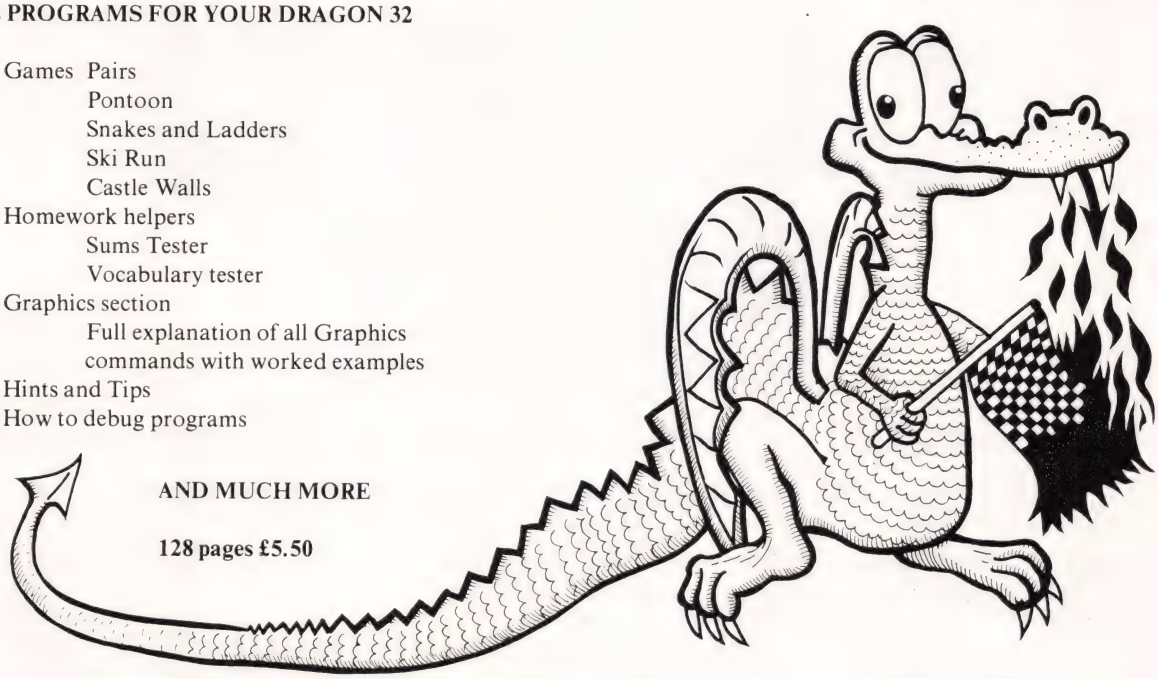
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– Color Computer News, Jan. 1982

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CASSETTE INDEX

Lost software a problem? Use R. Stephenson's program to keep track of your tapes.

As any computer user knows, after a while you tend to accumulate a mass of cassette tapes with pieces of programs and useful routines stored away on them. The problem comes when you urgently need to find one particular piece of software and you cannot remember which part of which tape it was stored on.

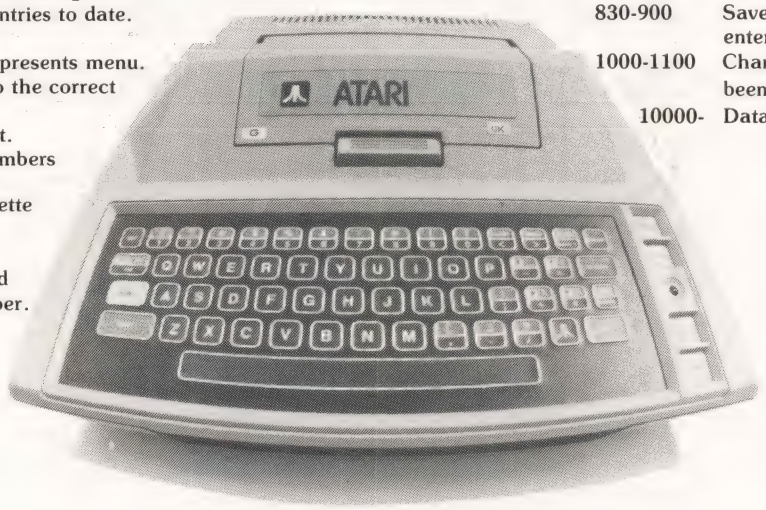
This program goes a long way to alleviate this problem by providing a comprehensive computer based filing system for the tapes. The program uses the dynamic keyboard technique, whereby data is written into the data bank automatically by creating new program lines. With 16K of memory there should be room for about 400 entries.

The program is driven by a menu, each item of which is self-explanatory. The search program itself will look for a complete title or indeed any number of characters, from one to the maximum of 16. This system is particularly useful when you cannot remember the whole title of a piece of software which you are looking for.

When entering the program, particular attention should be paid to a couple of points. Lines 250 and 410 contain control characters, and the keystrokes shown within the brackets should be used to produce these. The symbol that should be produced is a 'down arrow'. Any words shown in PRINT statements that are enclosed in vertical lines should be input in reverse field.

HOW IT RUNS

10-40	Dimensions & clears strings.
50	Holds number of entries to date.
70-100	Reads keyboard.
110-160	Clears screen and presents menu.
170-200	Directs program to the correct subroutine.
220-380	Prompts data input.
390-460	Writes new line numbers and stores data.
470-730	Lists titles for cassette number input, or searches for a specified title and lists cassette number.
740-820	Updates P in line 50
830-900	Saves program along with all data entered.
1000-1100	Changes data if new material has been recorded on any cassette.
10000-	Data bank.



HINTS ON CONVERSION

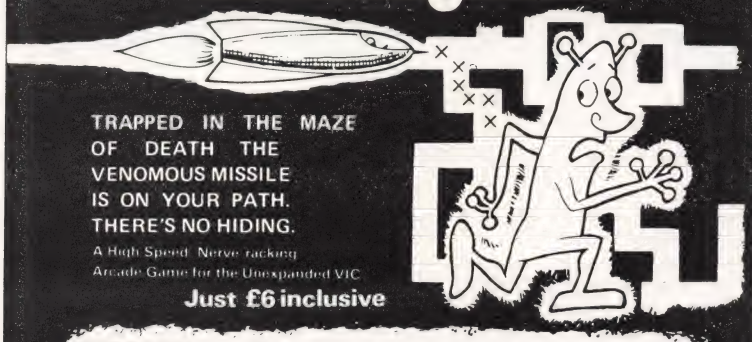
Because of the way this program uses the technique of creating new program lines in memory it is not suitable for direct conversion onto another machine. It would be far better to study the How it Runs section in conjunction with the program listing and then try to write your own version from scratch on your computer.

PROGRAM LISTING

```
10 REM ==============================
11 REM =====  CASSETTE INDEX   ======
12 REM =====  ******** *****   ======
13 REM ===== by ROY STEPHENSON ======
18 REM ==============================
20 DIM S$(38),B$(1),N$(4),T$(16),TR$(1),
I$(3),C$(1),R$(5),Z$(38),W$(16)
30 FOR X=1 TO 38:S$(X,X)=" ":NEXT X
40 N$=S$:T$=S$:TR$=S$:I$=S$:R$=S$:W$=S$:
Z$=S$:C$=",":B$=S$:CL=125:N=78:Y=89:GT=7
0:L=10000
50 P=0
60 GOTO 110
70 REM GET SUBR
80 CLOSE #1:OPEN #1,4,0,"K:"
90 GET #1,Q
100 RETURN
110 ? CHR$(CL):POKE 752,1:POKE 709,8:POK
E 710,16:C=0
120 ? "WHAT DO YOU WANT TO DO?":?
130 ? "1. UPDATE CASSETTE FILE":?
140 ? "2. SEARCH FOR TITLE":?
150 ? "3. EXAMINE CASSETTE":?
155 ? "4. CHANGE DATA":?
160 ? "5. STORE DATA AND END"
170 GOSUB GT
180 IF Q<49 OR Q>53 THEN 170
190 CHOICE=VAL(CHR$(Q))
195 IF CHOICE=4 THEN C=1
200 ON CHOICE GOSUB 220,470,470,470,760
210 GOTO 110
220 REM ENTER NEW DATA
230 LINE=P+L+1:? CHR$(CL):POKE 710,132
240 ? :? "        ***ENTER NEW DATA***":?
 :?
250 ? "ENTER CASSETTE NUMBER - - - - - -
 - - (ESC/CTRL/=)OR HIT (RETURN) WHEN DO
NE  ";:INPUT W$
260 IF W$="" THEN RETURN
265 N$=W$
270 ? :? "ENTER TITLE ";:INPUT T$
280 ? :? :? "ENTER SIDE (1 OR 2) ";:INPU
T TR$
290 ? :? :? "ENTER START INDEX ";:INPUT
I$
300 ? :? :? "ENTER RECORD METHOD ";:INPU
T R$
310 ? :? :? "IS DATA OK - TYPE (Y) OR (N
)";
320 GOSUB GT
330 IF Q=N THEN ? CHR$(CL):GOTO 250
340 IF CHOICE=4 AND Q=N THEN POP :GOTO 1
020
345 IF Q=Y THEN 360
350 IF Q<>N OR Q<>T THEN 90
360 IF  NOT C THEN P=P+1
370 GOSUB 390
380 GOTO 220
390 REM PUTS DATA INTO PROGRAM
400 ? CHR$(CL)
410 ? "(ESC/CTRL/=)";LINE;" DATA";N$;C$;
T$;C$;TR$;C$;I$;C$;R$
420 ? :? :? "CONT"
430 POSITION 0,0
440 POKE 842,13:STOP
450 POKE 842,12
460 RETURN
470 REM SEARCH ROUTINE
480 ? CHR$(CL):POKE 710,224
490 IF CHOICE=2 THEN 510
500 ? "      *** LIST A CASSETTE ***":? :
? "  ENTER CASSETTE NUMBER      ";:GOTO 5
20
510 ? "      *** SEARCH FOR A TITLE ***":
? :? "   ENTER TITLE  ";
520 INPUT W$
530 IF W$="" THEN RETURN
540 RESTORE L:K=0
545 IF C THEN LINE=L:GOTO 570
550 ? CHR$(CL):? "NUM  TITLE          SI
DE INDEX SAVE/M"
560 ? "--------------------------------
---"
570 X=LEN(W$):B=0
575 IF K=P THEN 730
580 READ N$,T$,TR$,I$,R$:K=K+1:LINE=LINE
+1
600 IF CHOICE=3 AND W$=N$ THEN 680
605 IF C AND W$=N$ THEN 680
610 IF CHOICE=3 AND W$<>N$ THEN 575
615 IF C AND W$<>N$ THEN 575
620 IF LEN(T$)<X THEN 575
630 FOR I=1 TO LEN(T$)-X+1
640 IF T$(I,I+X-1)=W$ THEN 670
650 NEXT I
660 GOTO 575
670 POP
680 Z$=S$
685 IF C THEN Z$(1,3)=N$:Z$(5,20)=T$:Z$(
21,21)=TR$:Z$(23,27)=I$:Z$(28,32)=R$:GOT
O 1000
690 Z$(1,4)=N$:Z$(6,21)=T$:Z$(22,22)=TR$
:Z$(25,29)=I$:Z$(31,35)=R$
700 ? Z$;:B=B+1:IF B=15 THEN ? :? "THERE
'S MORE.HIT (RETURN) TO CONTINUE":INPUT
B$:GOTO 550
710 GOTO 575
730 ? :? "SEARCH COMPLETED":? :? "PRESS
(RETURN) TO CONTINUE"
740 INPUT B$
750 GOTO 480
760 REM UPDATE P
770 ? CHR$(CL)
780 ? "(ESC/CTRL/=) 50 P=";P
790 ? :? :? "CONT"
800 POSITION 0,0
810 POKE 842,13:STOP
820 POKE 842,12
830 ? CHR$(CL):POKE 709,0:POKE 710,132:?
 :? :? "     SAVE PROGRAM FOR NEXT TIME"
840 ? :? :? "1. TURN OVER TAPE AND REWIN
D"
850 ? :? "2. PRESS (RECORD) AND (PLAY) K
EYS"
860 ? :? "3. PRESS (RETURN) AFTER BUZZER
 SOUNDS"
870 TRAP 890
880 LPRINT
890 CSAVE
900 END
1000 REM CHANGE DATA FILE
1010 ? CHR$(CL):? :? LINE;" ";Z$
1020 ? "   CHANGE THIS DATA PRESS  (Y) O
R (N)":? :? "        WHEN DONE-PRESS (RET
URN)":?
1030 GOSUB GT
1040 IF Q=155 THEN 110
1050 IF Q=N THEN ? CHR$(CL):GOTO 575
1060 IF Q=Y THEN 1080
1070 IF Q<>N OR Q<>Y THEN 1030
1080 GOSUB 250
1085 IF W$="" THEN 110
1090 GOSUB 390
1100 GOTO 575
10000 REM CASSETTE DATA BANK
```

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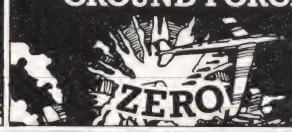
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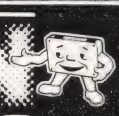
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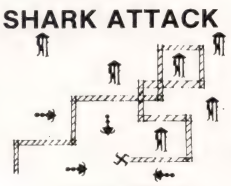
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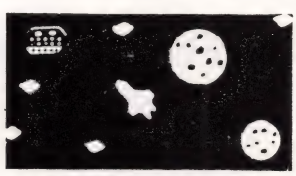
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VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20 VIC 20

FACTFILE

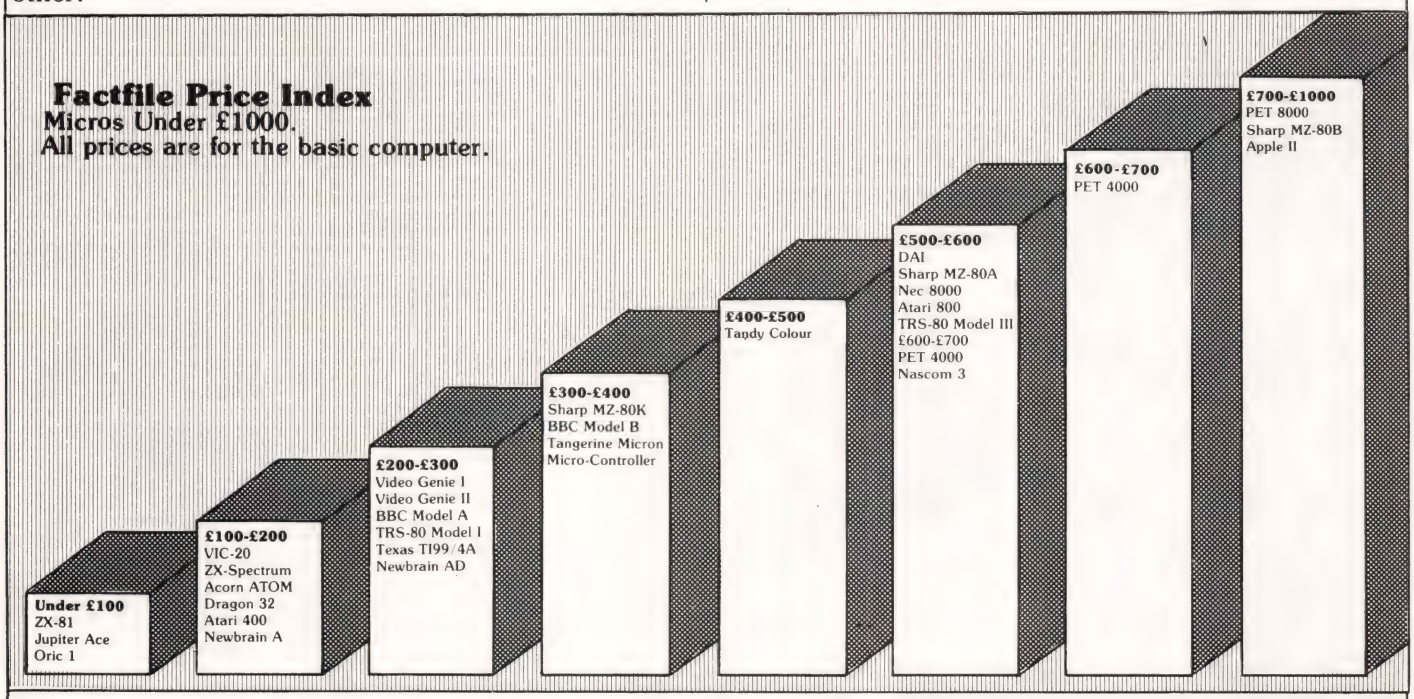
MICRO FACTFILE

Factfile is our regular buyer's guide to microcomputers. Herein you will find all the important facts and figures on 28 of the most important micros on the market under £1000. The idea is that you are able to directly compare what different manufacturers are offering you and how much they are charging you for it. Many brochures and adverts bury the reader in a mass of irrelevant facts and figures, which make it difficult to judge one against the other.

Factfile sorts it all out for you!

Just look down the price index to discover which machines are in your price-range and then consult the 'cards' on each. All the information is in a standard form and has all been checked by our technical staff. The section is presented alphabetically.

As new machines become available, we will add them into the FACTFILE as soon as we can.



Factfile

RAM: Stands for Random Access Memory and it is in there to accept the user's programs. Amount of memory is measured in "thousands of bytes" or "K" ie, 8K. A byte is a computer 'word' or single piece of information, made up of eight 'bits' which are just 1 or 0. Hence you need thousands of bytes to store a reasonable size program, since each letter, number, full stop, comma, line number, etc, uses up computer 'words' quite rapidly.

As a guideline – you can get about 50 program lines into 1K and 250 into 8K. This is a rough estimate – don't take it literally! The figures are not straight multiples, because you need to allow the machine space to work on your listing, once you've typed it in.

ROM: Read Only Memory. The machine can look and see what is stored in the memory, but it cannot alter the contents, nor store anything new. Generally used for control programs, where the micro consults the memory to see what to do next at various points in the program. Languages, such as BASIC, are stored in ROM and allow the machine to interpret what you type in, in terms of its own 'machine code'.

SIZE OF BASIC: The number of bytes occupied by the BASIC language is important, as it is an approximate guide to the BASICs versatility. The more powerful the language, the easier it should be to use.

BUS CONNECTION: A socket on the micro which allows it to be linked up to various add-ons. This can take the form of many various items, ie, expansion box, printer, disc drives, plotting device. In short a BUS is an information 'window' through which the micro communicates with the outside world.

SERIAL/PARALLEL OUTPUT: This refers to the manner in which the micro transmits data to other units. If it puts out information in a long string, one bit after another, down a single wire or connector, it is a serial output. Parallel output is where pins or wires carry information simultaneously and are 'read' together as a block by whatever it is the micro is communicating with.

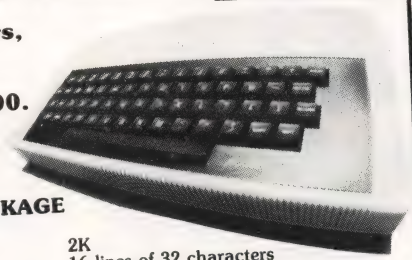
VIDEO OUTPUT: an output which will drive a monitor, as opposed to a TV set, allowing it's use as a screen for the computer.

REFERENCE

FACTFILE

ACORN ATOM

Acorn Computers,
4A Market Hill,
Cambridge.
Tel: 0223-245200.



STANDARD PACKAGE

Memory Size (RAM)	2K
Screen Size	16 lines of 32 characters
Expansion Sockets	BUS connector, Printer, Video output
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£140 kit, £174.50 built**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	12K internal, 32K external options	£45-149
Printer	Yes	£232
Monitor	No	—
Disc Drives	Yes	£299
Other Languages	Yes	£11.50
Multi-user Capabilities	Yes	—
BASIC extensions (Toolkits)	Yes, BBC BASIC	£50

OTHER ADD-ONS:

Centronics-type connector, Technomatic Ltd, 17 Burnley Road, London NW10, £8.50; **TMS 5100 Talking Board,** GM Microtronics Ltd, Unit 14, Godinton Way Industrial Estate, Godinton Road, Ashford, Kent, £82.95; **DUO-1 64K add-on,** Audio Computers, 87 Bournemouth Park Road, Southend-on-sea, SS5 2JJ, £64 kit, £70 built; **MZ163 RAM expansion boards,** Timedata Ltd, 57 Swallowdale, Basildon, Essex SS15 5BZ, £59.50-76.

APPLE II

Apple Computer (UK) Ltd,
Finway Road,
Hemel Hempstead,
Herts, HP2 7PS



STANDARD PACKAGE

Memory Size (RAM)	48K
Screen Size	24 lines of 40 characters
Expansion Sockets	BUS connections
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8 or 12K
Average Price	**£812**

MANUFACTURER'S EXPANSIONS

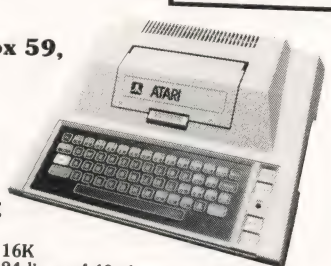
	DETAILS	PRICE
RAM	No	—
Printer	Yes various	£200-1700
Monitor	Yes	£134
Disc Drives	Yes	£379
Other Languages	Yes	£84-500
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	£26

OTHER ADD-ONS:

TMS 5100 Talking Board, GM Microtonics Ltd, Unit 14, Godinton Way Industrial Estate, Godinton Road, Ashford, Kent, £82.95; **Multifunction Card,** Datex Micros, 193 Touring Road, Worthing, W. Sussex, £85; **5¼" Winchester disc drive,** Independent Computer Engineering Ltd 16/18, Littleton Road, Ashford, Middlesex, TW15 1UQ; **16K RAM Board,** DDP Research & Marketing, 17 Novel Square, Basildon, Essex, SS13 1LP, £75; **U-port, 8 serial interfaces,** U-Microcomputers, Ltd, Winstanely Industrial estate, Long Lane, Warrington, Cheshire, WA2 8PR, £195.

ATARI 400

Atari UK Ltd, PO Box 59,
Alperton Lane,
Wembley, Middx.



STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	24 lines of 40 characters
Expansion Sockets	Serial output, BUS connector
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£199.95**

MANUFACTURER'S EXPANSIONS

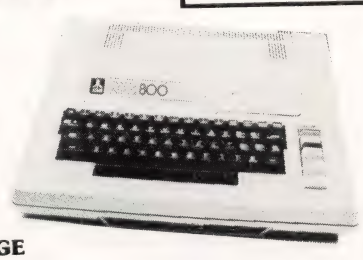
	DETAILS	PRICE
RAM	No	—
Printer	Yes	£265
Monitor	No	—
Disc Drives	Yes	£345
Other Languages	Yes	£39-79
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	TBA

OTHER ADD-ONS:

TMS 5100 Talking Board, GM Microctonics Ltd, Unit 14, Godinton Way Industrial Estate, Godinton Road, Ashford, Kent, £82.95

ATARI 800

Atari UK Ltd,
PO Box 59
Alperton Lane,
Wembley, Middx



STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	24 lines of 40 characters
Expansion Sockets	Serial output, BUS connector
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£599.95**

MANUFACTURER'S EXPANSIONS

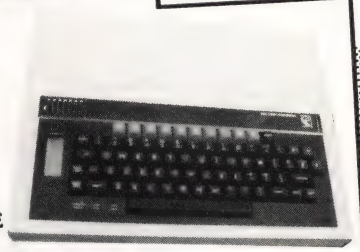
	DETAILS	PRICE
RAM	optional 16K RAM packs (to 48K Max)	£65
Printer	Yes	£265
Monitor	No	—
Disc Drives	Yes	£345
Other Languages	Yes	£345
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	TBA

OTHER ADD-ONS:

TMS 5100 Talking Board, GM Microtonics Ltd, Unit 14, Godinton Way Industrial Estate, Godinton Road, Ashford, Kent, £82.95; **Carrying case,** CJE Microcomputer, 25 Henry Avenue, Rustington, W. Sussex, BN16 2PA, £18.50

BBC MICROCOMPUTER

BBC Model A,
BBC Microcomputer
Systems,
PO Box 7,
London W3 6JX.



STANDARD PACKAGE

Memory Size (RAM)	16
Screen Size	32 lines of 40 characters (max)
Expansion Sockets	Parallel serial output, analogue output, Bus connection
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	16K
Average Price	**£299**

MANUFACTURER'S EXPANSIONS

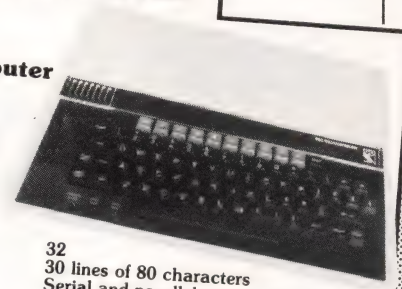
	DETAILS	PRICE
RAM	up to 32K	£100
Printer	TBA	—
Monitor	Yes	£200
Disc Drives	TBA	—
Other Languages	TBA	—
Multi-user Capabilities	Yes	—
BASIC extensions (Toolkits)	TBA	—

OTHER ADD-ONS:

Disc drives, single and dual, Cumara Ltd, 35 Walnut Street Close, Guildford, Surrey GU1 4UN, Tel: 0483 50321, £199-799; **BBC Cassette Recorder,** Microage Electronics, 135 Hale Lane, Edgeware, Middx, £28; **Colour Monitor,** PortaTel Conversions Ltd, 25 Sunbury Cross Centre, Staines Roach West, Sunbury-on-Thames, Middx, TW16 7BB, £299; **Floppy Disc Controller Kit,** Midwich Computer Co Ltd, Newitt House, Northgate Street, Bury St. Edmunds, Suffolk IP33 1HQ, £42.50; **Analogue Joystick, Light Pen,** Stack Computers, 290-298 Derby Road, Bootle, Liverpool.

BBC MICROCOMPUTER

BBC Model B
BBC Microcomputer
Systems,
PO Box 7,
London W3 6JX



PACKAGE

Memory Size (RAM)	32
Screen Size	30 lines of 80 characters
Expansion Sockets	Serial and parallel output, analogue output, printer BUS connection
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	16K
Average Price	**£399**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	TBA	TBA
Monitor	No	—
Disc Drives	TBA	TBA
Other Languages	TBA	TBA
Multi-user Capabilities	Yes	—
BASIC extensions (Toolkits)	TBA	TBA

OTHER ADD-ONS:

Disc drives, single and dual, Cumara Ltd, 35, Walnut Tree Close, Guildford, Surrey GU1 4UN, Tel: 0483 503121, £199-799; **BBC Cassette recorder,** Microage Electronics, 135 Hale lane, Edgware, Middx, HA8 9QP, £28; **Colour Monitor,** Portatel Conversions Ltd, 25 Sunbury Cross Centre, Saires Road West, Sunbury-on-Thames, Middx, TW16 7BB, £299; **Floppy Disc Controller Kit,** Midwich Computer Co Ltd, Hewitt House, Northgate Street, Bury St. Edmunds, Suffolk, IP33 1HQ, £42.50; **Carrying Case,** CJE Microcomputers, 25 Henry Avenue, Rustington, W. Sussex, BN16 2PA, £18.50.

COMMODORE PET 4000

Commodore,
675 Ajax Avenue,
Slough, Berks



STANDARD PACKAGE

Memory Size (RAM)	16 or 32K
Screen Size	25 lines of 40 characters
Expansion Sockets	IEEE 488 standard, parallel output
Tape Included?	Yes
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	12K
Average Price	**£632.50, £799.25**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes several	£454-1604
Monitor	N/A	—
Disc Drives	Yes	£396
Other Languages	Yes, single or dual	£454-1029
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Universal Interface, Technomatic Ltd, 17 Burnley Road, London NW10, £149; **TMS 5100 Talking Board,** GM Microtronics Ltd, Unit 14, Godinton Way industrial Estate, Ashford, Kent, £82.95; **64K DRC Module,** Audio Computers, 87 Bournemouth Park Road, Southend-on-sea SS5 2JJ, £70 kit, £80 built.

COMMODORE PET 8000

Commodore,
675 Ajax Avenue,
Slough, Berks



STANDARD PACKAGE

Memory Size (RAM)	32K or 96K
Screen Size	25 lines of 80 characters
Expansion Sockets	IEEE 488 standard, parallel output
Tape Included?	Yes
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	12K
Average Price	**£980, £1374**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes various	£454-1604
Monitor	N/A	—
Disc Drives	Yes single or dual	£454-1029
Other Languages	Yes	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

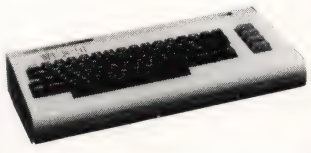
OTHER ADD-ONS:

Universal Interface, Technomatic Ltd, 17 Bunley Road, London NW10, £149; **TMS 5100 Talking Board,** GM Microtronics Ltd, Unit 14, Godinton Way industrial Easte, Godinton Road, Ashford, Kent, £82.95; **64K DRC Module** Audio Computers, 87 Bournemouth Park Road, Southend-on-sea SS5 2JJ, £70 kit, £80 built.

FACTFILE

COMMODORE VIC20

Commodore,
675 Ajax Avenue,
Slough, Berks



STANDARD PACKAGE

Memory Size (RAM)	5K
Screen Size	23 lines of 22 characters
Expansion Sockets	BUS connection, Disc, Printer, Serial output, joystick
Tape Included?	Yes
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£129.99**

MANUFACTURER'S EXPANSIONS

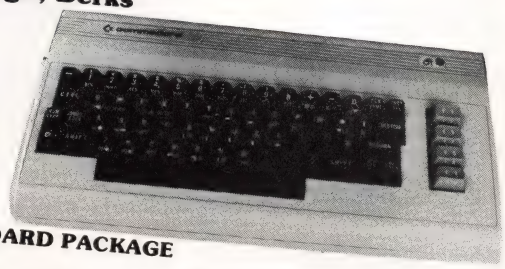
	DETAILS	PRICE
RAM	3K,8K,16K expansion options	£30,£45,£75
Printer	Yes	£270
Monitor	No	—
Disc Drives	Yes	£396
Other Languages	Yes	£38.95
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

VCR-20,
20K RAM cartridge, Audio Computers, 87 Bournemouth Park Road, Southend on Sea SS5 2JJ, £39 kit, £45 built; **Expansion Board,** 3K-16K, Arfon Microelectronics Ltd, Gibyn Industrial Estate, Caernafon, Gwynedd, Wales LL55 2BD, £220. Languages: VIC Forth, Adda Computers, 154 Victoria Road, Acton, London, W3.

COMMODORE 64

Commodore,
675 Ajax Avenue,
Slough, Berks



STANDARD PACKAGE

Memory Size (RAM)	64K
Screen Size	25 lines of 40 characters
Expansion Sockets	BUS, Serial, Video
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£350**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes	£230-276
Monitor	No	—
Disc Drives	Yes	£299
Other Languages	Yes	—
Multi-user Capabilities	Yes	—
BASIC Extensions	Yes	—

OTHER ADD-ONS:

Light Pen, 4 slot motherboard, Joystick, RS232 Interface, Stack Computers, 290-298 Derby Road, Bootley Liverpool. 051-933 5511.

DAI

Data Applications UK Ltd,
16B Dyer Street,
Cirencester,
Gloucestershire,
GL7 2PF



STANDARD PACKAGE

Memory Size (RAM)	48K
Screen Size	24 lines of 60 characters
Expansion Sockets	BUS connection, Serial output, joystick socket
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	16K
Average Price	**£575**

MANUFACTURER'S EXPANSIONS

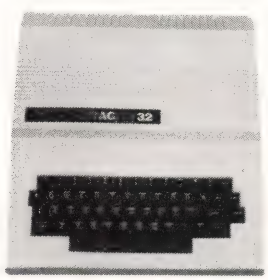
	DETAILS	PRICE
RAM	No	—
Printer	No	—
Monitor	No	—
Disc Drives	Yes	TBA
Other Languages	No	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes, maths pack	£149

OTHER ADD-ONS:

None Reported

DRAGON 32

Dragon Data Ltd
Queensway,
Swansea
Industrial Estate,
Swansea, SA5 4EH



STANDARD PACKAGE

Memory Size (RAM)	32K
Screen Size	16 lines of 32 characters
Expansion Sockets	Yes
Display Unit Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	16K
Average Price	**£199**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	—	—
Printer	No	—
Monitor	No	—
Disc Drives	No	—
Other Languages	Yes	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Joystick, Light Pen, 4 slot motherboard, Stack Computers 290-298 Derby Road, Bootle, Liverpool. 051-933 5511.

JUPITER ACE



Jupiter Cantab
22 Foxhollow
Bar Hill
Cambridge
CB3 8EP

STANDARD PACKAGE

Memory Size (RAM)	3K
Screen Size	24 lines of 32 characters
Expansion Sockets	Not known
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	Resident language is FORTH at 8K
Average Price	**£89.95**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	TBA	–
Printer	TBA	–
Monitor	TBA	–
Disc Drives	TBA	–
Other Languages	TBA	–
Multi-User Capabilities	TBA	–
BASIC extensions (toolkits)	TBA N/A	–

OTHER ADD-ONS:

None Reported.

NASCOM 3



Lucas Logic, NASCOM
Microcomputers Division,
Welton Road,
Wedgenock Industrial
Estate,
Warwick, CV34 5PZ.
Tel: 0926-497733

STANDARD PACKAGE

Memory Size (RAM)	0-48K
Screen Size	25 lines of 40 or 80 character
Expansion Sockets	Parallel & serial outputs, BUS connections
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8-10K
Average Price	**£549**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	up to 48K (max)	£130
Printer	Yes	£215-1285
Monitor	Yes	£99-120
Disc Drives	Yes, single or dual	£470-685
Other Languages	Yes	£50
Multi-user Capabilities	No	–
BASIC extensions (Toolkits)	Yes	-15-50

OTHER ADD-ONS:

Olivetti disc drives, single and dual, Kram Electronics, Victoria House, 17, Highcross St., Leicester, LE1 4PF, £179-349; **A/D Board,** 10, Research Ltd, 6, Laleham Avenue, Mill Hill, London NW7 3HL, £120 + VAT; **Hobbit – mini-cassette system,** Ikon Computer Products, Kiln Lane, Laugharne, Covnathen, Dyfed, £99 + VAT; **Disc drives, single and dual,** Micro-Spares, 19, Roseburn Terrace, Edinburgh, EH12 5N9, £199-279.

NEWBRAIN



Grundy Business
Systems Ltd,
Grundy House,
Somerset Road,
Teddington
TW11 8TD.

STANDARD PACKAGE

Memory Size (RAM)	32K
Screen Size	25 lines of 40 or 80 characters
Expansion Sockets	Printer, serial, video, data bus
Tape Included?	No
Display Unit Included?	No (Single line option on model AD)
Usable Domestic TV?	Yes
Size of BASIC	18K
Average Price	**£199 model A, £299 Model AD**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	64 – 512K,	£75 – £445
Printer		
Monitor		
Disc Drives	NYA	–
Other Languages	NYA	–
Multi-user	NYA	–
BASIC extensions	NYA	–

OTHER ADD-ONS:

None Reported.

ORIC 1



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

STANDARD PACKAGE

Memory Size (RAM)	16K, 48K
Screen Size	28 X 40
Expansion Sockets	Yes
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£99, £169**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	N/A	–
Printer	TBA	–
Monitor	No	–
Disc Drives	TBA	–
Other Languages	N/A	–
Multi-user Capabilities	No	–
BASIC extensions	TBA	–

OTHER ADD-ONS:

FACTFILE

SHARP MZ-80A

**Sharp UK Ltd,
Thorn Road,
Newton Heath,
Manchester
M10 9BE
Tel: 061-205 2333**



STANDARD PACKAGE

Memory Size (RAM)	48K
Screen Size	25 lines of 40 characters
Expansion Sockets	BUS connector
Tape Included?	Yes
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	12K
Average Price	**£549**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes	£450-800
Monitor	N/A	—
Disc Drives	Yes, dual	£600
Other Languages	Yes	£45
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

None Reported

SHARP MZ-80B

**Sharp UK Ltd,
Thorn Road,
Newton Heath,
Manchester M10 9BE**



STANDARD PACKAGE

Memory Size (RAM)	64K
Screen Size	25 lines of 40 or 80 characters
Expansion Sockets	BUS connector
Tape Included?	Yes
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	16K
Average Price	**£990**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	Yes	£120
Printer	Yes	£450-800
Monitor	N/A	—
Disc Drives	Yes, dual	£600
Other Languages	Yes	£45
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Multi-vision and triple-vision, Datron Micro Centre, 2 Abbeydale Road, Sheffield S7 1FD, £35-79

SHARP MZ-80K

**Sharp UK Ltd,
Thorn Road,
Newton Heath,
Manchester
M10 9BE**



STANDARD PACKAGE

Memory Size (RAM)	48K
Screen Size	25 lines of 40 characters
Expansion Sockets	BUS connector
Tape Included?	Yes
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	12K
Average Price	**£350**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes	£450-800
Monitor	N/A	—
Disc Drives	Yes, dual	£600
Other Languages	Yes	£45 upwards
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

None Reported

SINCLAIR ZX 81

**Sinclair Research,
6 Kings Parade,
Cambridge CB2 1SN**



STANDARD PACKAGE

Memory Size (RAM)	1K
Screen Size	24 lines of 32 characters
Expansion Sockets	BUS connections
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£49.95 built**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	16K RAM pack	£29.95
Printer	ZX Printer	£59.95
Monitor	No	—
Disc Drives	No	—
Other Languages	No	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Memory expansion unit 16K or 64K, Memotech Ltd, 3 Collins St, Oxford OX4 1XL, £39.95-79; Memory Expansion 64K, Downsway Electronics (UK) Ltd, Dept M, Downsway House, Epsom Road, Ashtead, Surrey; £59.95; **Key Bleep Unit,** Microtronix, 3 Buxton Avenue, Coulton, Nottingham, N94 3RR, £8.85 kit, £9.95 built; **Maximem 1.1,** East London Robotics, Finlandia House, 14 Darwell Close, East Ham, London, EB4 BT, £93.50; **Music Synthesiser + 16 line control port,** William Stuart Systems Ltd, Dower House, Billicicay Road, Herongate, Brentwood, Essex CM13 3SD, £19.50; **Full-size keyboard,** Protos Computer Systems, Frome Computing, 20 Ashtree Road, Frome, Somerset, BA11 2SF, £64.95; **ZX99 Automatic tape control,** Data-cassette, 44, Shroton Street, London NW1 6UG, £59.95.

SINCLAIR ZX SPECTRUM

Sinclair Research,
6 Kings Parade,
Cambridge, CB2 1SN



STANDARD PACKAGE

Memory Size (RAM)	16-48K
Screen Size	24 lines of 32 characters
Expansion Sockets	BUS connections
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	10K
Average Price	**£125 or £175**

MANUFACTURER'S EXPANSIONS

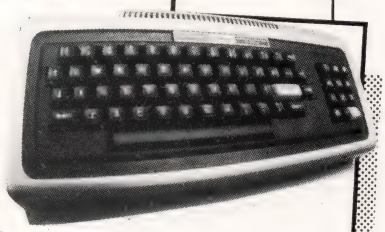
	DETAILS	PRICE
RAM	48K RAM for 16K version	£60
Printer	ZX Printer	£59.95
Monitor	No	—
Disc Drives	ZX Microdrive	TBA
Other Languages	No	—
Multi-user Capabilities	No	TBA
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Memory Expansion 32K, Downsway Electronics (UK) Ltd, Dept M, Downsway House, Epsom Road, Ashtead, Surrey; £42.50

TANDY TRS 80 I

Tandy Corporation,
12th Floor,
Tameway Tower,
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West Midlands
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STANDARD PACKAGE

Memory Size (RAM)	4 or 16K
Screen Size	16 lines of 32 or 64 characters
Expansion Sockets	BUS connection
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8 or 12K
Average Price	**£229 or £339**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	32K extra in expansion unit	£349
Printer	Yes	£239-1200
Monitor	Yes	£100
Disc Drives	Yes	£369
Other Languages	Yes	£100
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	£100

OTHER ADD-ONS:

Disc drives, single and dual, Cumana Ltd, 35 Walnut Tree Close, Guildford, Surrey GU1 4UN, £199-799; **Olivetti disc drives single and dual,** Kran Electronics, Victoria House, 17 Highcross St., Leicester LE1 4PF, £179-349; **48K internal RAM,** General Northern Microcomputers, (GNOMIC) 46 Middle Street, Blackhall, Marlepool, Cleveland, £70 + VAT; **32K RAM card,** Audio Computers, 87 Bournemouth Park Road, Southend on Sea, SS5 2JJ, £40 kit, £46 built.

TANDY TRS 80 III

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Tameway Tower,
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Walsall,
West Midlands,
WS1 1LA



STANDARD PACKAGE

Memory Size (RAM)	4-48K
Screen Size	16 lines of 32 or 64 characters
Expansion Sockets	BUS connection, parallel & serial output
Tape Included?	No
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	16K
Average Price	**£599-1799**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	16K modules	£70
Printer	Yes various	£239-1200
Monitor	N/A	—
Disc Drives	Yes	£600
Other Languages	Yes	£100
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	£100

OTHER ADD-ONS:

Disc drives, Cumara Ltd, 35, Walnut Tree Close, Guildford, Surrey GU1 4UN, £199-799; **Olivetti disc drives single and dual,** Kram Electronics, Victoria House, 17, Highcross St, Leicester LE1 4PF, £179-349; **48K internal RAM,** General Northern Microcomputers, (GNOMIC), 46 Middle Street, Blackhall, Hartlepool, Cleveland, £70 + VAT; **32K RAM card,** Audio Computers, 87 Bournemouth Park Road, Southend on Sea, SS5 2JJ, £40 kit, £46 built.

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STANDARD PACKAGE

Memory Size (RAM)	16-32K
Screen Size	16 lines of 32 characters
Expansion Sockets	Serial output, ROM pack, joystick socket
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8-16K
Average Price	**£499**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes various	£239-1200
Monitor	No	—
Disc Drives	Yes	£439
Other Languages	No	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

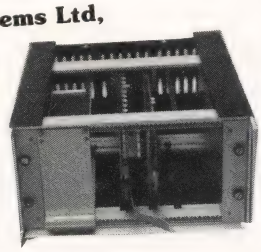
OTHER ADD-ONS:

Olivetti disc drives single and dual, Kram Electronics, Victoria House, 17 Highcross St., Leicester LE1 4PF, £179-349.

FACTFILE

TANGERINE MICRON

Tangerine Computer Systems Ltd,
The Science Park,
Milton Road,
Cambridge
CB4 4BH



STANDARD PACKAGE

Memory Size (RAM)	8K
Screen Size	16 lines of 32 characters
Expansion Sockets	Parallel & serial output, BUS connection
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	10K
Average Price	**£395**

MANUFACTURER'S EXPANSIONS

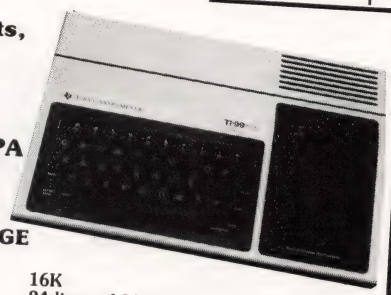
	DETAILS	PRICE
RAM	48K in system rack	£144
Printer	No	—
Monitor	No	—
Disc Drives	Yes	TBA
Other Languages	Yes	£40
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Sound Board and Graphics Board, Bulldog Video Ltd, 52, Nash Square, Birmingham, B42 2EX, £49-£179; **Toolkit,** Microtanic Software, 235, Friern Road, Dulwich, London, OBD, £22.50.

TEXAS TI 99/4A

Texas Instruments,
European
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Division,
Manton Lane,
Bedford MK41 7PA



STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	24 lines of 32 characters
Expansion Sockets	ROM pack, Bus connector, joystick, socket
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	14K
Average Price	**£199**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	up to 48K (max)	£300
Printer	Yes	£275
Monitor	No	—
Disc Drives	Yes	£300
Other Languages	Yes	£50-£100
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	£100

OTHER ADD-ONS:

Speech Synthesiser, Texas Instruments, £46.60; **Terminal Emulator II,** Texas Instruments, £37.80; **RS232 Interface,** Texas Instruments.

VIDEO GENIE I

Lowe Electronics,
Bentley Bridge,
Chesterfield Road,
Matlock,
Derbyshire,
DE4 5LE



STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	16 lines of 64 characters
Expansion Sockets	BUS connector
Tape Included?	Yes
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	12K
Average Price	**£279**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	optional 48K in expansion unit	£200
Printer	Yes	£210
Monitor	Yes	£69-99
Disc Drives	Yes, single and dual	£220-375
Other Languages	No	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Disc drives, single and dual, Cumara Ltd, 35 Walnut Tree Close, Guildford, Surrey GU1 4UN, £199-799; **Olivetti disc drives single and dual,** Kram Electronics, Victoria House, 17 Highcross St, Leicester LE1 4PF, £179-349; **EG3014 Expansion box with 16K/32K RAM,** Swanley Electronics, 32 Goldsel Road, Swanley, Kent BR8 8EZ, £199-213 **48K internal RAM,** General Northern Microcomputers, GNOMIC, 46 Middle Street, Blackhall, Martlepool, Cleveland, £70 + VAT: **32K RAM Card** Audio Computer, 87 Bournmouth Park Road, Southend-on-sea, SS5 2JJ, £40 kit, £46 built.

VIDEO GENIE II

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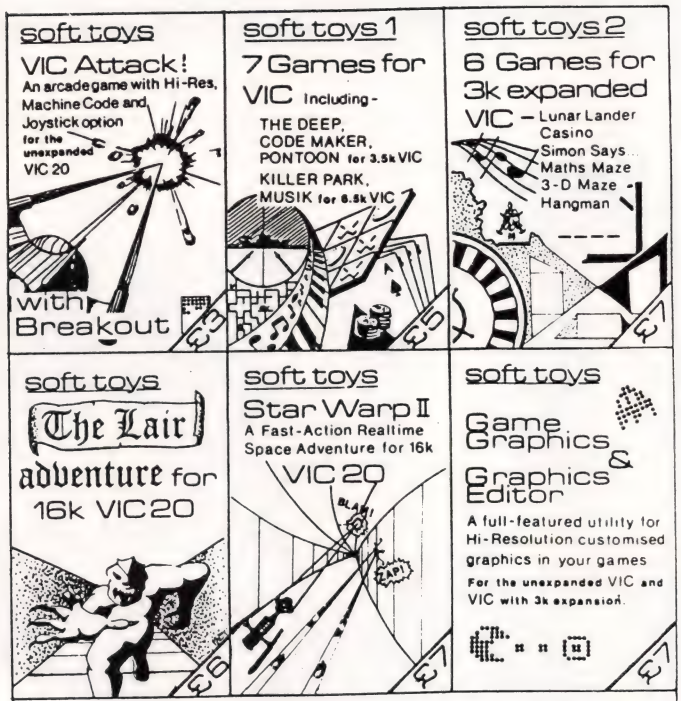
Memory Size (RAM)	16K
Screen Size	16 lines of 32 or 64 characters
Expansion Sockets	BUS connector
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	13K
Average Price	**£299**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	optional 48K in expansion unit	£200
Printer	Yes	£210
Monitor	Yes	£69-99
Disc Drives	Yes, single and dual	£220-375
Other Languages	No	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Disc drives, single and dual, Cumana Ltd, 35, Walnut Tree Close, Guildford, Surrey, Gul 4UN, £199-799; **Olivetti disc drives single and dual,** Kram Electronics, Victoria House, 17 Highcross St, Leicester LE1 4PF, £179-349; **EG3014 Expansion box with 16K/32K RAM,** Swanley Electronics, 32 Goldsel Road, Swanley, Kent BR8 8EZ, £199-213; **48K internal RAM,** General Northern Microcomputers, GNOMIC, 46 Middle Street, Blackhall, Hartlepool, Cleveland, £70 + VAT; **32K RAM Card** Audio Computers, 87 Bournemouth Park Road, Southend-on-sea, SS5 2JJ, £40 kit, £46 built.



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Your trusty Pointer dogs help you track Godfrey down. But you only have a limited time to locate him because it's a dark, rainy night and the aniseed will soon wash off making his trail vanish.

Your controls are as follows:

[= up
/ = down
Z = left
X = right

Line 270 controls the time you have to catch Godfrey, if you find you have too much or too little time you can alter it to suit your level.

PROGRAM LISTING

```
10    REM GNU BY DAVID KNOTT 1/11/82
20    P.$12;?£E1 = 0
30    P."(14 spaces)GNU";LINK $FE94
40    X = A.R.%32;Y = A.R.%15 + 2;A = B = 1;T = 0;@ = 0
50    DIM P( - 1);P.$21
60    [;JSR £FE71;STY $80;RTS; ];P.$6
70    M = (A *32) + B;M?£8000 = £AA
80    IF Y>A AND X>B;P = - 31;D = £46;G.160
90    IF Y>A AND X<B;P = - 33;D = £49;G.160
100   IF Y<A AND X<B;P = 31;D = £58;G.160
110   IF Y<A AND X>B;P = 33;D = £64;G.160
120   IF Y<A;P = - 32;D = £55;G.160
130   IF Y>A;P = 32;D = £6A;G.160
140   IF X<B;P = - 1;D = £4C;G.160
150   P = 1;D = £4C
160   P = M + P;P?£8000 = D
170   R = A.R.%4;GOS.(R + 1000)
180   IF R>512;R = R - 480
190   IF R<32;R = R + 480
200   IF X = B AND Y = A;X = X + 1
210   LINK TOP;K = ?£80;IF K = 255;G.70
220   IF K = 1;A = A - 1
230   IF K = 31;A = A + 1
240   IF K = 56;B = B + 1
250   IF K = 58:B = B + 1
260   IF X = A AND Y = B;G.e
270   T = T + 1;IF T = 2000;G.t
280   IF A<1;A = A + 16
290   IF A>16;A = A - 15
300   P.$12;G.70
1000  X = X + 1;R.
1001  X = X - 1;R.
1002  Y = Y + 1;R.
1003  Y = Y - 1;R.
2000e P.$12"YOU CAUGHT THE GNU!!!!!"
2010  P.$11"you caught the gnu !!!!"
2020  P.' "IN "T"UNITS!!!""
2030  P."PRESS SPACE TO START" ';LINK $FE94
2040  G.10
3000t P.$12$7"it's all washed off; hard luck!!!"
3010  P.' "PRESS SPACE TO START";LINK $FE94
3020  G.10
```

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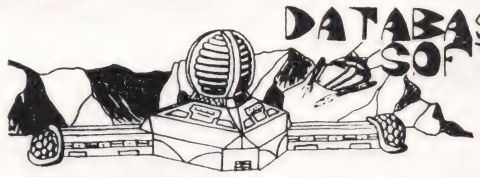
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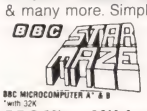
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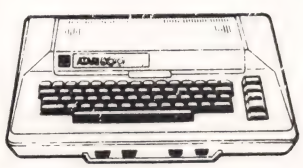
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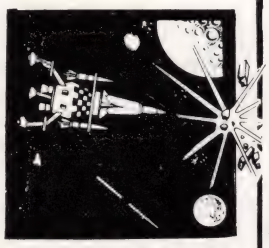
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FOREST SOFTWARE

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SOFTWARE LISTING

Looking for a program to buy? Look no further! If it's available, it's listed here in our exclusive and comprehensive software checklists.

Looking through any computer magazine can be a bewildering experience if you're in search of a program. Count the hundreds of ads and thousands of titles on sale and it would be easy to lose heart!

We've tried to sort out the confusion, and the sheer numbers, to present an easily understood list for each machine. Where possible, we have eliminated duplications, so that the same tape with a different label is not listed twice. Rather it should be credited once, with as many suppliers as we could find.

Table Codes

In order to fit as many programs as possible into our pages, we have had to use codes for some columns, considerably shortening the wording.

The information given for each program is: Title, memory required to run it, company producing it, whether tape/cartridge or disk, type and supplier and price.

The codes we have used are:

Program Type

GM = Game
BS = Business routine
UT = Utility (ie. programming aid)
DO = Domestic
ED = Educational

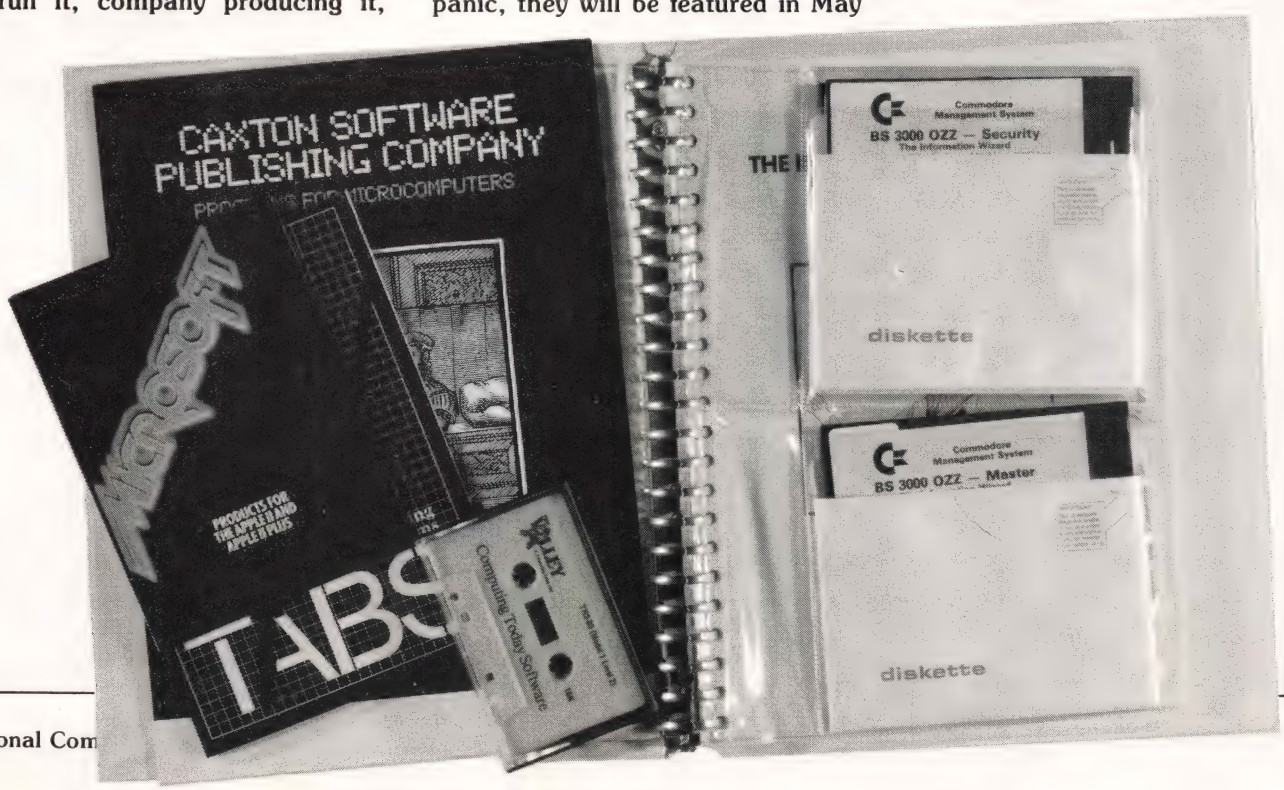
How Sold

R = Cartridge (may include memory)
C = Tape (cassette)
D = Disc (for expanded systems)
L = Listing (sold as print-out)

Due to overwhelming response we have been forced to alternate machines included in our checklist each month. Out this month are the Atom, Texas and Vic 20. But don't panic, they will be featured in May for you to make your software selection. Also we have had to drop the addresses from our dealer list, but don't worry, you should be able to find these addresses from adverts or back issues of PCT.

Not Here?

To companies whose products are not listed herein we can only say TELL US ABOUT IT! This applies particularly to the smaller retailer who may sell only half a dozen or so programs for one machine. If you produce software for *any* of the machines on the market today, then we would love to include your wares in our checklists. Send it in to us, marked for the attention of the Editor (in our format *Please*!) or ring Chris Palmer on 01-437 1002 as soon as possible.



SOFTWARE LISTING

ATOM

Title	Program Type	Program Produced By	Memory Reqd	How Sold	Supplier Codes	Prices
3-D Asteroids	Gm	Program Power	5K	C	GK	£6.85
747 Flight simulator	Gm	Bug Byte	12K	C	CH,GA,GB	£8.00
Adventure	Gm	Program Power	12K	C	CH,GK	£9.15
Adventures	Gm	Acornsoft	12K	C	EJ	£30.00
Air Attack	Gm	Program Power	12K	C	CH,GK	£9.15
Air Attack	Gm	Program Power	12K	C	GK	£7.95
Air Strike	Gm	Pro S/W	9K	C	LD	£6.00
Alien Maze	Gm	Program Power	8K	C	GK	£5.69
Astrafire	Gm	Program Power	5K	C	GK	£4.54
Astro Birds	Gm	Program Power	12K	C	CH,GK	£9.15
Atom Adventure	Gm	Acornsoft	12K	C	GA,AL	£11.50
Atom Adventure	Gm	Hopesoft	12K	C	JV	£6.75
Atom Breakout	Gm	Bug Byte	4K	C	HO	£4.00
Atom Business Games	B/G	Program Power	12K	C	GK	£7.99
Atom Business Cassette	Bs	Acornsoft		C	AL	£7.50
Atom Business Pack	Bs	Acornsoft		C	AY,FA	£11.50
Atom Chess	Gm	Acornsoft	12K	C	GA,EA,AL	£11.50
Atom Chess	Gm	Acornsoft	12K	C	GK	£11.44
Atom Forth	Ut	Acornsoft		C	GA,EJ,AL	£11.50
Atom Invaders	Gm	Bug Byte	12K	C	HO	£8.00
Atom Life Category	Bs	Acornsoft		C	AL,GA	£11.50
Atom List	Ut	Acornsoft		C	AL	£17.25
Atom Man	Gm	Hopesoft	12K	C	JV	£6.75
Atom Store	Bs	Program Power	12K	C	GK	£9.15
Atom Synthesiser	Gm	Acornsoft	12K	C	AL,GA	£11.50
Atomic Cube	Gm	A&F S/W	12K	C	GE	£4.95
Backgammon	Gm	Bug Byte	7K	C	GA	£7.00
Blitz	Gm	Rucksoft	4K	C	KO	£2.65
Chaser	Gm	Hopesoft	4K	C	JV	£3.75
Chess	Gm	Bug Byte	12K	C	CH,GA,GB	£9.00
Chess	Gm	Program Power	12K	X	GK	£9.15
Constellation	Gm	Program Power	12K	C	GK	£7.99
Constellation	Gm	Program Power	12K	C	GK	£7.99
Colour Invaders	Gm	Hopesoft	12K	C	JV	£3.75
Cowboy Shootout	Gm	Program Power	12K	C	CH,GK	£7.99
Cylon Attack	Gm	A&F S/W	12K	C	GE	£4.95
Dambusters	Gm	Program Power	10K	C	GK	£5.69
Data Base	Ut	Acornsoft	6K	C	EJ,FZ,FA,GA	£11.50
Death Satelite	Gm	A&F S/W	12K	C	GE	£6.00
Demon Dungeon	Gm	Program Power	5K	C	GK	£6.85
Derby, Blitz and Rat Race	Gm	Program Power	12K	C	GK	£6.84
Desk Diary	Bs	Acornsoft	12K	C	FA,EJ,AL,GA	£11.50
Detective	Gm	Computersmith	12K	C	LC	£4.95
Disassembler	Ut	Hopesoft	3K	C	JV	£1.75
Disassemble Program	Ut	Program Power	4K	C	GK	£6.85
Dragon's Lair	Gm	Program Power	12K	C	GK	£6.85
Early Warning	Gm	A&F S/W	12K	C	GE	£4.95
Earth Rescue	Gm	Rucksoft	6K	C	HO	£2.80
Easy Talker	Ed	Acornsoft	16K	C	AW	£5.00
Escape	Gm	A&F S/W	8K	C	GE	£4.95
Fall of Rome	Gm	Program Power	12K	C	GK	£7.99
Forth Tape	Ut	Acornsoft		C	FA	POA
Forth, Theory & Practice	Bs	Acornsoft		C	AL	£6.00
Fruit Machine	Gm	Bug Byte	8K	C	HO	£4.00
Galactica	Gm	Program Power	12K	C	GK	£5.69
Galaxian	Gm	Bug Byte	12K	C	CH,GA,GB	£8.00
Galaxian War and Invasion	Gm	Program Power	2K	C	GK	£6.84
Golf	Gm	Computersmith	12K	C	LC	£4.95
Golf	Gm	Bug Byte	6K	C	HO	£5.00
Games Pack 1:	Gm	Acornsoft		C	AY,FA,GA	£11.50
Asteroids			10K		EJ,AL,CH	
Sub Hunt			6K		FZ	
Break Out			4 K			
Games Pack 2:	Gm	Acornsoft		C	AY,FA,GA	
Dog Fight			10K		EJ,AL,CH	
Mastermind			4K		FZ	
Zombie			4 K			
Games Pack 3:	Gm	Acornsoft		C	AY,FA,GA	£11.50
Rat Trap			10K		EJ,AL,CH	
Lunar Lander			6K		FZ	
Black Box			10K			
Games Pack: 4	Gm	Acornsoft		C	AY,FA,GA	£11.50
Star Trek			8K		EJ,AL,CH	
Four Row			12K		FZ	

SOFTWARE DEALERS

Supplier Code		Supplier Code	
AA	Micro Centre Ltd	CD	Omega Plus
AB	Micro and Video Palace	CE	Southern Software
AC	Laskys	CF	Sigma Systems
AD	Datarite Terminals Ltd	CG	Planet Software
AE	Vincelord Ltd	CH	Brighton Gamer
AF	MicroComputerLand	CI	Picturesque
AG	Comart Ltd	CJ	ACS Software
AH	Cream Computer Shop	CK	Chrisalid
AI	Microvalue	CL	MED
AJ	Molimerx Ltd	CM	Simple Software
AK	GW Computers Ltd	CN	Buffer Micro Shop
AL	Acornsoft Ltd	CO	Pixel Productions
AM	Acorn Computers	CP	Computics Microsoft
AN	Microcomputers Products Int.	CQ	KW Software
AO	Xitan Systems	CR	Sideline Freepost
AP	KGB Micros Ltd	CS	IQ Services
AQ	Broadside	CT	Willow Software
AR	Software Ltd	CU	Level 9 Computing
AS	Lucas Logic Ltd	CV	J Purves
AT	Atlantic Micro System	CW	Cambell Systems
AU	TCL Software	CX	Microdeal
AV	I A S	CY	Prof. F H George
AW	Intelligent Artefacts Ltd	CZ	J Wolstencroft
AX	Kuma Computers	DA	Ground Control
AY	Microstore	DB	Mick Bignell
AZ	London Retail	DC	Giltrole Ltd
BA	Micro-Spares	DD	Deep Thought Software
BB	CAPS Ltd	DE	Silversoft
BC	Maplin	DF	Michael Orwin
BD	Caxton Software	DG	Hisoft
BE	Cornshall Ltd	DH	The Soft Option
BF	Micro Technology	DJ	Microcomputer Spacedrome
BG	Elcon Research Ltd	DK	Spider Software
BH	Avalon Hill Games	DL	Xavier Business Systems
BI	Call Apple (UK)	DM	Camden Electronics
BJ	Lifeboat Associates	DN	Sumlock Electronic Services
BK	L & J Computers	DO	Microstyle
BL	Peach Tree Software	DP	Small Systems Engineering
BM	ACT (Microsoft) Ltd	DQ	Woodland Software
BN	Personal Computer Palace	DR	Telesystems Ltd
BO	Sinclair Software	DS	Macronics
BP	Leicester Computer Centre Ltd	DT	Hewson Consultants
BQ	TABS Ltd	DU	Silicon Office Services
BR	IBR Microcomputers	DV	Sirton Computer Systems
BS	Computer Plus	DW	Psion Ltd
BT	The Essential Software Co.	DX	JRS Software
BU	Guestel	DY	Calisto Computers Ltd
BV	Lowe Electronics	DZ	Micro Gen
BW	Gate Micro System Ltd	EA	Anglia Computer Centre
BY	Almarc Data Systems Ltd	EB	SBD Software
BZ	Interam Computer Systems Ltd	EC	Abacus Software
CA	Terodec Ltd	ED	Qdos Business Software
CB	Poolsoft	EE	dK'tronics
CC	Highlight Software	EF	Computech Systems

Games Pack 5:	Gm	Acornsoft		C	AY,FA,GA	£11.50
Invaders			10K		EJ,AL,CH	
Wumpus			3K		GZ	
Reversi			5K			
Games Pack 6:	Gm	Acornsoft		C	AY,FA,GA	£11.50
Dodgems			10K		EJ,AL,CH	
Simon			8K		FZ	
Amoeba			6K			
Games Pack 7:	Gm	Acornsoft		C	AY,FA,GA	£11.50
Life Forms			8K		EJ,AL,CH	
Ballistics			10K		FZ	
Snake			10K			
Games Pack 8:	Gm	Acornsoft		C	AY,FA,GA	£11.50
Star Date			8K		EJ,AL,CH	
Gomoku			8K		FZ	
Robots			10K			
Games Pack 9:	Gm	Acornsoft		C	AY,FA,FA	£11.50
Snapper			8K		FJ,AL,CH	
Minotaur			12K		FZ	
Babies			8K			
Games Pack 10:	Gm	Acornsoft	2K	C	AY,FA,GA	£11.50
10 Games for minimum					EJ,AL,CH	
Atom					FZ	
Games Pack 11:	Gm	Acornsoft	12K	C	AY,FA,GA	£11.50
Missile Base					EJ,AL,CH	
Snooker					FZ	
Dominoes						
High Stats	Bs	Program Power	12K	C	GK	£7.99
Hyper Fire	Gm	Program Power	12K	C	GK	£9.15
Introductory Pack	Ed	Acornsoft	3K	C	GA,FA,AL	£23.00
Invader Force	Gm	Program Power	12K	C	GK	£9.15
Invaders	Gm	Bug Byte	12K	C	CH,GA,GB	£8.00
Labyrinth	Gm	Bug Byte	12K	C	HO	£6.95
Last Run	Gm	Bug Byte	7K	C	HO	£3.00
Lunar Lander	Gm	Program Power	12K	C	GK	£7.99
Martians	Gm	Program Power	12K	C	GK	£7.99
Maths Pack 1:	Ed	Acornsoft	4K	C	EJ,FA,FZ,AL, GA	£11.50
Maths Pack II:	Ed	Acornsoft	6K	C	EJ,FA,FZ AL,GA	£11.50
Maze Ball	Gm	Program Power	12K	C	GK	£5.69
Microbudget	Bs	Program Power	12K	C	GK	£9.15
Mine Field	Gm	A&F S/W	6K	C	GE	£4.95
Missile Command	Gm	A&F S/W	12K	C	GE	£4.95
Mode 4 VDU	Ut	Program Power	12K	C	GK	£7.99
Moon Lander	Gm	Rucksoft	6K	C	HO	£2.25
Munchy Man	Gm	Program Power	12K	C	GK	£5.69
Music Box	Gm	Program Power	12K	C	GK	£7.99
Parachute	Gm	Rucksoft	5K	C	HO	£2.25
Peeko Computer	Ed	Acornsoft	6K	C	GA,FA,AL	£11.50
Pinball	Gm	Bug Byte	6K	C	HO	£4.50
Pirate Island	Gm	Hopesoft	12K	C	JV	£6.75
Polaris	Gm	A&F S/W	12K	C	GE	£3.95
Polecat	Gm	A&F S/W	12K	C	GE	£4.95
Pontoon	Gm	A&F S/W	12K	C	GE	£3.95
Programmer's Toolkit	Gm	Program Power		C	GK	£28.15
Reversi	Gm	Program Power	8K	C	GK	£5.69
Rhino and Wiggle	Gm	Bug Byte	10K	C	Ho	£5.00
Robot Control	Ed	Acornsoft	16K	C	AW	£35.00
Robot Nim	Gm	A&F S/W	6K	C	GE	£3.95
Sketch Pad Program	Gm	Program Power	5K	C	GK	£5.69
Softscreen	Ut	Computer Concepts	12K	C	GJ	£11.50
Space Invaders	Gm	Pro S/W	12K	C	LD	£6.00
Space Fighter	Gm	Program Power	12K	C	GK	£9.15
Space Invaders	Gm	Computer Concepts	12K	C	GJ	£7.80
Space Adventure	Gm	Pro S/W	12K	C	LD	£6.00
Space Storm	Gm	Program Power	4K	C	GK	£5.69
Spirographics	Gm	Rucksoft	8K	C	HO	£2.45
Star Raid	Gm	Rucksoft	11K	C	HO	£3.30
Star Trek	Gm	Program Power	5K	C	GK	£6.85
Star Trek	Gm	Bug Byte	12K	C	HO	£5.00
Statistics Pack	Ut	Bug Byte	12K	C	Ho	£20.00
Stockbroker	Gm	Program Power	5K	C	GK	£4.54
Super Race Track	Gm	Program Power	12K	C	GK	£5.69
Squares, Simon and Parachute	Gm	Bug Byte	7K	C	HO	£5.00
Tangle	Gm	A&F S/W	6K	C	GE	£3.95
The Soft VDU	Gm	Acornsoft	8K	C	AY,FA,GA EJ,AL,CH,FZ	£11.50
The Park	Gm	Program Power	12K	C	GK	£5.69
Time Tutor	Ed	A&F S/W	6K	C	GK	£3.95
2K Programs (1)	Gm	Bug Byte	2K	C	HO	£4.50
2K Programs (3)	Gm	Bug Byte	2K	C	HO	£4.50
Typist	Ut	Bug Byte	6K	C	HO	£4.00
Tunnel	Gm	Rucksoft	6K	C	HO	£2.65

SOFTWARE DEALERS

GJ	Computer Concepts	EG	Electronics Experts
GK	Program Power	EH	Artic Computing
GL	Syrtis Software	EI	Knights TV & Computers
GM	Lutterworth Software	EJ	Microage Electronics
GN	Collins Computing	EK	Holly Products
GO	Datafax	EL	I O Systems
GP	CCSoft	EM	Merton Electronics
GQ	Microx	EN	Davinci Computer Shop
GR	Pro Software	EO	Calco Software
GS	Sussex Software	EP	Richard Francis
GT	Rose Cassettes	EQ	Microtek Ltd
GU	Axis	ER	Diskwise Ltd
GV	PR Software	ES	Control Technology
GW	Bridge Software	ET	Comp Shop
GX	Video Software Limited	EU	Micro Computer Prods
GY	J M Steadman	EV	GW Computers
GZ	Transform Ltd	EW	C/WP Computers
HA	Baust Computing Consultants	EX	Metrotech Mail Order
HB	University Computers	EY	Microsystems Ltd
HC	Educare	EZ	Superior Systems Ltd
HD	Simon Software	FA	Control Universal Ltd
HE	Docimodus	FB	Pete & Pam Computers
HF	M C Associates	FC	Zenith Data Systems
HG	Addictive Games	FD	Commodore Information
HH	J K Greye Software	FE	Logic Computers
HI	John Prince	FF	Overseas Computer
HJ	Titan Programs	FG	Blyth Computers
HK	Micro Computer Software	FH	Taurus Computer Design
HL	Phipps Associates	FI	HITEC (Austria)
HM	Gemini Electronics	FJ	Graffcom Systems
HN	The Vic Centre	FK	Electronic Aids (Tewkesbury)
HP	R & R Software	FL	BUG-BYTE
HQ	Town Book & Toys	FM	Learning Computer Systems
HR	Screen Scene	FN	Jentech Services Ltd
HS	Software Masters	FO	Work Force
HT	John Prince Software	FP	Twickenham Computer Centre
HU	Nick Godwin	FQ	Sbd Software
HV	A.Parsons	FR	Beebug
HW	Bryants (Educational) Software	FS	RAM Computer Services Ltd
HX	Abersoft	FT	Ozwise Computers
IC	Ogre Games & Software	FU	Compusense
ID	Tridata Micro's Ltd	FV	The Avery Computer Company
IE	Plympton Computer Services	FW	Hilderbey Ltd
IF	Electronics Applied	FX	Micromedia
IG	Emjay	FY	Wida Software
IL	V&H Computer Services	FZ	Superior Systems Ltd
IM	AVC Software	GA	Eletec Serives Limited
IN	Computator	GB	Anglo American Software
IO	Ohmega Electronics	GC	Castle Electronics
IP	A.V.O. Software Distribution	GD	Quicksilva
IQ	Big Softie	GE	A&F Software
IR	Adamsoft	GF	SRS Microsystems
IS	Microcomputer Applications	GG	Stirling Microsystems
IT	I.J.K. Software	GH	Microtanic Software
IU	Aardvark Software	GI	Lander Microsystems

SOFTWARE LISTING

ATOM

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
UFO Bomber	Gm	Bug Byte	7K	C	HO	£4.00
Utility Pack 1	Ut	Acornsoft	2K	C	FA,GA,AL,GA	£11.50
Warlords	Gm	Program Power	12K	C	GK	£7.99
Word Pack ROM	Ut	Acornsoft	8K	C	AJ,EJ,GA	POA
Word Processings Pack	Bs	Acornsoft	8K	C	FA	POA
Word Tutor	Bs	Acornsoft	12K	C	GA,EJ,FA,AL	£11.50
Write Your Own Adventure	Ut	Hopesoft	12K	C	JV	£5.75
Yan	Gm	Program Power	3K	C	GK	£5.69
Yellow Pearl	Gm	Rucksoft	7K	C	HO	£3.30

ATARI

Air Strike	Gm	English S/W	16K	C	CH,HM	£15.95
Ali Baba	Gm	Quality S/W	32K	D	HM	£22.95
Alien Hell	Gm	Syncro	24K	D	JR	£16.95
Alien Hell	Gm	Syncro	16K	C	JR	£13.95
Alpha Fighter	Gm	Dinacomp	24K	C	AB,IK	£11.99
Analog Adventure	Gm		32K	D	BC	£34.95
Angle Worms	Gm	Adventure Int.	8K	C	AB,IK	£12.50
Ants Hill	Gm	Atari	8K	C	GC	POA
					AB	£11.25
Armoured Patrol	Gm	Adventure Int.	16K	C	AB	£16.50
Arcade Baseball	Gm	Arcade Plus	16K	C	JR	£18.95
Arcade Baseball	Gm	Arcade Plus	16K	D	JR	£20.95
Assembler Editor	Ut	Atari		R	AB,HM	£39.95
Assembler	Ut	Quality S/W	16K	C	BC	£14.95
Assembler Editor	Ut	United S/W of America	16K	R	BC	£34.50
Asteroids	Gm	Atari	16K	R	AC, BC,CH, HM,IK	£29.95
					BC	£18.95
Atari Word Processor	Bs	Atari	32K	C	AB	£95.95
Atari Word Processor	Bs	Atari	32K	C	BC	£85.00
Atari Word Processor	Bs	Atari	32K	D	HM	£99.95
Atari World Graphics	Ut	United S/W of America	48K	D	BC	£43.95
Avalanche	Gm	Atari	16K	C	GC	POA
					CH	£13.95
					AB	£16.75
Babel	Gm	Atari	16K	C	GC	POA
					AB,IK	£16.75
Balrog Sampler	Gm	Adventure Int.	32K	C	AB	£24.95
Basic A Plus	Ut	OSS S/W	48K	D	BC	£52.50
Basic A Plus and Operating System A	Ut	OSS S/W	48K	D	BC	£99.50
Basic Program Compress.	Ut	Atari	32K	D	AB	£16.75
Basic Utility/Renumber	Ut	Atari	16K	C	AB	£16.75
Basics of Animation	Ed	Santa Cruz	24K	D	BC	£10.95
Basics of Animation	Ed	Atari	16K	C	BC	£9.95
Basics of Animation	Ed	Santa Cruz	16K	C	AB	£13.95
Basketball	Gm	Atari	16K	C	AC,HM,IK	£24.50
Basketball	Gm	Atari	16K	R	AB,BC,IK	£29.95
Beta Fighter	Gm	Allrian	16K	C	JS	£15.50
Beneath the Pyramids	Gm	Chrystal	48K	C	CH,AB,IK	£19.99
Beta Fighter	Gm	Artworx	16K	C	JR	£13.95
Beta Fighter	Gm	Artworx	16K	D	JR	£16.50
Black Jack	Gm	Atari	16K	C	GC	POA
					AC,BC	£8.95
					AB,HM,IK	£9.95
Black Jack Shooter	Ed	Atari	16K	C	AB	£16.75
Bob's Business	Bs	Santa Cruz	16K	C	AB	£9.95
Bridge 2.0	Gm	Allrian	24K	C	JS	£16.00
British Heritage Jigsaw Puzzle	Gm	Thorn EMI	16K	C	BC,HM,IK	£19.95
Bug Attack	Gm	Cavalier Computers	16K	C	JR	£19.25
Bug Attack	Gm	Cavalier Computers	16K	D	JR	£19.25
Bumper Pool	Gm	Atari	16K	C	GC,IK	POA
					AB	£11.25
Calculator	Bs	Atari	24K	D	BC,IK	£16.95
Canyon Climber	Gm	Datasoft	16K	D	HM	£20.00
				C	JR	£18.95
				D	JR	£19.25
Caverns of Mars	Gm	Atari	16K	C	BC,HM,IK	£24.50
Caverns of Mars	Gm	Atari	16K	C	BC,HM,IK	£24.50
Centipede	Gm	Atari	16K	R	GC	POA
					BC,HM,IK	£29.95
Champelo	Gm	Dinacomp	16K	C	AB,IK	£10.99
Character Generator	Ut	Data Soft	16K	C	BC	£9.97
Character Generator	Ut	Data Soft	16K	D	BC	£12.50
Checker Kim	Gm	Personal S/W	16K	C	BC	£15.95
Chicken	Gm	Synapse	16K	C	HM	£19.95

SOFTWARE DEALERS

IV	James Hager
IW	Simon Hessel Software
IX	Mayday Software
IY	Persoft
IZ	Micro-Aid
JA	Hexagon Software
JB	N. Darwood Ltd
JC	Futura Software
JE	Ultra-Tech Services
JF	Mr. Laird
JG	Gary Smith
JH	Aquarius Software
JI	Precision Software Engineering
JJ	Spectre Soft
JK	Cornhill Services
JM	Morris Associates (Computing)
JN	Terminal Software
JO	Mossoft Microcomputer Software
JP	Romik
JQ	David Computer Software
JR	Creative Software
JS	Allrian Data Services
JT	Apex Trading Ltd
JU	TX Software
JV	Hopesoft
JW	GT Software
JX	Garland Computing
JY	Corona Software
JZ	MP Software & Services
KA	Ludinski Computer-Assisted Learning
KB	B.B.C. Publications
KC	Miking S/W
KD	Inverse
KE	Alan Turnbull
KF	Chromasoft
KG	Llamasoft
KH	Superior Software
KI	Earthshock Software
KJ	Bridge Software
KK	ME&P Micro Products
KL	Calpac Computer Software
KM	KCET Software
KN	Software for All
KO	Rucksoft
KP	Liverpool Computer Centre
KQ	W.E. Hunt
KR	ABC Software
KS	Rainbow Software
KT	Chalksoft
KU	Wizard Software
KV	Data-Brain Software
KW	NCG Ltd
KX	Broadwater Economic Simulations
KY	Kent Computer Company
KZ	Cases Computer Simulations
LA	Juniper Computer
LB	J.K. Gosden Software
LC	Computersmith
LD	Pro Software
NP	Program Direct
NR	Foilkade
NT	Digital Fantasia
NU	Database Software
NV	CJE Microcomputers
NW	Eduquest
NX	Davansoft
NY	Square Software
NZ	Salamander Software
OA	Anirog Computers
OB	Golem Ltd
OC	A Lane (Software)
OD	ASP Software
OE	Micromail



Chicken	Gm	Synapse	16K	D	£19.95	
Chrystals	Gm	Dinacomp	24K	C	AB,IK	£9.99
Close Encounter	Gm	Concom	16K	C	JR	£13.95
Code Cracker	Gm	Atari	8K	C	GC	POA
					AB	£11.25
Commbat	Gm	Adventure Int	24K	C	JR	£12.95
Commbat	Gm	Adventure Int	24K	D	JR	£16.95
Computer Acquire	Gm	Avalon Hill	16K	C	GB	£17.25
Computer Chess	Gm	Atari	16K	R	GC	POA
					CH,AC,HM	
					AB,BC	£24.95
Conflict 2500	Gm	Avalon Hill		C	GB,AB	£12.50
Controller	Gm	Avalon Hill	32K	D	BH	£17.95
Conversational French	Ed	Atari	16K	C	AC,BC,IK	£32.50
Conversational French	Ed	Atari	16K	R	AB,HM,IK	£39.95
Conversational German	Ed	Atari	16K	C	AC,BC,IK	£32.50
Conversational German	Ed	Atari	16K	R	AB,HM,IK	£39.95
Conversational Italian	Ed	Atari	16K	R	AB,HM,IK	£39.95
Conversational Italian	Ed	Atari	16K	C	AC,BC,IK	£32.50
Conversational Spanish	Ed	Atari	16K	R	AB,HM,IK	£39.95
Conversational Spanish	Ed	Atari	16K	C	AC,BC,IK	£32.50
Convoy Raider	Gm	Avalon Hill	16K	C	BH	£10.95
					GB,AB	£12.50
Crazitack	Gm	Allrian	16K	C	JS	£16.00
Cribbage and Dominoes	Gm	Thorn EMI	16K	C	CH,BC,HM	£14.95
					,IK,	
Cross Fire	Gm	On Line	16K	C	HM	£19.95
Cross Fire	Gm	On Line	32K	D	HM	£19.95
Crush, Crumble, Chomp	Gm	Avalon Hill	16K	C	GB,IK	£15.50
Crush, Crumble, Chomp	Gm	Avalon Hill	16K	D	GB,IK	£17.95
Crypts of Terror	Gm	In Home S/W	16K	C	CH,HM	£19.95
Curse of Rah	Gm	Auto Simulations	32K	C	JR	£13.80
Curse of Rah	Gm	Auto Simulations	32K	D	JR	£13.80
Curse of Crawley Manor	Gm	Adventure Int.	16K	C	AB	£16.50
Cyclod	Gm	Sirius Software	32K	D	JR	£19.25
Cypher Bowl	Gm	Artsci Inc.	32K	D	BC	£22.45
DI Nuclear Bomber	Gm	Avalon Hill	16K	C	BH	£10.95
Darts	Gm	Thorn EMI	16K	C	CH,BC,HM	£19.95
					IK	
Data Management S/W	Bs	C E S/W	48K	D	AB	£101.00
Data Management System	Do	Atari	32K	D	AB	£20.50
Datestone of Ryn	Gm	Avalon Hill		D	GB,IK	£15.50
Datestone of Ryn	Gm	Avalon Hill		C	BC	£14.95
					GB,IK	£13.50
Deadline	Gm	Infocom	32K	C	JR	£34.50
Deflections	Gm	Adventure Int.	8K	C	AB,IK	£12.50
DeLuxe Invaders	Gm	Rocklan	32K	D	JR	£22.99
Disc Fixer	Ut	Atari	16K	D	AB	£22.50
Diskassembler	Ut	Allrian	32K	D	JS	£27.95
Display List	Ed	Santa Cruz	16K	C	BC	£9.95
Display List	Ed	Santa Cruz	16K	D	BC	£10.95
Dnieper River	Gm	Avalon Hill	48K	C	BH	£15.95
					CH	£14.50
Doctor Goodcodes Cavern	Gm	Gebelli Software	32K	D	JR	£18.95
Domination	Gm	Atari	24K	C	GC	POA
					AB	£16.75
		Allrian	24K	C	JS	£16.00
Dos 2	Ut	Atari	32K	D	AB	£21.95
Dragon of Hong Kong	Gm	Adventure Int.	32K	C	AB	£16.50
Drawpic	Ut	Artworx	16K	C	JR	£22.75
Drawpic	Ut	Allrian	16K	C	JS	£24.50
Drawpic	Ut	Artworx	16K	D	JR	£25.00
Eastern Front	Gm	Atari	16K	C	CH	£24.95
Eastern Front	Gm	Atari	16K	D	AB	£30.25
Empire of the Overmind	Gm	Avalon Hill		C	BH	£17.95
					CH	£18.95
Empire of the Overmind	Gm	Avalon Hill		D	GB,AB	£24.95
Encounter at Questar IV	Gm	Allrian	24K	C	JS	£19.50
Escape from Tramm	Gm	Adventure Int.	16K	C	AB	£16.50
European Capitals	Ed	Atari	16K	C	AC,BC	£8.95
					AB,HM,IK	£9.95
European Scene Jigsaw Puzzle	Gm	Thorn EMI	16K	C	BC,HM,IK	£19.95
Extended WSNA	Ut	Atari	16K	C	AB	£19.00
Fantasy land 2041	Gm	Chrystal	48K	C	CH,AB,IK	£34.99
Fastgammon	Gm	Quality S/W	16K	C	BC	£9.95
Forest Fire	Gm	Dinacomp	24K	C	AB,IK	£15.99
Frog	Gm	C E S/W	16K	C	AB	£9.95
Frogger	Gm	On Line	16K	C	HN	£22.95
Frogger	Gm	On Line	32K	D	HN	£22.95
Galactic Chase	Gm	Spectrum	16K	C	AB,BC,HM	£15.99
Galactic Chase	Gm	Spectrum	16K	D	AB	£20.25
Galactic Chase	Gm	Spectrum	16K	D	BC,HM	£17.95
Galactic Empire	Gm	Adventure Int.	32K	C	BC	£14.95
					AB,IK	£16.50
Galactic Guest	Gm	Chrystal	48K	C	CH,AB,IK	£19.99
Galactic Trader	Gm	Adventure Int.	32K	C	AB,CH,IK	£16.50
Galaxy	Gm	Avalon Hill	16K	C	BH	£12.95
Galaxy	Gm	Avalon Hill	16K	D	BH	£14.95
Ghost Hunter	Gm	Arcade Plus	16K	C	HM	£19.95
Ghost Hunter	Gm	Arcade Plus	16K	D	HM	£22.95
Ghost Town	Gm	Adventure Int.	24K	C	BC	£14.95
					AB,IK	£16.50
Giant Slalem	Gm	Dinacomp	16K	C	AB	£11.99
Golden Voyage	Gm	Adventure Int.	24K	C	BC	£14.95
					AB	£16.50
Gomoku	Gm	Artsci Inc	16K	C	BC	£14.95
Graph it	Ut	Atari	16K	C	AC,BC,IK	£11.95
					AB,HM	£13.95
Graphic Sound Demo	Gm	Atari	16K	D	GC	POA
					AB	£16.75
Graphics Machine	Ut	Santa Cruz	16K	C	AB	£13.50
Guns of Fort Defiance	Gm	Avalon Hill	32K	C	BH	£12.95
HMS Impetuous	Gm	Adventure Int.	32K	C	AB	£16.50
Hangman	Gm	Atari	16K	C	AC,BC	£8.95
					AB,HM,IK	£9.95
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Home Financial Mg'ment	Dm	Thorn EMI	16K	D	HM	£29.95
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House of Usher	Gm	Chrystal	48K	C	AB,CH,IK	£19.99
Humpty Dumpty/Jack & Jill	Gm	Thorn EMI	16K	C	BC,HM,IK	£19.95
Intruder Alert	Gm	Dinacomp	16K	C	AB,IK	£15.99
Invasion Orion	Gm	Avalon Hill		C	GB,IK	£13.25
Invasion Orion	Gm	Avalon Hill		D	GB,IK	£15.75
Invitation to Prog I	Ed	Atari	16K	C	AB,HM,IK	£15.95
Invitation to Prog. II	Ed	Atari	16K	C	GC,IK	POA
					AB,BC,HM	£22.95
Invitation to Prol. III	Ed	Atari	16K	C	AB,BC,HM	£22.95
					IK	
Nautilus	Gm	Synapse	32K	C	HM	£20.00
Nomino's Jigsaw	Gm	Dinacomp	24K	C	AB,IK	£15.99
Norton Forth	Gm	Adventure Int.	32K	C	AB	£24.95
Nuke War	Gm	Avalon Hill	16K	C	BH	£10.95
Old McDonald's Farm	Gm	Adventure Int.	16K	C	AB	£12.50
Operating System A Plus	Ut	OSS S/W	48K	D	BC	£52.50
Outlaw Howitzer	Gm	Atari	24K	C	GC	POA
					AB	£16.75
Pacific Coast Highway	Gm	Datasoft	16K	C	HN	£20.00
Pacific Coast Highway	Gm	Datasoft	16K	D	HN	£20.00
Pac-Man	Gm	Atari	16K	R	GC,IK	POA
					BC,HM	£29.95
Page Flipping	Ed	Santa Cruz	16K	C	BC	£9.95
Page Flipping	Ed	Santa Cruz	16K	D	BC	£10.95
Personal Finance	Gm	Atari		R	BC,HM,IK	£49.00
Pilot (Educator)	Ut	Atari	16K			
				C/R	AB,BC,HM	£79.95
Pirate Adventure	Gm	Adventure Int.	24K	C	BC	£14.95
					AB,IK	£16.50
Planet Miners	Gm	Avalon Hill	24K	C	BH	£10.95
Player Missile Graphics	Ed	Santa Cruz	24K	D	BC	£19.95
Player Missile Graphics	Ed	Santa Cruz	24K	C	BC	£18.95
					AB	£19.95
Poker & Solitaire	Gm	Artsci Inc.	16K	C	BC	£10.95
Program Pack I	Ut	Avalon HIll	16K	C	GB	£3.50
Protector	Gm	Synapse	32K	C	HN	£19.95
Purchase Ledger	Bs	Atari	48K	C	AB,IK	£149.95
Pyramid of Doom	Gm	Adventure Int.	24K	C	BC	£14.95
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QS Forth	Ut	Quality S/W	24K	D	BC	£44.90
Quest for Power	Gm	Chrystal	48K	C	CH,AB	£26.99
Race in Space	Gm	Analog S/W	16K	C	BC	£14.95
Race in Space	Gm	Analog S/W	16K	C	HN	£15.95
Race in Space	Gm	Analog S/W	16K	D	HN	£15.95
Raster Blaster	Gm	Budgeco	32K	C	HN	£22.95
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Sales Ledger	Bs	Atari	48K	C	AB,IK	149.95
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					AB,CH,HM	£17.50
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Shooting Arcade	Gm	Datasoft	16K	D	HM	£20.00
Shooting Gallery	Gm	Analog S/W	16K	C	BC	£15.95
Shooting Gallery	Gm	Analog S/W	16K	D	BC	£15.95
Six Microstories	Gm	Adventure Int.	32K	C	AB	£12.50
Sky Warrior	Gm	Adventure Int.	16K	C	AB	£16.50
Snake Byte	Gm	Sirius Software	32K	D	JR	£19.25
Snooker and Billards	Gm	Thorn EMI	16K	C	BC,HM,IK	£19.95
Sound Editor	Gm	Atari	16K	C	GC	POA
					AB	£16.75
Sound Tutorial	Ed	Santa Cruz	16K	C	AD	£13.95
Space Ace	Gm	London S/W	16K	C	HM	£19.95
Space Ace	Gm	London S/W	16K	D	HM	£19.95
Space Invaders	Gm	Atari	16K	R	AB,CH,HM	
					M,BC,IK	
Space Tilt	Gm	Dinacomp	16K	C	AB,IK	£29.95
Space Trap	Gm	Allrian	16K	C	JS	£15.50
Space Trap	Gm	Dinacomp	24K	C	AB,IK	£9.99
Space Trek	Gm	Atari	24K	C	CC	POA
					AH	£13.50
Star Raiders	Gm	Atari	16K	R	HM,AC,BC	
					CH,IK	£29.95
Star Trek 3.5	Gm	Adventure Int.	32K	C	BC	£14.95
					AB	£16.50
Star Warrior	Gm	Epyx	32K	C	BC,IK	£28.95
States and Capitals	Ed	Atari	16K	C	AC,BC,IK	£8.95
					AB,HM	£9.95
Statistics 1	Fm	Atari		C	AC,BC,IK	£11.95
Stock and Bonds	Gm	Avalon Hill	32K	C	BH	£12.95
Stone of Sisyphus	Gm	Adventure Int.	24K	C	BH	£12.95
Strange Odyssey	Gm	Adventure Int.	24K	C	BC,IK	£14.95
					AB	£16.50
Stud Poker	Gm	Dinacomp	16K	C	AB,IK	£10.99
Stud Poker	Gm	Allrian	16K	C	JS	£14.00
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SOFTWARE LISTING

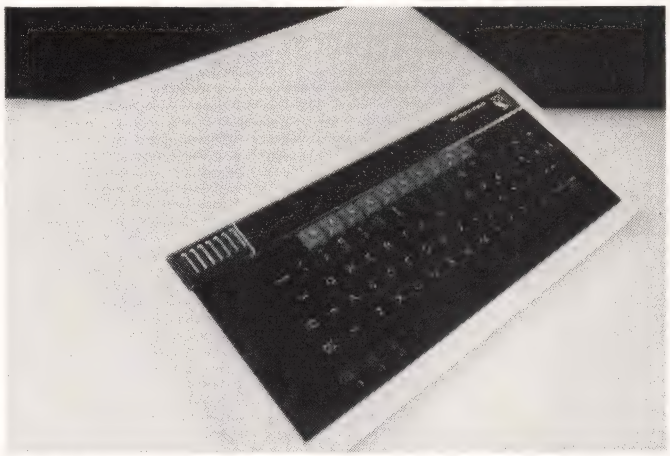
ATARI

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Summer	Gm	Chrystal	16K	C	AB	£11.99
Sunday Golf	Gm	Adventure Int.	16K	C	AB,IK	£16.50
Super Breakout	Gm	Atari	16K	C	AC,HM,IK	£24.50
Super Breakout	Gm	Atari	16K	R	AB,IK	£35,95
T:A Text Display Device	Do	Allrian	16K	C	JS	£16.00
Tack Trek	Gm	Atari	24K	C	GC	POA
					AB	£13.50
Tank Trap	Gm	Quality S/W	16K	C	BC	£8.95
Tank Trap	Gm	Quality S/W	16K	D	BC	£11.95
Tanktics	Gm	Avalon Hill	32K	C	CH	£16.95
Tari Trek	Gm	Quality S/W	16K	C	BC	£8.95
Teachers Pet	Ed	Allrian	16K	C	JS	£14.00
Tari Trek	Gm	Quality S/W	16K	D	BC	£11.95
Tele Link	Gm	Atari	16K	R	HM,IK	£21.50
Tele Link	Ut	Atari	16K	R	AB,IK	£19.95
Telelink	Ut	Data Soft	16K	R	BC,IK	£14.95
Terrie	Gm	Atari	32K	C	GC	POA
					AB	£16.75
Text Editor	Bs	Allrian	32K	D	JS	£30.00
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The Count	Gm	Adventure Int.	24K	C	BC,IK	£14.95
					AB	£16.50
The Cranston Manor Adventure	Gm	Allrian	32K	D	JS	£30.00
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Threshold	Gm	On-Line	32K	C	HM,IK	£24.95
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Touch Typing	Ed	Atari	16K	C	AC,BC,IK	£14.95
					AB,HM	£15.95
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					IK	
Track Attack	Gm	Broada Bond	32K	D	HM	£32.95
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Tumble Bugs	Gm	Datasoft	24K	D	HM	£19.95
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Ulysses	Gm	On-Line	40K	D	HM	£24.95
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					AB,BC,HM	£24.50
Visicalc	Bs	Personal S/W	32K	D	BC,IK	£119.95
Voodoo Castle	Gm	Adventure Int.	24K	C	BC,IK	£14.95
					AB	£16.50
Voyager	Gm	Avalon Hill	32K	C	CH,BH	£12.95
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Adventure	Gm	Micro Power	32K	C	GK	£6.95
Adventure	GM	Program Direct	32K	C	NP	£5.99
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Algebraic Manipulation	Ut	Acornsoft	16K	C	AL,GA	£9.95
Algebraic Manipulation	Ut	Acornsoft	32K	C	AL,GA	£9.95
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Arrow of Death (2)	Gm	Digital Fantasia	16K	C	NT	£8.95
Airlift	Gm	Bug Byte	32K	C	KP	£5.50
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Append It	Ut	Aztec S/W	16K	C	IB	£3.00
Asteroids/Frong	Gm	Aardvark Software	16K	C	IU	£4.00
Asteroid Belt	Gm	Electronics Appplied	32K	C	IF	£11.50
Asteroid Belt	Gm	Computer Concepts	16K	C	GJ	£7.80
Astro Navigator	Gm	Micro Power	32K	C	GK, NR	£6.95
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Balloons	Gm	C J E Microcomputers	32K	C	NV	£6.00
Basic Maths	Ed	Aztec S/W	16K	C	IB	£3.00
Battlefield	Gm	Micro-Aid	32K	C	IZ	£2.50
Banner	Do	Micro-Aid	16K	C	IZ	£2.95
Beeb-Chase	Gm	Database Software	32K	C	NU	£7.50
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Breakout	Gm	I.J.K. S/W	16K	C	IT	£3.95
Breakout	Gm	Bryants S/W	32K	C	HW	£3.75
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Call Your Bluff	Gm	Square Software	16K	C	NY	£6.00
Capitol Cities	Ed	Square Software	16K	C	NY	£6.00
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Cashbook A	Do	Micro-Aid	16K	C	IZ	£3.95
Cashbook B	Do	Micro-aid	16K	C	IZ	£3.95
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Cells & Serpent	Gm	Hexagon S/W	16K	C	JA	£5.00
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CESCIL	Ed	Eduquest	16K	C	NW	£19.95
Character Builder	Ut	Davensoft	16K	C	NX	£4.95
Characters	Ut	Computer Concepts	32K	C	GJ	£6.67
Character Generator	Ut	MP S/W	32K	C	JZ	£3.00
Character Generator	Ut	Software for All	32K	C	KN	£4.95
Characters	Ut	Computer Concepts	16K	C	GJ	£6.67
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Chess	Gm	Bug Byte	32K	C	EA	£11.50
Chess	Gm	Micro Power	32K	C	GK	£6.95
Circus	Gm	Digital Fantasia	32K	C	NT	£8.95
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Cobra/Robo-Swamp	Gm	Software for All	16K	C	KN	£6.95
Cobra/Robo-Swamp	Gm	Software for All	32K	C	KN	£6.95
Code Race	Gm	Computer Concepts	16K	C	GJ	£6.67
Code Race	Ut	Computer Concepts	32K	C	GJ	£6.67
Colossal Adventure	Gm	Level 9 Computing	32K	C	CU	£9.90
Connect 4	Gm	Database Software	32K	C	NU	£5.90
Constellation	Ed	Micro Power	32K	C	GK	£5.95
Cookbook Wizardry	Do	Database Software	32K	C	NU	£7.50
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Creative Graphics	Ut	Acornsoft	32K	C	AL,GA	£9.95
Crossed Words	Ed	Aztec S/W	16K	C	IB	£6.50
Data-Quiz	Ut	Bryants S/W	32K	C	HW	£4.88
Database	Bs	Computercat	16K	C	IJ	£11.95
Database	Bs	Software for All	16K	C	KN	£9.95
Defchr	Ut	Micro-Aid	16K	C	IZ	£2.95
Defender	Gm	Acornsoft	32K	C	AL,GA	£9.95
Desk Diary	Bs	Acornsoft	32K	C	AL,GA	£9.95
Desk Diary	Bs	Acornsoft	16K	C	AL	£9.95
Devil's Causeway	Gm	Anirog Computers	16K	C	0A	£6.00
Dissassembler	Ut	Micro Power	16K	C	GK	£5.95
Dissassembler	Ut	Program Direct	16K	C	NP	£3.00
Dissassembler	Ut	Davansoft	16K	C	NX	£5.95
Dissassembler	Ut	C J E Microcomputers	16K	C	NV	£5.00
Distances	Ed	Micro-Aid	32K	C	IZ	£2.95
Dissembler	Ut	Rainbow S/W	16K	C	KS	£2.50
Digital X-Word Compiler	Gm	N. Darwood	16K	C	JB	£6.00
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Dragon Quest	Gm	Bug Byte	32K	C	KP	£11.50
Drawing	Ut	B.B.C.	16K	C	KB	£10.00
Dungeon Adventure	Gm	Level 9 Computing	32K	C	CU	£9.90
Early Learning	Ed	B.B.C.	16K	C	KB	£10.00
Early Numbers	Ed	Bryants S/W	32K	C	HW	£4.80
Early Warning	Gm	A&F Software	16K	C	GE	£6.00
Educational (1)	Ed	Golem	16K	C	OB	£8.05
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7 Educational Games	Gm	Micromail	32K	C	OE	£5.75
Eldorado Gold	Gm	Program Power	32K	C	GK	£7.99
Electric	Ed	Database Software	16K	C	NU	£5.50
European Studies	Ed	Aztec S/W	32K	C	IB	£6.50
Escape from Pulsar 7	Gm	Digital Fantasia	32K	C	NT	£8.95
Fairytale	Gm	Molimerx	32K	C	AJ	£10.06
Feasibility Experiment	Gm	Ditigal Fantasia	32K	C	NT	£8.95
Filer	Bs	Micro Power	16K	C	GK	£8.95
Firien Wood	Gm	MP S/W	32K	C	JZ	£6.50
Flags	Ed	Micro-Aid	16K	C	IZ	£2.95
Flush	Ut	Micro-Aid	16K	C	IZ	£1.00
Football Pools Predictor	Do	Mayday Software	16K	C	IX	£4.99
Footer	Gm	Micro Power	32K	C	GK	£6.95
Frenzy	Gm	Persoft	16K	C	IY	£5.75
Frogger (Machine Code)	Gm	A&F Software	32K	C	GE	£8.00
Fruit Machine	Gm	Superior Software	32K	C	KH	£6.50
Fruit Machine	Gm	Bug Byte	32K	C	KP	£5.50
FORTH	Ut	Acornsoft	32K	C	AL	£16.85
Fun Games	Gm	B.B.C.	16K	C	KB	£10.00
Galactic Commander	Gm	Micro Power	32K	C	GK	£6.95
Games Pack 1	Gm	Computersmith	16K	C	LC	£5.50
Galaxians	Gm	Superior S/W	32K	C	KH	£7.00
Game of Logic	Ed	N. Darwood	16K	C	JB	£8.00
Games of Logic and cunning	Gm	Golem	16K	C	0B	£9.20
Games of Strategy	Gm	B.B.C.	16K	C	KB	£10.00

Games Pack II	Gm	Micromail	32K	C	OE	£6.75
Genetic Code	Ed	Garland Comp.	32K	C	JX	£17.65
Geography Italy	Ed	Corona S/W	32K	C	JY	£5.00
Ghost/Diamonds	Gm	A Lane	16K	C	0C	£3.00
Ghost Maze	GM	Software for All	32K	C	HN	£6.95
Grand Prix	Gm	Software for All	32K	C	HN	£5.95
Golf	Gm	Bryants S/W	32K	C	HW	£4.88
Golf	Gm	Bug Byte	32K	C	GA,EA	£7.00
Golf	Gm	Computersmith	32K	C	LC	£5.50
Gomoku	Gm	Micro Power	16K	C	GK	£3.95
Graphics Package	Ut	Salamander Software	32K	C	NZ	£24.95
Graph and Charts Pack	Bs	Acornsoft	32K	C	AL,GA	£9.95
Graph and Charts Pack	Bs	Acornsoft	16K	C	AL,GA	£9.95
Great Britain Ltd	Gm	S.W. Hessel S/W	32K	C	IW	£5.95
Guzzler	Gm	Computersmith	32K	C	LC	£5.50
Hangman	Gm	Aztec S/W	16K	C	IB	£5.50
Hangman	Gm	MP S/W	32K	C	JZ	£4.00
Helicopter Rescue/Tunnel/ Roadrace	Gm	A Lane	16K	C	0C	£4.00
Home Accounts	Do	Persoft	32K	C	IY	£12.50
Home Finance	Do	B.B.C.	16K	C	KB	£10.00
Hydraulics	Ed	Database Software	16K	C	NU	£5.50
Inkosi	Gm	Chalksoft	32K	C	KT	£5.95
Invaders	Gm	Superior S/W	32K	C	KH	£7.00
Invaders	Gm	Software for All	16K	C	KN	£6.95
Invaders	Gm	Hexagon S/W	16K	C	JA	£6.00
Invaders	Gm	MP S/W	32K	C	JZ	£6.50
Invisible Man	Ed	Chalksoft	32K	C	KT	£5.95
Inheritance	Gm	S.W. Hessel S/W	32K	C	IW	£5.95
Inheritance	Ed	Garland Comp.	32K	C	JX	£34.70
Inkosi	Gm	Chalksoft	32K	C	KT	£5.95
Invaders	Gm	Superior S/W	32K	C	KH	£7.00
Invaders	Gm	Software for All	16K	C	KN	£6.95
Invaders	Gm	Hexagon S/W	16K	C	JA	£6.00
Invaders	Gm	MP S/W	32K	C	JZ	£6.50
Invisible Man	Ed	Chalksoft	32K	C	KT	£5.95
Inheritance	Gm	S.W. Hessel S/W	32K	C	IW	£5.95
Inheritance	Ed	Garland Comp.	32K	C	JX	£34.70
J.R.	Gm	Software for All	32K	C	KN	£6.95
Jumbles	Ed	Bryants S/W	32K	C	HW	£4.88
Jumbo	Gm	Molimerx	32K	C	AJ	£17.25
Junior Maths Pack	Ed	Micro Power	32K	C	GK	£5.95
La Princesse (French)	Ed	Aztec S/W	32K	C	IB	£6.50
Landfall & Serpent	Gm	GT Software	32K	C	JW	£6.50
Laser Command	Gm	Micro Power	32K	C	GK	£6.95
Letters	Ed	Chalksoft	32K	C	KT	£6.95
Library Dewey Classification	Ed	Aztec S/W	32K	C	IB	£6.50
Link-4-Plus	Gm	ABC Software	16K	C	KR	£6.95
Lisp	Ut	Acornsoft	32K	C	AL,GA	£16.85
Lisp	Ut	Acornsoft	16K	C	AL,GA	£16.85
Logo 2	Ut	Computer Concepts	32K	C	GJ	£10.00
Lunar Lander	Gm	A&F Software	32K	C	GE	£6.90
Mailing A	Bs	Micro-aid	16K	C	IZ	£3.95
Mailing B	Bs	Micro-Aid	16K	C	IZ	£3.95
Martians	Gm	Micro Power	32K	C	GK	£5.95
Mastermind	Gm	Micro Power	16K	C	GK	£3.95
Maze Invaders	Gm	Micro Power	32K	C	GK	£4.95
Maze Man	Gm	C J E Microcomputers	32K	C	NV	£6.00
Micro Budget	Do	Micro Power	16K	C	GK	£6.95
Metrics (5)	Ed	Chalksoft	32K	C	KT	£9.95
Micro Maths	Ed	LCL	16K	C	KA	£24.50
Minefield	Gm	Eduquest	16K	C	NW	£5.95
Master Copier	Ut	Aztec S/W	16K	C	IB	£6.50
Maths Translation	Ed	Corona S/W	32K	C	JY	£5.00
Micro-Derby	Gm	Bug Byte	32K	C	KP	£5.50
Micro Man	Gm	Pro S/W	32K	C	LD	£8.00
Middle Kingdom	Gm	Pro S/W	16K	C	LD	£8.00
Minefield	Gm	A&F Software	16K	C	GE	£6.00
Missile Control	Gm	C J E Microcomputers	32K	C	NV	£9.00
Mission Impossible	Gm	Aztec S/W	16K	C	IB	£6.50
Mixed Games	Gm	I.J.K. S/W	16K	C	IT	£3.95
Model A Invaders	Gm	I.J.K. S/W	16K	C	IT	£4.95
Model B Invaders	Gm	I.J.K. S/W	32K	C	IT	£6.95
Money Box	Ed	Bryants S/W	32K	C	HW	£4.88
Monsters	Gm	Acornsoft	32K	C	AL,GA	£9.95
Monster Battles	Gm	Bryants S/W	32K	C	HW	£4.80
Multifile	Bs	Bug Byte	16K	C	EA	£25.00
Multiple Choice	Ed	Eduquest	32K	C	NW	£25.00
Munchyman	Gm	Micro Power	16K	C	GK	£5.95
Music	Do	B.B.C.	16K	C	KB	£10.00
Music Maker	Gm	Rainbow S/W	16K	C	KS	£3.50
Musical Numbers	Ed	Bryants S/W	32K	C	HW	£4.88
Musical Number Box	Gm	Bryants S/W	16K	C	HW	£3.75
Music Program	Do	Golem	32K	C	OB	£6.90
Mutant Invaders	Gm	I.J.K. S/W	16K	C	IT	£5.95
MX 80 Type 3 Screen Dump	Ut	Software for All	16K	C	KN	£6.95
Othello	Gm	Computer Concepts	16K	C	GJ	£8.95
Othello	Gm	Computer Concepts	32K	C	GJ	£8.95
Othello	Gm	Computercat	16K	C	IJ	£8.95
Parity	Ed	N. Darwood	16K	C	JB	£6.00
Payroll	Bs	Micro-Aid	32K	C	IZ	£5.95
Payroll 2	Bs	Micro-Aid	32K	C	IZ	£5.95
Peeko Computer	Bs	Acornsoft	16K	C	AL,GA	£9.95
Pete the Plastered Postman/ Asteroid Lander	Gm	ASP Software	16K	C	OD	£8.50
Pharoah's Tomb	Gm	A&F Software	32K	C	GE	£8.00
Philosopher's Quest	Gm	Acornsoft	16K	C	GA	£9.95
Picsave	Ut	Hexagon S/W	16K	C	JA	£6.00
Painting	Ut	B.B.C.	16K	C	KB	£10.00
Peeko Computer	Ut	Acornsoft	32K	C	AL,GA	£9.95
Procflush	Ut	Micro-Aid	16K	C	IZ	£1.00
Powerboat Race	Gm	Futura S/W	32K	C	JC	£7.95
Polaris	Gm	Bug Byte	32K	C	KP	£5.50
Procvar	Ut	Micro-Aid	16K	C	IZ	£1.95
Princess	Gm	Aztec S/W	16K	C	IB	£6.50
Punctuation	Ed	Bryants S/W	32K	C	HW	£4.88



Reversi & Gomuko	Gm	Pro S/W	16K	C	LD	£8.00
Reversi 1	Gm	Micro Power	16K	C	GK	£4.95
Reversi 2	Gm	Micro Power	32K	C	GK	£4.95
Road Runner	Gm	A&F Software	32K	C	GE	£6.90
Robot	Gm	Miking S/W	32K	C	KC	£4.95
Roulette	Gm	Micro Power	32K	C	GK	£4.95
Searchbas	Ut	Micro-Aid	16K	C	IZ	£1.95
Skwosh	Gm	Miking S/W	32K	C	KC	£3.95
Seed Germination	Ed	Garland Comp.	32K	C	JX	£18.82
Sequences	Ed	Chalksoft	32K	C	KT	£5.95
Sheepdog Trials	Ed	Bryants S/W	32K	C	HW	£4.80
Shootout	Gm	MP S/W	32K	C	JZ	£5.00
Snake	Gm	Computer Concepts	32K	C	GJ	£6.67
Snapper	Gm	Acornsoft	32K	C	AL,GA	£9.95
Sort M/C	Ut	Micro-Aid	16K	C	IZ	£1.00
Sortbas	Ut	Micro-Aid	16K	C	IZ	£1.00
Soundplan	Ut	ME & P Products	16K	C	KK	£10.00
Spacehawks	Gm	Computer Concepts	32K	C	GJ	£7.80
Spacemaze	Gm	Micro Power	32K	C	GK	£5.95
Spacefight	Gm	Miking S/W	32K	C	KC	£7.95
Space Adventure	Gm	Pro S/W	32K	C	LD	£8.00
Space Warp	Gm	Bug Byte	32K	C	GA,EA	£11.50
Space Fighter	Gm	MP S/W	32K	C	JZ	£8.50
Space Fighter	Gm	Superior S/W	32K	C	KH	£7.00
Space Games Pack 1	Gm	Futura S/W	16K	C	JC	£3.99
Space Games Pack 2	Gm	Futura S/W	16K	C	JC	£3.99
Space Games Pack 3	Gm	Futura S/W	16K	C	JC	£4.99
Space Games Pack 4	Gm	Futura S/W	16K	C	JC	£4.99
Space Invaders	Gm	Pro S/W	16K	C	LD	£8.00
Space Trek	Gm	Program Direct	32K	C	NP	£5.99
Space Pirates	Gm	Bug Byte	16K	C	KP	£8.00
Speechparts	Ed	Bryants S/W	32K	C	HW	£4.88
Squash	Gm	Aztec S/W	16K	C	IB	£5.50
Star Maze	Gm	Database Software	32K	C	NU	£7.50
Star Trek	Gm	Micro Power	16K	C	GK	£4.95
Startrek/Candy Floss	Gm	I.J.K. S/W	16K	C	IT	£5.95
Star Treck	Gm	Hexagon S/W	16K	C	JA	£5.50
Statpack	Ed	Micro-Aid	32K	C	IZ	£7.95
Storybuilder	Ed	Bryants S/W	32K	C	HW	£4.88
Stats 1	Bs	ME & P Products	16K	C	KK	£15.00
Superlife	Gm	Golem	32K	C	OB	£9.20
Super Hangman	Gm	I.J.K. S/W	32K	C	IT	£3.95
Swamp Monsters	Gm	M P Software	32K	C	JZ	£6.50
Swoop	Gm	Micro Power	32K	C	GK	£6.95
Tables Test	Ed	Bryants S/W	32K	C	HW	£4.88
Tape Copy	Ut	Davansoft	16K	C	NX	£7.50
Teacher's Toolkit	Ed	Wida Software	32K	C	FY	£30.00
Text Processing Pack	Bs	Eduquest	32K	C	NW	£10.00
The Frog	Gm	James Hager	32K	C	IV	£6.50
The Golden Baton	Gm	Digital Fantasia	16K	C	NT	£8.95
3D Maze	Gm	I.J.K. S/W	32K	C	IT	£3.95
The Time Machine	Gm	Digital Fantashia	16K	C	NT	£8.95
Timetrek	Gm	Micro Power	32K	C	GK	£6.95
Touch Typist	Ed	Computercat	16K	C	IJ	£9.95
Tower of Alos	Gm	A&F Software	16K	C	GE	£6.90

SOFTWARE LISTING

BBC

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Towns of Britain	Ed	Aztec S/W	16K	C	IB	£6.50
The Computer Programme Programs Vol 2	Do	B.B.C	32K	C	KB	£10.00
The Computer Programme Programs Vol 1	Do	B.B.C.	16K	C	KB	£10.00
Threed OXO	Gm	Micro-Aid	16K	C	IZ	£2.50
3-D Mouse Maze	Gm	Rainbow S/W	32K	C	KS	£3.50
3-D Maze	Gm	Hexagon S/W	16K	C	JA	£6.00
3D Maze	Gm	Earthshock S/W	16K	L	KI	£3.00
Utilities	Ut	Golem	16K	C	OB	£8.05
Utility A	Ut	Micro-Aid	16K	C	IZ	£4.95
Valley	Gm	ASP Software	32K	C	OD	£11.45
Varkman/Meanies	Gm	Aardvark Software	16K	C	IU	£4.00
Vogon Attack	Gm	Micromail	32K	C	OE	£6.33
Water Relations of Plant Cells	Ed	Garland Comp.	32K	C	JX	£18.82
Whole Number Arithmetic	Ed	W.E. Hunt	32K	C	KQ	£7.95
What's my number	Gm	Square Software	16K	C	NY	£6.00
Where?	Ed	Micro Power	32K	C	GK	£5.95
White Barrows Conquering Everest	Gm	ASP Software	16K	C	OD	£11.45
Wordwise	Gm	Computer Concepts	32K	C	GJ	£74.75
Word Processor	Bs	Rainbow S/W	32K	C	KS	£8.00
Word Processor	Bs	Pro S/W	32K	C	LD	£19.95
Wordy	Gm	Square Software	16K	C	NY	£6.00
World Geography	Ed	Micro Power	32K	C	GK	£5.95
Zombies	Gm	Micro Power	16K	C	GK	£3.95

DRAGON

Arcade Action	Gm	Apex S/W	32K	C	JT	£3.95
Astroblast	Gm	Dragon Data	16K	R	R KY	£19.95
Alcatraz II	Gm	Micro deal	16K	C	KY	£8.00
Berserk	Gm	Dragon Data	32K	R	DN,KY	£19.95
Black Sanctum	Gm	Dragon Data	16K	C	KY	£7.95
Breaker	Gm	Wizard S/W	32K	C	KU	£3.50
Calixto Island	Gm	Dragon Data	16K	C	KY	£7.95
Computavoice	Ut	Dragon Data	16K	C	KY	£7.95
Cosmic Invaders	Gm	Dragon Data	32K	R	DN	£19.95
Cyrus Chess	Gm	Dragon Data	16K	R	KY	£19.95
Devil's Island	Gm	Apex S/W	32K	C	JT	£4.95
Defense	Gm	Microdeal	16K	C	KY	£8.00
Dragon Mountain	Gm	Dragon Data	16	C	KY	£7.95
Dragon Invaders	Gm	Microdeal	16K	C	KY	£8.00
Dragon Selection 1	Gm	Dragon Data	32K	C	DN	£7.95
Dragon Selection 2	Ut	Dragon Data	32K	C	DN	£7.95
Examples from the Manual	Ut	Dragon Data	32K	C	DN	£7.95
Escape	Gm	Microdeal	16K	C	KY	£8.00



Flag	Gm	Dragon Data	16K	C	KY	£7.95
Flipper	Gm	Microdeal	16K	C	KY	£8.00
Forbidden City	Gm	Apex S/W	32K	C	JT	£4.95
Fruita	Gm	Wizard S/W	32K	C	KU	£6.50
Galleons	Gm	Wizard S/W	32K	C	KU	£5.00
Gamestape 1	Gm	Apex S/W	32K	C	JT	£1.95
Gamestape 2	Gm	Apex S/W	32K	C	JT	£2.95
Gamestape 3	Gm	Apex S/W	32K	C	JT	£2.95
Ghost Attack	Gm	Dragon Data	32K	R	DN	£24.95
Graphic Animator	Ut	Dragon Data	32K	C	DN	£7.95
Haunted House	Gm	Apex S/W	32K	C	JT	£3.95
Island Adventure	Gm	Apex S/W	32K	C	JT	£3.95
Invaders Revenge	Gm	Microdeal	16K	C	KY	£8.00
Jerusalem Adventure	Gm	Microdeal	16K	C	KY	£8.00
Lightpen	Ut	Microdeal	16K	C	KY	£12.00
Madness and the Minotaur	Gm	Dragon Data	32K	C	DN,KY	£7.95
Mansion Adventure	Gm	Microdeal	16K	C	KY	£8.00
Meteoroids	Gm	Dragon Data	32K	R	DN,KY	£19.95
Personal Finance	Do	Dragon Data	32K	C	DN,KY	£7.95
Pharaoh's Curse	Gm	Apex S/W	32K	C	JT	£4.95
Program Pack 1	Gm	Microdeal	16K	C	KY	£8.00
Program Pack 2	Gm	Microdeal	16K	C	KY	£8.00
Program Pack 3	Gm	Microdeal	16K	C	KY	£8.00
Quest	Gm	Dragon Data	32K	C	DN	£7.95
Scarfman	Gm	Microdeal	4K	C	KY	£8.00
Space War	Gm	Microdeal	16K	C	Ky	£8.00
Space Monopoly	Gm	Microdeal	16K	C	KY	£8.00
Sirius IV	Gm	Wizard S/W	32K	C	KU	£6.50
Sixth Sense	Gm	Kent Computer Co	32K	C	Ky	£9.95
Starship Chaleon	Gm	Dragon Data	16K	R	KY	£19.95
Special Selection 2	Gm	Dragon Data	16K	C	KY	£7.95
Triplet	Gm	Wizard S/W	32K	C	KU	£5.50
Typing Tutor	Ed	Dragon Data	16K	C	KY	£7.95
3-D Maze	Gm	Apex S/W	32K	C	JT	£3.95
Williamsburg Adventure	Gm	Microdeal	16L	C	KY	£8.00
Wizard	Gm	Wizard S/W	32K	C	KU	£6.50
Word Processor	Bs	Juniper Comp	32K	C	LA	£25.00

SHARP

3-D Basic	Gm	Kuma	6K	C	AX,AO,AB	£6.32
3-D Space Battle	Gm	Sumlock	48K	C	DN	£8.00
Acrobat	Gm	Sumlock	48K	C	DN	£6.33
Address Book	Gm	Highlight S/W	4K	C	CC,AB	£4.60
Agent 007	Gm	DCS	24K	C	JQ	£3.00
Aladdin's Cave	Gm	Kuma		C	AX,CH	£6.32
Aldebaren I	Gm	Sharpsoft	20K	C	CH	£5.85
Alien Attack	Gm	Sumlock	48K	C	DN	£6.50
Alien Attack	Gm	J Wolsencroft	24K	C	CZ	£4.60
Analysis Book	Bs	Microtek	48K	C	EQ	£95.00
Animate	Gm	Kuma	48K	C	AX,AB,AO	£9.20
Apollo Front Panel	Bs	Kuma	20K	C	AX	£14.35
Apolloword	Bs	Kuma	48K	C	AX,AC,AO	£28.70
Apolloword	Bs	Kuma	48K	D	AX,AC,AO	£63.25
Ardensoft Toolkit	Ut	Kuma	20K	C	AX	£40.25
Artillery/Biorythms	Gm	DCS	24K	C	JQ	£3.00
Asteroids	Gm	Sharpsoft	20K	C	CH	£5.85
Astro Dodge	Gm	Kuma		C	AX,CH	£6.32
Astor Shoot	Gm	Sumlock	48	C	DN	£6.33
Auto Cross	Gm	Highlight S/W	6K	C	CC,AB	£4.60
Backgammon	Gm	Highlight S/W	10K	C	CC,AB	£5.75
Bank Account	Do	Highlight S/W	6K	C	CC,AB	£4.60
BASIC-C	Ut	DCS	24K	C	JQ	£16.00
BASIC-B	Ut	DCS	24K	C	JQ	£12.00
Basic Compiler	Ut	Sharp	48K	C	AB	£34.50
Basic Extensions	Ut	Kuma	20K	C	AX,AO,AB	£14.95
Basic Plus	Ut	Kuma		C	AX	£13.80
Battleships	Gm	DCS	24K	C	JQ	£3.00
Bean Feast	Gm	DCS	24K	C	JQ	£3.00
Bingo Caller	Gm	DCS	48K	C	JQ	£3.00
Bio-Rhythm	Gm	Highlight S/W	6K	C	CC,AB	4.60
Block QC	Gm	Sharpsoft	20K	C	AB	£3.50
Block Stop	Gm	J Wolstencroft	24K	C	CZ	£4.60
Blockade	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Bomb Run	Gm	Sumlock	48K	C	DN	£7.50
Bomber	Gm	Kuma	6K	C	AX,AO,AB	£6.32
Breakout	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Breakout	Gm	Sharpsoft	20K	C	AB	£5.75
Bridge	Gm	Highlight S/W	22K	C	CC	£12.95
Broadwater Economic Simulations	Ed	BES	16K	C	KX	£28.75
Brownian Motion	Ed	Kuma		C	AX	£12.00
CPM	Ut	Chrystal	48K	C	AX,AO	£172.50
Calc II	Bs	Kuma	20K	C	AX,AO,FZ	£39.65
Camelot	Gm	Kuma	48K	C	AX,AC,AB	



					AO,FZ	£6.32
Carols	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Cash Book	Bs	Microtek	48K	C	EQ	£95.00
Cash Flow Projection	Bs	NCG Ltd	36K	C	KW	£95.00
Castle Bloodstone Adventure	Gm	Sumlock	48K	C	DN	£17.25
Casino	Gm	Kuma		C	AX	£6.32
Catch 2000/Invader	Gm	Kuma	12K	C	AX,AO,AB	£6.32
Cesil III	Ed	Kuma	20K	C	AX	£17.20
Chase	Gm	Highlight S/W	6K	C	CC,AB	£5.75
Chess	Gm	Kuma	12K	C	AX,AO,FZ,CH	£12.00
Children's Maths	Ed	Kuma		C	AX	£6.32
Chrystal Basic	Ut	Chrystal	48K	C	AX,AO	£46.00
Colditz	Gm	Sharpsoft	20K	C	CH	£8.46
Combat	Gm	Highlight S/W	6K	C	CC,AB	£5.75
Combat	Gm	Kuma	12K	C	AX,AO,AB	£6.32
Commands	Gm	Sharpsoft	20K	C	AB	£5.85
Composer	Gm	Highlight S/W	6K	C	CC,AB	£5.75
Concentration	Gm	Kuma	12K	C	AX,AO,AB	£6.32
Conflict	Gm	Sumlock	48K	C	DN	£6.33
Connect 4	Gm	Highlight S/W	6K	C	CC,AB	£4.60
Connect Four	Gm	DCS	24K	C	JQ	£3.00
Cosmiad	Gm	Highlight S/W	10K	C	CC,AB	£5.75
Cosmiad	Gm	Kuma	12K	C	AX,AC,AO,AB	£9.20
Count and Add	Ed	Highlight S/W	22K	C	CC,AB	£5.75
Cribbage	Gm	Kuma	12K	C	AX,AO	£12.00
Critical Path Analysis	Bs	NCG Ltd	36K	C	KW	£40.00
Cricket	Gm	Kuma		C	AX	£6.32
Cursed Chambers	Gm	J Wolstencroft	48K	C	CZ	£5.75
Data Base	Bs	Kuma	48K	C	AX,AO	£33.95
Data File	Gm	Gamer	48K	C	CZ	£29.95
Deferment Allowances	Bs	DCS	32K	C	JQ	£3.00
Demons Castle	Gm	DCS	48K	C	JQ	£3.00
Demon Drive	Gm	DCS	24K	C	JQ	£3.00
Disassembler	Ut	Kuma	20K	C	AX,AO,AB	£12.00
Donky Derby	Gm	Kuma	12K	C	AX,AO,AB	£6.32
Double Precision Basic	Ut	Sharp	48K	C	AB	£28.75
Double Precision Basic	Ut	Sharp	48K	D	AX	£46.00
Drunken Driver	Gm	Highlight S/W	6K	C	CC,AB	£5.75
Dybug	Ut	Kuma		C	AX	£16.65
Editor Assembler	Ut	Sharp	48K	C	AB	£15.50
Editor Assembler	Ut	Sharp	48K	D	AX	£51.75
Election '84	Gm	Sharpsoft	20K	C	CH	£8.45
Electronic Organ	Gm	Kuma	12K	C	AX	£6.32
Electronic Organ	Gm	DCS	48K	C	JQ	£3.00
Electrons I	Ed	Kuma		C	AX	£12.00
Electrons II	Ed	Kuma		C	AX	£12.00
Empire II	Gm	Sharpsoft	20K	C	AB	£5.85
Enigma	Gm	Kuma	12K	C	AX	£6.32
Escape Forth	Gm	J Wolstencroft	24K	C	CZ	£4.60
Evasion	Gm	Kuma	6K	C	AX,AO	£6.32
Executive	Gm	Kuma	6K	C	AX,AB	£9.20
Exploring Africa	Gm	Kuma	6K	C	AX,AB	£6.32
F DOS	Ut	Sharp	48K	C	AB	£57.50
Fall Out	Gm	Kuma	6K	C	AX,AO	£6.32
Fireballs	Gm	Kuma	6K	C	AX,AB	£6.32
Fishing	Gm	Sumlock	48K	C	DN	£8.50
Football Manager	Gm	Highlight S/W	10K	C	CC,AB	£5.75
Forth	Ut	Kuma		C	AX	£40.20
Foundry Package	Bs	Microtek	48K	C	EQ	POA
Four in a Row	Gm	Kuma	6K	C	AX,AO,AB	£6.32
Fox and Geese	Gm	Highlight S/W	6K	C	CC,AB	£4.60
Fruit Machine	Gm	Kuma	6K	C	AX,AO,AB	£6.32
Full Accounting	Bs	Microtek	48K	C	EQ	POA
Games Pack 1	Gm	Sumlock	48K	C	DN	£8.50
Games Pack 2	Gm	Sumlock	48K	C	DN	£8.50
Guess Word	Gm	Kuma	6K	C	AX,AB	£6.32
Hangman	Gm	Kuma	6K	C	AX,AO,AB	£6.32
Head On	Gm	Highlight S/W	10K	C	CC,AB	£6.90
Head On	Gm	Kuma	6K	C	AX,AO,AB	£6.32
Head On	Gm	Sharpsoft	20K	C	CH	£5.85
Hissing Sid	Gm	Kuma		C	AX	£6.32
Home Budget I	Do	Kuma	6K	C	AX,AC,AO,AB	£6.32
Hunter Killer	Gm	Kuma	48K	C	AX,AB	£6.32
I Spy	Ed	Highlight S/W	22K	C	CC	£5.75
Instant Addition And The Four Rules	Ed	Kuma		C	AX	£6.32
Intruder	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Invaders	Gm	Kuma	20K	C	FZ	£6.30
J S Line 4	Gm	Kuma	48K	C	AX,AB	£6.32
Junior Maths and Stepping Stones	Ed	Kuma		C	AX	£6.32
Juntori	Gm	Sharpsoft	20K	C	AB	£5.85
Kentucky Derby	Gm	Kuma		C	AX	£6.32
Knights Commander	Ut	Knights	48K	C	AX	£28.75
Knights Commander	Ut	Knights	48K	D	AX	£74.75
Knights Fortran	Ut	Knights	48K	C	AX	£34.50
Knights Wee Pascal	Ut	Knights	48K	C	AX	£23.00
Large Display	Gm	Kuma	48K	C	AX	£6.32
Las Vegas	Gm	Sharpsoft	20K	C	AB	£5.85
Ledger	Bs	NCG Ltd	40K	C	KW	£90.00
Life	Gm	Kuma	48K	C	AX,AO,AB	£9.20
Linear Programming	Bs	NCG Ltd	20K	C	KW	£45.00
Lunar	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Lunar Lander	Gm	Kuma	48K	C	AX,AO,AB	£6.32
MZ Othello	Gm	Kuma	48K	C	AX	£12.00
Machine Code Editor	Ut	DCS	24K	C	JQ	£14.00
Machine Code Editor	Ut	DCS	48K	C	JQ	£14.00
Madness	Gm	J Wolstencroft	24K	C	CZ	£4.60
Mailing List	Bs	DCS	48K	C	JQ	£6.00
Maniac	Gm	Highlight S/W	6K	C	CC,AB	£5.75
Man on the Run	Gm	Sumlock	48K	C	DN	£6.33
Map of England	Gm	Kuma	48K	C	AO	£6.32
Map of Englad	Gm	Kuma	48K	D	AX	£12.00
Mastermind	Gm	Highlight S/W	6K	C	CC,AB	£4.60
Mastermind	Gm	Kuma	48K	C	AX,AO,FZ,AB	£6.32
Match the Character	Ed	Highlight S/W	22K	C	CC,AB	£4.60
Match the Word	Ed	Highlight S/W	22K	C	CC,AB	£5.75
Maths	Ed	Highlight S/W	22K	C	CC	£5.75
Maths 1	Ed	DCS	48K	C	JQ	£3.00
Maths 2	Ed	DCS	48K	C	JQ	£3.00
Maths 3	Ed	DCS	48K	C	JQ	£3.00
Maths 4	Ed	DCS	48K	C	JQ	£3.00
Maths 5	Ed	DCS	48K	C	JQ	£3.00
Maths 6	Ed	DCS	48K	C	JQ	£3.00
Melody	Gm	Kuma	48K	C	AX	£6.32
Memory Tests	Ut	Kuma	20K	C	AX,AO,AB	£6.32
Minefield	Gm	Kuma	48K	C	AX	£6.32
Missle Defence	Gm	Sumlock	48K	C	DN	£8.50
Miz-Maze	Gm	Kuma	48K	C	AX,AO	£6.32
Monkey Climb	Gm	Kuma	48K	C	AX,AO	£6.32
Moonlander	Gm	Highlight S/W	10K	C	CC,AB	£5.75
Mortar Attack	Gm	Kuma	48K	C	AX,AO	£6.32
Music Composer/Editor	Ed	Kuma	48K	C	AX,AC,AB	£12.00
Multiple Regression	Ed	NCG Ltd	24K	C	KW	£65.00
Narpex	Ed	Kuma		C	AX	£28.70
Newton/Conservation	Ed	Kuma		C	AX	£12.00
Pac Man	Gm	Kuma		C	AX	£9.20
Pascal	Ut	Sharp	48K	C	AB	£34.50
Patience	Gm	Kuma	48K	C	AX,AO	£6.32
Payroll	Bs	Microtek	48K	C	EQ	£65.00
Payroll	Bs	NCG Ltd	40K	C	KW	£150.00
Payroll 81-C	Bs	Sumlock	48K	C	DN	£74.75
Payroll 81-D	Bs	Sumlock	48K	D	DN	£74.75
Payroll	Bs	Tridata	48K	D	ID	£170.00
Pelmanism	Gm	Sumlock	48K	C	DN	£5.75
Physics 1	Ed	DCS	48K	C	JQ	£3.00
Physics 2	Ed	DCS	48K	C	JQ	£3.00
Picture Count	Ed	Highlight S/W	22K	C	CC,AB	£5.75
Pilot	Ut	Kuma		C	AX	£17.25
Poker	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Polaris	Gm	Sumlock	48K	C	DN	£6.50
Pontoon	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Poseidon	Gm	Highlight S/W	6K	C	CC, AB	£5.75
Poster Printer	Bs	DCS	48K	C	JQ	£3.00
Princess & Monster Maze	Gm	Kuma	48K	C	AX,AB	£6.32
Program Filing Index	Bs	Kuma	20K	C	AX	£6.32
Quadrax	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Quest	Gm	J Wolstencroft	48K	C	CZ	£4.60
Race Track	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Racing	Gm	Kuma	48K	C	AX	£6.32
Raider	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Reactor	Gm	Kuma	48K	C	AX,AB	£6.32
Rhymes	Gm	Kuma	48K	C	AX,AB	£6.32
Road Hunter	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Rocket	Ed	Kuma		C	AX	£6.32
Roulette	Gm	Sumlock	48K	C	DN	£6.33
Scramble	Gm	Sumlock	48K	C	DN	£7.50
Semi Conductors I	Ed	Kuma		C	AX	£12.00
Semi Conductors II	Ed	Kuma		C	AX	£12.00
Shape Match	Gm	Kuma	48K	C	AX,AO	£6.32
Shapes	Ed	Highlight S/W	22K	C	CC,AB	£5.75
Sharp Demo	Gm	Kuma	48K	C	AX,AO	£6.32
Show Jumping	Gm	Kuma	48K	C	AX,FZ	£6.32
Shudo	Gm	Kuma	48K	C	AX	£6.32
Simon	Gm	Kuma	48K	C	AX	£6.32
Slave Interpreter	Ut	Kuma		C	AX	£16.65
Snakes and Ladders	Gm	Kuma	48K	C	AX,AO	£6.32
Solid State Non VAT Accounts	Ed	Kuma		C	AX	£33.90
Solid State VAT Accounts	Ed	Kuma		C	AX	£33.90
Space Battle	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Space Invaders	Gm	Kuma	48K	C	AX,AO,AC,AB	£6.32
Space Bomber	Gm	Sumlock	48K	C	DN	£7.00
Space Pursuit	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Space Rescue	Gm	Sumlock	48K	C	DN	£7.50
Space Invaders	Gm	Sumlock	48K	C	DN	£7.50
Star Trek	Gm	Kuma	10K	C	AX,AC,AO	£6.32

REFERENCE

SOFTWARE LISTING

SHARP

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Stella Adventure	Gm	Sumlock	48K	C	DN	£15.50
Stock Control/Invoicing	Bs	Microtek	48K	C	EQ	£316.00
Stock Control	Bs	NCG Ltd	36K	C	KW	£40.00
Stomper	Gm	Kuma	10K	C	AX,FZ,AB	£6.32
Stomper/Minefields	Gm	Sharpsoft	20K	C	AB	£5.85
Stoneville Manor Adventure	Gm	Sumlock	48K	C	DN	£10.35
Submarine	Gm	Kuma	10K	C	AX,AO	£6.32
Super Simon	Gm	Kuma	48K	C	AX,AO	£6.32
Supercopy	Ut	Kuma	20K	C	AX	£12.00
Superfire	Gm	Kuma	48K	C	AX	£6.32
Supermouse	Gm	Kuma	48K	C	AX,CH	£6.32
Swordmen	Gm	Kuma	48K	C	AX,AO	£9.20
Tank Wall	Gm	Kuma	48K	C	AX,AO	£6.32
Tank Practice	Gm	DCS	48K	C	JQ	£3.00
Tenpin Bowling	Gm	Kuma	48K	C	AX,AO	£6.32
Timetabling Aid	Ed	Kuma	20K	C	AX	£22.45
Towering Inferno	Gm	Sharpsoft	20K	C	CH,AB	£5.85
Towers	Gm	DCS	48K	C	JQ	£3.00
Towers of Hanoi	Gm	Kuma	48K	C	AX	£6.32
Track Layer	Gm	Kuma	48K	C	AX,CH	£6.32
Trader Smith	Gm	Kuma	48K	C	AB	£6.32
Tudor Village	Gm	DCS	48K	C	JQ	£3.00
Trench Mortars	Gm	DCS	48K	C	JQ	£3.00
Tycoon	Gm	Kuma	48K	C	AX,AO	£6.32
Typewriter	Do	DCS	48K	C	JQ	£3.00
UFO	Gm	Kuma	6K	C	AX,AC	£6.32
Video Draughts	Gm	DCS	48K	C	JQ	£3.00
War at Sea	Gm	DCS	48K	C	JQ	£3.00
Waves I	Ed	Kuma		C	AX	£12.00
Waves II	Ed	Kuma		C	AX	£12.00
Wizards Quest Adventure	Gm	Sumlock	48K	C	DN	£10.50
Wordpro	Bs	Kuma	48K	C	AX,AC	£45.45
Wordpro	Bs	Kuma	48K	C	AX,AC	£91.95
Wordprocessor LW	Bs	DCS	48K	C	JQ	£10.00
Wordprocessor RW	Bs	DCS	48K	C	JQ	£8.00
Zen Dos	Ut	Kuma	4K	C	AX	£66.16
Zen Editor Assembler	Ut	Kuma	20K	C	AX,AO,AB	£22.45
Zenmod	Ut	Kuma	4K	C	AX,AB	£12.00
Z-80 Disassembler	Ut	Sumlock	48K	C	DN	£12.00

SPECTRUM

Adventure	Gm	Abersoft	48K	C	HX	£9.95
Autochef	Gm	CCS	16K	C	KZ	£5.00
Alien	Gm	Spectre Soft	16K	C	JJ	£3.95
Angles	Ed	AVC Software	16K	C	IM	£3.00
Arcade Pack 1	Gm	Ohmega Electronics	16K	C	IO	£4.82
Assembler	Ut	Artic	16K	C	EH	£9.95
Associative Database Systen	Do	Docimodus	16K	C	JD	£15.00
Atoms	Gm	B.G. Cornhill	16K	C	JK	£5.50
Airline	gm	CCS	16K	C	KZ	£5.00
Bit, Byte Rotation	Ut	B.G. Cornhill	16K	C	JK	£4.50
Bomber	Gm	Llamasoft	16K	C	KG	£2.95
City	Gm	Docimodus	48K	C	JD	£8.00
Count-down	Ed	AVC Software	16K	C	IM	£3.00
Database	Do	Chromasoft	16K	C	KF,CN	£4.50
Dallas	Gm	CCS	16K	C	KZ	£5.00
Digital X-Word Compiler	Gm	N. Darwood	8K	C	JB	£6.00
Escape	Gm	New Generation S/W	16K	C	CH,CN	£4.95
Fortune	Do	AVC Software	16K	C	IM	£3.00
French	Ed	AVC Software	16K	C	IM	£3.00
Game of Logic	Ed	N. Darwood	16K	C	JB	£8.00
Galaxian	Gm	Artic	16K	C	EH	£3.95
Gobbleman	Gm	Artic	16K	C	EH	£3.95
Graph	Ed	AVC Software	16K	C	IM	£3.00
Graph	Ut	Spectre Soft	16K	C	JJ	£4.95
Graphics Creator	Ut	Llamasoft	16K	C	KG	£2.95
Great Britain Ltd	Gm	S.W. Hesel S/W	48K	C	IW	£14.39
Hangperson	Ed	AVC Software	16K	C	IM	£3.00
Hangman	Gm	Spectre Soft	16K	C	J	£4.95
Inheritance	Gm	S.W. Hessel S/W	48K	C	IW	£5.95
Learning	Ed	AVC Software	16K	C	IM	£3.00
Magic Cards	Gm	B.G. Cornhill	16K	C	JK	£3.50
Mazing	Gm	Spectre Soft	16K	C	JJ	£4.95
Mazeman	Gm	Abersoft	16K	C	HX	£4.95
Modeller X	Bs	CCS	16K	C	KZ	£8.00
Namitar Raiders	GM	Artic	16K	C	EH	£3.95
Parity	Ed	N.Darwood	16K	C	JB	£6.00
Payroll	Bs	V&H Computer	48K	C	IL	£14.65
Physprob	Ed	AVC Software	16K	C	IM	£3.00
Print Shop	Gm	CCS	16K	C	KZ	£5.00
Reversi	Gm	Spectre Soft	16K	C	JJ	£4.95
Space Inturders	Gm	Quicksilva	16K	C	GD	£5.85
Spectral Invaders	Gm	Bug Byte	16K	C	CH	£5.00
Tables	Ed	AVC Software	16K	C	IM	£3.00
Turtle	Ed	AVC Software	16K	C	IM	£3.00
User-Defined Graphics	Ut	B.G. Cornhill	16K	C	JK	£1.50
Wordprocess	Bs	Spectre Soft	16K	C	JJ	£4.95

TRS-80

A-Maz-Ing	Gm	Molimerx	4K	C	AJ	£6.33
Acquire	Gm	Avalon Hill	16K	C	IA	£13.95
Adventure I	Gm	Adventure Int.	16K		AJ	£13.77
Adventure III	Gm	Adventure Int.	16K	C	AJ	£13.77
Adventure III	Gm	Adventure Int.	16K	D	AJ	£13.77
Adventures No.1	Gm	Cload Inc	16K	C	IA	£11.95
Advanced Programming Aid	Ut	Kansas	16K	C	IH	£12.50
Adventureland	Gm	Adventure Int.	16K	C	IS	£12.50
					AJ	£18.99
Adventure Mysterious	Gm	Adventure Int.	16K	C	AJ	£10.06
Adventure Mysterious	Gm	Adventure Int.	32K	D	AJ	£13.50
Aid, Basic	Ut	J.K. Gosden S/W	16K	C	LB	£9.00
Air Raid	Gm	MA	16K	C	IS	£7.50
Air Traffic Control	Gm	MA	16K	C	IS	£9.50
Airflight Simulation	Gm	Instant S/W	16K	C	GB,AB	£9.95
Airmail Pilot	Gm	Instant S/W	16K	C	GB,AB	£8.50
Ajedit	Bs	Molimerx	32K	C	AJ	£49.95
Aladdin	Ed	Bryants S/W	16K	C	HW	£3.75
Alien Armada	Gm	Molimerx	16K	C	IS	£11.50
					AJ	£10.06
Alien Armada	Gm	Molimerx	32K	D	AJ	£13.23
Alien Attack Force	Gm	Instant S/W	16K	C	GB,AB	£8.50
Alien Attack	Gm	Kansas	16K	C	IH	£9.50
Alien Defence	Gm	Soft Sector Mkting	16K	C	IS	£11.50
					GB	£15.50
Alien Defence	Gm	Soft Sector Mkting	16K	D	IA	£11.95
All Stars	Gm	Instant S/W	16K	D	GB	£26.50
					AB	£28.95
All Turret Gunner	Gm	Instant S/W	16K	C	GB,AB	£8.50
Amateur Log	Ut	Molimerx	32K	D	AJ	£18.40
Amazing Maze						
Touchdown	Gm	Kansas	16K	C	IH	£7.50
Angel Worms	Gm	Adventure Int.	8K	C	AB	£14.35
Animation	Ut	Molimerx	16K	C	AJ	£17.20
Animation	Ut	Molimerx	32K	D	AJ	£20.65
Android Nim	Gm	Molimerx	16K	C	IS	£7.50
					AJ	£10.06
Arcade Invaders	Gm	Kansas	16K	C	IH	£9.50
Arcade Scramble	Gm	Kansas	16K	C	IH	£9.50
Armoured Patrol	Gm	Adventure Int.	16K	C	IS	£15.00
					GB	£15.00
Armoured Patrol	Gm	Adventure Int.	16K	D	AB	£18.99
Ascertain	Ut	Kansas	16K	C	IH	£6.25
Assembly Package	Ut	Molimerx	32K	D	AJ	£74.75
Asteroids	Gm	Molimerx	16K	C	AJ	£10.06
Asteroids	Gm	Molimerx	32K	D	AJ	£13.50
Astro Navigator	Gm	Molimerx	16K	C	AJ	£14.95
Astroball	Gm	Molimerx	16K	C	AJ	£13.77
Astrolog	Ed	Molimerx	16K	C	AJ	£10.93
Astronomical Calendar	Ed	Molimerx	16K	C	AJ	£10.93
Asylum	Gm	Med Systems	16K	C	IS	£9.50
					BT	£12.00
Atlantian Odyssey	Gm	Guild	16K	C	IS	£11.50
					GB	£19.75
Atlantian Odyssey	Gm	Guild		D	GB	£21.50
					GB,BT	£10.95
Attack Force	Gm	Big 5 S/W	16K	C	IS	£11.50
BI Nuclear Bomber	Gm	Instant S/W	16K	C	GB	£12.50
					BT	£12.95
BQ81	Bs	Baust Computing	48K	D	HA	£79.95
Back 40	Gm	Molimerx	16K	C	AJ	£10.06
Back 40	Gm	Molimerx	32K	D	AJ	£13.50
Back 40 III	Gm	Adventure Int.	16K	C	AB	£14.35
Backgammon	Gm	Adventure Int.	16K	C	IS	£7.50
					AB	£7.99
Backgammon	Gm	Kansas	16K	C	IH	£8.50
Balrog Sampler	Gm	Adventure Int.	16K	D	AB	£33.70
Bandito	Gm	Acorn	16K	C	AJ	£7.49
Barricade	Gm	MA	16K	C	IS	7.50
Bandit/Maze Chase	Gm	Kansas	16K	C	IH	£7.50
Banner	Ut	Kansas	16K	C	IH	£7.50
Basic Bidding	Gm	Bryants S/W	16K	C	HW	£9.00
Basic Compiler Accel.	Ut	Microsoft	16K	C	AJ	£22.94
Basic Compiler Accel. 3	Ut	Microsoft	16K	C	AJ	£45.95
Basic Compiler Accel. 3	Ut	Microsoft	16K	D	AJ	£49.95
Basic Insert	Ut	Molimerx	16K	C	AJ	£10.95
Basic Insert	Ut	Molimerx	32K	D	AJ	£14.39
Basic Programming System	Ut	Instant S/W	16K	C	AB	£12.50
Basketball	Gm	Molimerx	16K	C	AJ	£10.95
Basketball	Gm	Molimerx	32K	D	AJ	£14.39
Battle Bastogne	Gm	MA	16K	C	IS	10.50
Battle St. Vith	Gm	MA	16K	C	IS	10.50
Battle of Britain	Gm	Molimerx	16K	C	AJ	£15.55
Battle Ground	Gm	Instant S/W	16K	C	GB,AB	£8.50
Bearings	Ed	Bryants S/W	16K	C	HW	£3.75
Bedchest III	Gm	Adventure Int.	16K	C	AB	£20.95
Beewary	Gm	Molimerx	16K	C	IS	£7.50
					AJ	£10.06

Beginner's Russian	Ed	Instant S/W	16K	C	GB,AB	£8.50
Biorhythm	Ed	Molimerx	16K	C	AJ	£8.63
Biorhythms	Do	Kansas	16K	C	IH	£7.50
B-I Nuclear Bomber	Gm	Avalon Hill	16K	C	IA	£11.95
Blackboard	Ut	Molimerx	16K	C	AJ	£10.06
Blackjack Master	Gm	Molimerx	16K	C	AJ	£21.15
Blackjack Master	Gm	Molimerx	32K	D	AJ	£25.42
Blink 1	Ut	Molimerx	32K	D	AJ	£17.00
Blockade	Gm	Molimerx	16K	C	AJ	£7.48
Bradley Estate Mystery	Gm	Ogre	16K	C	IC	£10.00
Bridge Partner	Gm	MA	16K	C	IS	£13.50
Bridge 2.0	Gm	MA	16K	C	IS	£13.50
Bright & Early Build High Knights Tour	Ed	Molimerx	16K	C	AJ	£8.90
	Gm	Kansas	16K	C	IH	£7.50
Business Analysis	Bs	Instant S/W	16K	C	GB	£59.25
Business Analysis	Bs	Instant S/W	16K	D	GB,AB	£82.00
Buzzword	Ed	Molimerx	16K	C	AJ	£5.75
Byte Saver	Ut	Kansas	16K	C	IH	£6.25
CTN Stock	Bs	Baust Computing	48K	D	HA	£79.00
Calendar	Ut	Molimerx	16K	C	AJ	£10.29
Car Doctor	Do	Kansas	16K	C	IH	£7.50
Cash Register	Bs	Molimerx	16K	C	AJ	£10.29
Catalogue	Do	Bryants S/W	16K	C	HW	£3.75
Character and Monster Generator	Gm	Ogre	16K	C	IC	£12.00
Checker King	Gm	Personal S/W	16K	C	AJ	£16.10
Chemical Formulae	Ed	Molimerx	16K	C	AJ	£10.95
Cheque Book	Dm	Molimerx	16K	C	AJ	£15.53
Chess Partner	Gm	MA	16K	C	IS	£9.50
Claws	Ed	Bryants S/W	16K	C	HW	£3.75
City Encounters	Ut	Molimerx	16K	C	AJ	£17.20
Climate Comp	Bs	Instant S/W	16K		AB	£20.50
Cload Cassette	Gm	Cload Inc	16K	C	IA	£5.75
Cloze	Ed	Bryants S/W	16K	C	HW	£3.75
Cluster War	Gm	J.K. Gosden S/W	16K	C	LB	£11.00
Code Breaker	Gm	Molimerx	16K	C	AJ	£7.49
Combat	Gm	Adventure Int.	16K	C	AB	£12.50
Company Director	Gm	Molimerx	16K	C	AJ	£17.19
Compression Utility	Ut	Instant S/W	16K	C	GB	£15.75
					AB	£16.50
Comproc	Ut	Molimerx	16K	C	AJ	£15.80
Comput-A-Organ	Ed	Molimerx	16K	C	AJ	£6.85
Computer Acquire	Gm	Adventure Int.	16K	C	IA	£10.15
Computer Acquire	Gm	Avalon Hill	16K	C	IA	£17.25
Computer Pools	Do	Molimerx	16K	C	AJ	£16.68
Conflict	Gm	MA	16K	C	IS	£10.50
Conflict 2500	Gm	Avalon Hill	16K	C	IA	£12.95
Consequest of Chester Wood	Gm	Adventure Int.	16K	C	AB	£18.99
Constellation	Ed	Molimerx	16K	C	AJ	£14.30
Constellation	Ed	Molimerx	32K	D	AJ	£17.83
Conv/CPM	Ut	Molimerx	32K	D	AJ	£20.70
Convoy Raider	Gm	Avalon Hill		C	IA	£10.95
Cop 16K	Ut	Molimerx	16K	C	AJ	£12.95
Copsys	Ut	Molimerx	16K	C	AJ	£12.95
Corplan	Gm	Molimerx	16K	C	AJ	£32.79
Cosmic Fighter	Gm	Big 5 S/W		C	IA	£10.95
Cosmic Fighter	Gm	MA	16K	C	IS	£11.50
Cosmic Patrol	Gm	Instant S/W	16K	C	GB,AB	£12.50
Cosmic Patrol	Gm	Instant S/W	16K	D	GB,AB	£16.25
Cowboys	Gm	P.C.S.	8K	C	IE	£4.25
Creole Lobster Catcher	Gm	Molimerx	16K	C	AJ	£10.06
Cribbage Player	Gm	MA	16K	C	IS	£9.50
Cribbage	Gm	Molimerx	16K	C	AJ	£14.38
Crocodiles	Ed	Bryants S/W	16K	C	HW	£3.75
Cross Reference	Bs	Molimerx	16K	C	AJ	£8.45
Crowley Manor	Gm	MA	16K	C	IS	£15.00
Crown of CWL IMDRAS part I	Gm	Ogre	16K	C	IC	£10.00
Crown of CWL IMDRAS part 2	Gm	Ogre	16K	C	IC	£10.00
Crusaders	Gm	Molimerx	16K	C	AJ	£13.51
Cube Hunt	Gm	Molimerx	16K	C	AJ	£10.35
DLDIS	Ut	Instant S/W	16K	D	GB	£15.50
					AB	£16.50
DSM	Ut	Racet Computers	32K	D	AJ	£46.00
D-Day	Gm	MA	16K	C	IS	£10.50
Danger in Orbit	Gm	Instant S/W	16K	C	AB	£12.50
Danger in Orbit	Gm	Instant S/W	16K	D	GB	£15.50
Daredevil	Gm	Instant S/W	16K	C	IA	£8.50
Dark Void	Gm	Molimerx	16K	C	AJ	£10.06
Darts	Gm	Molimerx	16K	C	AJ	£10.06
Data Base Management	Bs	Hubert Howe	32K	C	AJ	£28.75
Data Base Management	Bs	Hubert Howe	32K	D	AJ	£32.20
Datadisk	Bs	Kansas	32K	D	IH	£24.50
Data File	Bs	Kansas	16K	C	IH	£9.50
Datestone of Ryn	Gm	Automated Simulation	16K	C	GB	£13.50
Datestone of Ryn	Gm	Automated Simulation	16K	C	IS	£14.50
Dataquiz	Ut	Bryants S/W	16K	C	HW	£3.75
Day of the Week	Bs	Molimerx	4K	C	AJ	£5.75
Death Dreadnaught	Gm	MA	16K	C	IS	£10.50
Deathmaze	Gm	MA	16K	C	IS	£10.50
Deathmaze 5000	Gm	Med Systems	16K	C	IA	£10.95
Decision Master	Ut	Sytonic S/W	32K	D	GB	£35.50
Decimal Dan	Ed	Bryants S/W	16K	C	HW	£3.75
Defence Command	Gm	Big 5 S/W	16K	C	IS	£11.50
					GB,BT	£10.95
Defend	Gm	Molimerx	16K	C	AJ,CH	£14.95
Defend	Gm	Molimerx	32K	D	AJ	£18.40
Deflections	Gm	Adventure Int.	8K	C	AB	£14.35
Delay	Ut	Kansas	16K	C	IH	£6.25
Demo II	Gm	Instant S/W	16K	C	IE	£6.50
Descriptive Statistics	Bs	Molimerx	16K	C	AJ	£15.40
Differential Equations	Bs	Molimerx	16K	C	AJ	£16.10
Direction Finder	Ed	Molimerx	16K	C	AJ	£15.40
Disassembler	Ut	Molimerx	16K	C	AJ	£10.35
Disassembler	Ut	Buy Byte	16K	C	GB	£8.25
					AB	£8.50
Diassembler	Ut	Kansas	16K	C	IH	£8.50
Disc Directory	Ut	Molimerx	32K	D	AJ	£20.13
Disc Editor	Ut	Instant S/W	16K	D	GB	£30.50
Disc Scope	Ut	Instant S/W	16K	D	GB	£15.50
Discaid	Ut	Molimerx	32K	D	AJ	£19.49
Discator	Ut	Molimerx	32K	D	AJ	£29.90
Displus	Ut	J.K. Gosden S/W	16K	C	LB	£10.00
Dnieper River Line	Gm	Avalon Hill	32K	C	IA	£12.95
Dnieper River Line	Gm	Avalon Hill	32K	D	IA	£17.55
Doctor Chips	Gm	Instant S/W	16K	C	GB	£12.50
Doctor Chips	Gm	Instant S/W	16K	D	GB	£14.75
Domes of Kilgari	Gm	MA	16K	C	IS	£11.50
Dominoes	Gm	Molimerx	16K	C	AJ	£9.15
Dominoes	Gm	Molimerx	32K	D	AJ	£12.65
Doomwatch	Do	Kansas	16K	C	IH	£7.50
Dosort	Ut	Molimerx	32K	C	AJ	£27.60
Double Take 3741	Ut	Molimerx	64K	D	AJ	£44.85
Double Up	Ut	Kansas	16K	C	IH	£6.25
Dragon Quest	Gm	Instant S/W	16K	C	IS	£10.50
Dragon Quest	Gm	Instant S/W	16K	D	GB	£17.50
Dragons of Hong Kong	Gm	Adventure Int.	32K	C	AB	£18.99
Draughts	Gm	Molimerx	16K	C	AJ	£14.95
Draughts	Gm	Molimerx	32K	D	AJ	£18.40
Draw and Graphics Resolver	Bs	Molimerx	16K	C	AJ	£10.95
Dreamworld	Gm	Molimerx	16K	C	AJ	£10.06
Driver	Gm	Molimerx	4K	C	AJ	£6.33
Duel-n-Droids	Gm	Molimerx	16K	C	IS	£9.50
Dungeon Escape	Gm	Computer Shack	16K	C	GB	£11.95
Dungeon Escape	Gm	Computer Shack	16K	D	GB	£15.50
Duplex	Ut	J.K. Gosden S/W	16K	C	LB	£14.00
Dynamic Device Driving	Ut	Instant S/W	16K	D	GB	£20.50
Dynamic Device Driving	Ut	Instant S/W	16K	C	GB	£15.50
					AB	£16.50
Early Numbers	Ed	Bryants S/W	16K	C	HW	£3.75
Edas	Ut	Molimerx	32K	D	AJ	£53.49
Edit	Ut	Molimerx	16K	C	AJ	£20.13
Editor Assembler Plus	Ut	Molimerx	16K	C	AJ	£24.95
Editor Assembler and Debugger	Ut	Kansas	16K	C	IH	£19.50
Edjust	Ut	Molimerx	32K	D	AJ	£18.40
Eights	Gm	Emjay	16K	C	IG	£7.00
Electric Accountant	Bs	Molimerx	48K	D	Aj	£28.75
Electronic Breadboard	Ut	Instant S/W	16K	C	GB	£39.75
					AB	£40.95
Elemental Maze	Ed	Molimerx	16K	C	Aj	£10.93
Eliminator	Gm	Adventure Int.	16K	C	IS	£15.00
Eliminator	Gm	Adventure Int.	16K	d	AB	£18.99
Emperor	Gm	Molimerx	16K	C	AJ	£15.53
Empire	Gm	MA	16K	C	IS	£10.50
Empire of the Overmind	Gm	Avalon Hill	48K	C	IA	£17.95
Enhanced Basic	Ut	Molimerx	16K	C	AJ	£27.60
Enhanced Basic	Ut	Molimerx	32K	D	AJ	£31.05
Epson Patch	Ut	Molimerx	16K	C	Aj	£13.80
Epson Patch	Ut	Molimerx	32K	D	Aj	£17.25
Escape from Tramm	Gm	Adventure Int.	16K	C	IS	£15.00
					AB	£18.99
Everest Explorer	Gm	Molimerx	16K	C	AJ	£10.06
Escape	Gm	Kansas	16K	C	IH	£7.50
Everest Explorer	Gm	Molimerx	32K	D	AJ	£13.50
Everyday Russian	Ed	Instant S/W	16K	C	GB,AB	£8.50
F for Freddie	Gm	Kansas	16K	C	IH	£9.50
Facto Bingo	Ed	Bryants S/W	16K	C	HW	£3.75
Facto Finder	Ed	Bryants S/W	16K	C	HW	£3.75
Fairytale Adventure	Gm	Molimerx	16K	C	AJ	£10.06
Fastgammon	Gm	MA	16K	C	IS	£14.00
Family Tree	Do	Molimerx	32K	D	AJ	£20.70
Farmer Brown	Gm	Molimerx	16K	C	AJ	£7.49
Fed	Ut	Molimerx	32K	D	AJ	£27.60
Fetch	Ut	Molimerx	32K	D	AJ	£15.53
File Handling for Cassette	Ut	Molimerx	16K	C	AJ	£15.93
File Handling for Disc	Ut	Molimerx	32K	D	AJ	£28.75
Filter Package	Ut	Molimerx	32K	D	AJ	£40.25
Financial Analysis	Bs	Molimerx	32K	D	Aj	£46.00
Find it Quick	Ut	Instant S/W	16K	D	GB	£39.75
					AB	£40.95
Flight Path	Gm	Instant S/W	16K	C	GB,AB	£8.50
Flight Plan	Ut	Molimerx	32K	D	AJ	£20.70
Flippy	Gm	MA	16K	C	IS	£10.50
Flight Simulator	Gm	MA	16K	C	IS	£20.00
Flying Circus	Gm	Instant S/W	16K	D	AB	£24.50
					GB	£25.00
Forbidden City	Gm	Fantastic S/W	16K	D	IA	£24.95
Forbidden Planet	Gm	Fantastic S/W	48K	D	IA	£24.95
Forest of Mordor	Gm	Molimerx	16K	C	AJ	£8.63
Fortran	Ut	Molimerx	32K	D	AJ	£74.75

SOFTWARE LISTING

TRS-80

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Fortress	Gm	Soft Sector Mkting	16K	D	IA	£15.50
Fortress	Gm	Soft Sector Mkting	16K	C	IA	£11.95
Fortress	Gm	MA	16K	C	AJ	£10.50
Fox and Hounds	Gm	Molimerx	16K	C	AJ	£7.48
French Vocabulary	Ed	Molimerx	16K	C	AJ	£17.19
Frog	Gm	Adventure Int.	16K	C	AB	£12.50
Frog	Gm	Kansas	16K	C	AJ	£7.48
Frogs/Logic	Gm	Kansas	16K	C	IH	£7.50
Galatic Empire	Gm	Adventure Int.	16K	C	IS	£10.50
					AJ,AB	£9.78
Galatic Firebird	Gm	Kansas	16K	C	IH	£9.50
Galactic Revolution	Gm	Adventure Int.	16K	C	AB	£18.99
Galactic Revolution	Gm	Adventure Int.	16K	C	IS	£10.50
Galactic Trader	Gm	Adventure Int.	16K	C	IS	£10.50
Galactic Trader	Gm	Adventure Int.	32K	D	AB	£18.99
Galaxy Invasion	Gm	Big 5 S/W	16K	C	IS	£11.50
Gamesaver	Ut	J.K. Gosden S/W	16K	C	LB	£6.50
Game Of Life	Gm	MA	16K	C	IS	£6.50
Gammon Challenger	Gm	MA	16K	C	IS	£10.50
Gammon Challenger	Gm	Molimerx	16K	C	AJ	£10.06
Gammon Challenger	Gm	Molimerx	32K	D	AJ	£13.51
Gauntlet of Death	Gm	Programmer's Guild	16K	C	GB	£15.50
Gauntlet of Death	Gm	Programmer's Guild	16K	C	GB	£15.50
G.C.E. O'Levels						
Tape 1	Ed	Bryants S/W	16K	C	HW	£9.00
Tape 2	Ed	Bryants S/W	16K	C	HW	£9.00
Gencop	Ut	Molimerx	16K	C	AJ	£10.06
Geography Explorer	Ed	Instant S/W	16K		AB	£40.95
Ghost Town	Gm	Adventure Int.	16K	C	IS	£12.50
					AB	£18.99
Golfers Challenge	Gm	MA	16K	C	IS	£10.50
Golden Voyage	Gm	Adventure Int.	16K	C	IS	£15.00
					AB	£18.99
Golf	Gm	Molimerx	32K	D	AJ	£17.19
Good Games No.I	Gm	Cload Inc	16K	C	IA	£11.95
Guns of Fort Defiance	Gm	Avalon Hill	32K	C	IA	£12.95
Guns of Fort Defiance	Gm	Avalon Hill	32K	D	IA	14.95
Gun World	Gm	Ogre	16K	C	IC	£10.00
Graphics Assembler	Ut	Kansas	16K	C	IH	£7;50
Graphs	Ed	Bryants S/W	16K	C	HW	£3.75
Graphit	Ut	Molimerx	48K	D	AJ	£19.55
Gridref	Ed	Bryants S/W	16K	C	HW	£3.75
Hellfire Warrior	Gm	MA	16K	C	IS	£21.00
Highway Code	Do	Bryants S/W	16K	C	HW	£3.75
HMS Impetuous	Gm	Adventure Int.	32K	D	AB	£18.99
Home Budget Planner	Bs	Emjay	16K	C	IG	£8.00
House of 30 Gables	Gm	Instant S/W	16K	C	AB	£8.50
Hyperlight Patrol	Gm	Fantastic S/W	16K	D	GB	£11.25
ID Mailing List	Ut	Instant S/W	16K	D	GB	£19.50
					AB	£20.50
IRV	Ut	Instant S/W	16K	D	GB	£23.75
IRV	Ut	Instant S/W	16K	C	IS	£16.50
					AB	£20.50
Infinite Startrek	Gm	Kansas	16K	C	IH	£9.50
Inventory Control	Bs	MA	16K	C	IS	£11.00
Inventory Control	Bs	MA	32K	D	IS	£50.00
Inventory'S'	Bs	MA	16K	C	IS	£17.00
Invoicing	Bs	Tridata	48K	D	ID	£140.00
Instant Calculator	Do	MA	16K	C	IS	£8.50
Interlude	Gm	Syntonic S/W		C	GB	£20.25
Interlude	Gm	MA	16K	C	IS	£14.00
Invaders From Space	Gm	MA	16K	C	IS	£10.50
Invasion Orion	Gm	Automated Simulation		C	IS	£18.50
Invasion Orion	Gm	Automated Simulation		D	GB	£15.75
Investor's Paradise	Gm	Instant S/W	16K	C	AB	£8.50
Jabbertalky	Gm	Automated Simulation	16K	D	GB	£18.95
Jet Fighter Pilot	Gm	Instant S/W	16K	C	GB,AD	£12.50
Jumbo	Gm	Molimerx	16K	C	AJ	£17.25
Jumbo	Gm	Molimerx	32K	D	AJ	£19.55
Jumbles	Ed	Bryants S/W	16K	C	HW	£3.75
KFS-80	Ut	MA	32K	D	IS	£75.00
Keyboard 80	Do	MA	16K	C	IS	£7.50
KVP	Ut	MA	16K	C	IS	£10.50
KVP Disk	Ut	MA	16K	D	IS	£18.50
Keyspeed	Ut	Kansas	16K	C	IH	£6.25
Kid's Gallery	Gm	Instant S/W	16K	C	AB	£8.50
Kid Venture I	Gm	MA	16K	C	IS	£12.50
Kreigspiel II	Gm	MA	16K	C	IS	£10.50
Label	Gm	Instant S/W	16K	C	GB	£18.75
					AB	£20.50
Labyrinth	Gm	Med Systems	16K	C	IA	£11.75
					BT	£10.95
Labyrinth	Gm	MA	16K	C	IS	£10.50
Laser Defence	Gm	Med Systems	16K	C	GB	£11.95
Laser Defence	Gm	Med Systems	16K	D	GB	£14.50
LED	Ut	Molimerx	48K	D	AJ	£19.55
Life Two	Gm	MA	16K	C	IS	£7.50
Little Red Riding Hood	Gm	Adventure Int.	16K	C	AB	£14.35
Local Call for Death	Gm	Adventure Int.	32K	D	AB	£18.99
Lords of Karma	Gm	Avalon Hill	40K	D	IA	£14.95
Lord of the Rings	Gm	Kansas	16K	C	IH	£9.50
Lost Dutchmans Gold	Gm	MA	16K	C	IS	£9.50
Lunar Lander	Gm	Adventure Int.	16K	C	IS	£11.50
					AB	£12.50
Lunar Lander	Gm	Adventure Int.	16K	D	AB	£18.99
Lprint	Ut	Kansas	16K	C	IH	£6.25
Mach 1	Ut	J.K. Gosden S/W	16K	C	LB	£9.00
Mach 4	Ut	J.K. Gosden S/W	16K	C	LB	£14.00
Magic Paper Calculator	Do	MA	16K	C	IS	£9.50
Mail File	Ut	Instant S/W		D	GB	£75.25
Maillist Mod III	Bs	MA	48K	D	IS	£55.00
Martian Adventure	Gm	Emjay	16K	C	IG	£12.00
Master Cab	Ut	Bryants S/W	16K	C	HW	£3.75
Master Directory	Ut	Instant S/W	16K	D	GB	£21.00
Master Reversi	Ut	Instant S/W	16K	D	GB	£23.75
Matchmaker	Gm	Adventure Int.	16K	C	AB	£14.35
Maths Master	Ed	Instant S/W	16K	C	AB	£8.50
Maxi-Micro Manager	Bs	Adventure Int	48K	R	AB	£84.50
MDOC	Ut	J.K. Gosden S/W	16K	C	LB	£7.50
Memdump	Ut	MA	16K	C	IS	£6.00
Mentor	Ut	J.K. Gosden S/W	16K	C	LB	£16.00
Mean Checkers	Gm	MA	16K	C	IS	£11.50
Merge	Ut	Kansas	16K	C	IH	£6.25
Meteor Mission	Gm	Big 5 S/W	16K	C	IA	£10.95
Meteor Mission II	Gm	MA	16K	C	IS	£11.50
Microcosm I	Gm	Basic & Beyond	16K	C	IA	£11.95
Microcosm 2	Gm	Basics & Beyond	16K	C	IA	£19.95
Microcosm 3	Gm	Basics & Beyond	16K	C	IA	£19.50
Microtype	Do	Kansas	16K	C	IH	£12.50
Midway Campaign	Gm	Avalon Hill	16K	C	IA	£10.95
Minicrossword	Ed	MA	16K	C	IS	£12.50
Minotaur	Gm	Instant S/W	16K	C	AB	£8.50
Missile Attack	Gm	Adventure Int.	16K	C	AB	£12.50
Mission Impossible	Gm	Adventure Int.	16K	C	IS	£12.50
					AB	£18.99
Model 1 to 3	Ut	Kansas	16K	C	IH	£8.50
Monopolist	Gm	Baust Computing	4K	C	HA	£7.95
Monopolist	Gm	Baust Computing	4K	D	HA	£10.95
Morloc's Tower	Gm	MA	16K	C	IS	£14.50
Mortgage Calculator	Do	MA	16K	C	IS	£5.00
Mountain Shoot	Gm	Adventure Int.	16K	D	AB	£18.99
Multiple Choice Creation	Ed	Kansas	16K	C	IH	£12.50
Multiprint	Ut	Kansas	16K	C	IH	£8.50
Music Master	Gm	Instant S/W		C	GB,AB	£8.50
Musical Yat-C	Gm	Adventure Int.	16K	C	AB	£12.50
Money Box	Ed	Bryants S/W	16K	C	HW	£3.75
Mystery Funhouse	Gm	Adventure Int.	16K	C	IS	£12.50
					AB	£18.99
Newdos-80 Ver 2.0	Ut	MA	16K	D	IS	£110.00
Newdos +	Ut	MA	16K	D	IS	£45.00
Newdos + 40 Track	Ut	MA	16K	D	IS	£47.50
News 80	Bs	Baust Computing	48K	D	HA	POA
Night Flight	Gm	Instant S/W	16K	C	GB,AB	£8.50
Nominal	Bs	Tridata	48K	D	ID	£170.00
Norton Forth	Gm	Adventure Int.	32K	D	AB	£33.70
North Atlantic Raiders	Gm	Tridata	16K	C	IA	£11.95
Number Bonds	Ed	Bryants S/W	16K	C	HW	£3.75
Number Series	Ed	MA	16K	C	IS	£12.50
Nuke War	Gm	Avalon Hill	16K	C	IA	£10.95
Office Accouting	Bs	MA	16K	C	IS	£15.00
Oil Tycoon	Gm	Instant S/W	16K	C	AB	£8.50
					GB	£9.95
Old McDonald's Farm	Gm	Adventure Int.	16K	C	AB	£14.35
Olympic Decathlon	Gm	MA	16K	C	IS	£15.50
On Guard	Ed	Bryants S/W	16K	C	HW	£3.75
Pascal-80	Gm	MA	48K	D	IS	£75.00
Paraform	Ut	Molimerx	32K	D	AJ	£18.98
Patience	Gm	Bryants S/W	16K	C	HW	£3.75
Payroll	Bs	Tridata	48K	D	ID	£170.00
Perfect Pong	Gm	Instant S/W	16K	C	GB,AB	£12.75
Periodical X-Ref	Do	MA	16K	C	IS	£9.50
Personal Bill Paying	Do	Instant S/W	16K	C	AB	£6.50
Personal Accounts	Do	Kansas	16K	C	IH	£9.50
Personal Finance	Do	MA	16K	C	IS	£8.50
Pinball	Gm	MA	16K	C	IS	£10.50
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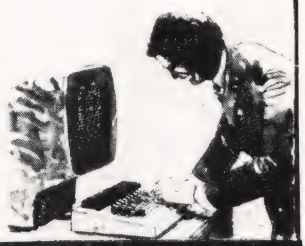
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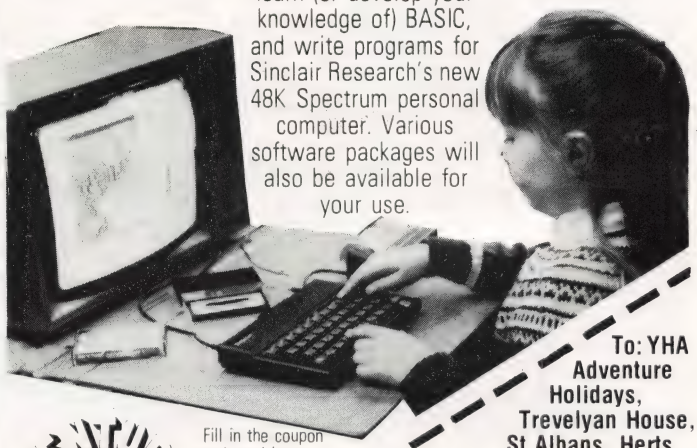
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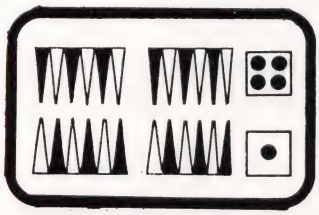
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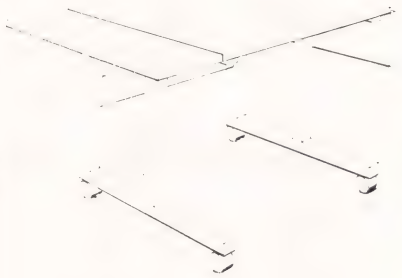
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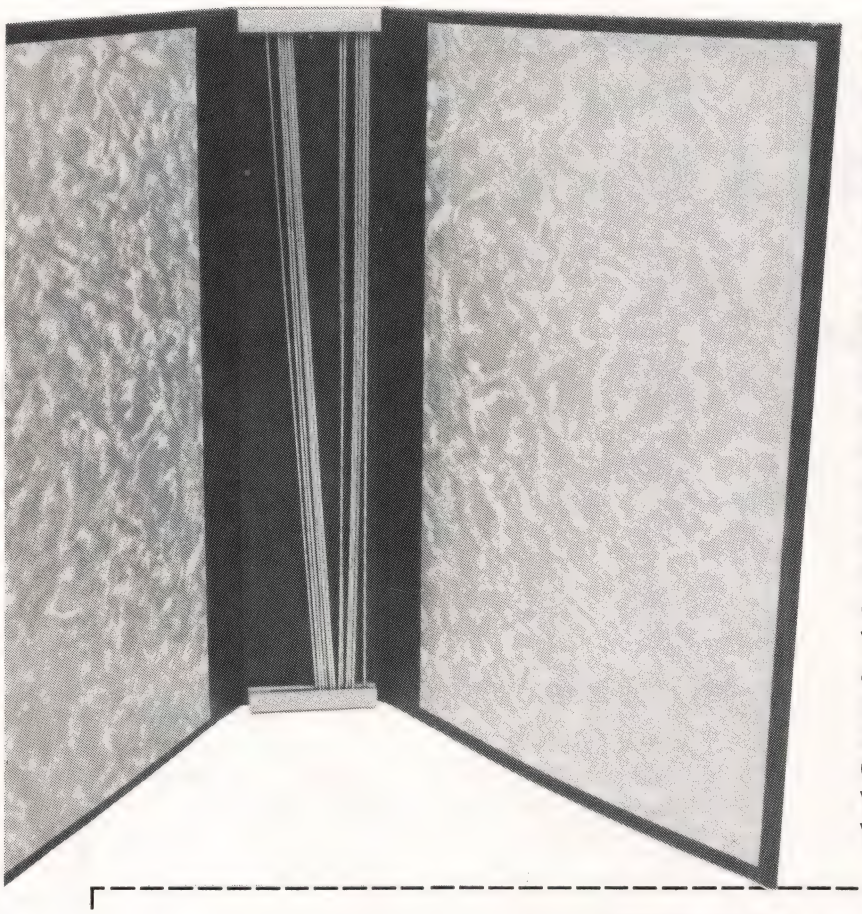
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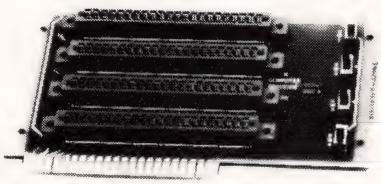
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MICROTERMS

Get to grips with terminology in this month's issue dictionary. A quick reference guide to common computer jargon.

Address
A label or name (usually a *binary* or *hexadecimal* number) specifying a particular *memory* location.

Array
A special variable that is used to hold large amounts of string or numeric information in a row and column format.

Assembly Language
Means of representing *program* statements in mnemonics and conveniently handling *memory* addressing by use of symbolic terms.

BASIC
Beginner's All Purpose Symbolic Instruction Code. An easy to learn, widely used computer language.

Bit
A single *binary* digit, representing either a 'one' or a 'zero'.

Bug
An error in *software*.

Byte
A *binary* number, usually of eight *bits*. It can represent a number from 0 to 255 (8-bit byte) as there are 256 possible combinations of "ones" and 'zeros" eight bits long.

Cartridge
A self-contained unit storing either ROM or RAM which plugs into a computer to expand the memory or provide a program.

Character Set
The list of letters, numbers and symbols that you can use to write programs and display information.

CP/M
A standard disc operating system that in theory allows software packages to be run on different machines. It stands for Control Program for Microcomputers.

Cursor
Character or graphic symbol used by the computer to denote where it's printing. Also used as a prompt to input information or a command.

Data
Simply, information. The raw material that the computer processes.

Debug
To correct the errors in a *program*.

Disc
Magnetic storage device allowing fast random access to a large volume of *data*. A full-size hard disc will hold, say, 5 *megabytes* or more; a smaller *floppy disc* typically holds from 80 to 250 *kilo* bytes but in either case the capacity is being increased all the time.

Display Mode
Means of indicating the form in which the computer's output will appear on the *VDU* screen. It is either text only, text and graphics or graphics only. The display mode is usually represented by a number and the difference between these numbers indicates the change in the display capabilities of the screen, for instance on the BBC computer Mode O gives a higher resolution than Mode 1.

DOS
Disc Operating System. This refers to the piece of computer code that controls the action of the disc drive. On some machines this code has to be loaded into the machines memory and on others it is present in the *ROM* onboard the disc drive. The DOS tells the disc drive how to load and save programs on the disc as well as carrying out any disc management functions such as updating the directory.

Dummy Variable
This is a variable that is defined at the beginning of a program that has no use until later on in the program.

EPROM
Erasable Programmable Read Only Memory. When programming, writing typically takes one minute and erasing, by ultra-violet light, 10 minutes or longer.

Get
A BASIC command. It tells the computer to search the keyboard and bring back the value of the first key pressed.

Gosub
A BASIC command telling the computer to go to a subroutine within a program.

Gcol
A colour command used in BBC Basic.

Hard Copy
A computer printout or listing on paper.

Hardware
All the electronic and mechanical components making up a computer system.

Hex
Shortened version of hexadecimal, meaning '6 plus 10', which is a funny way of saying 16. It refers to the number system with a base of 16. This uses 0 to 9 and then A to F of the alphabet to represent its 16 digits. Two hex digits can be conveniently used to represent a byte (eight bits).

High Resolution
This means that you can pinpoint one dot on a screen rather than one square, giving you graphical pictures of much greater detail and accuracy.

Instruction
A set of *bits* which causes the *CPU* to carry out a particular task in a program.

Interface
Circuit which connects different parts of a system together and performs any processing of signals in order to make transfer possible (ie serial-parallel conversion).

I/O
Input/Output. A computer generally has one or more *ports* through which it communicates with 'the outside world' — *peripheral* devices such as a *keyboard*, video display *(VDU)*, *printer* etc. An I/O port may be just an input or just an output or it can be bidirectional.

Kilo (K)
Normally means 1000, but stands for1024 (2^{10}) when referring to memory.

Language
A repertory of commands — symbols, expressions etc, used to 'call up' the instructions or procedures a *processor* can execute.

Location
Physical position; *memory* location is the same as *address*.

Loop
Program technique where one section of program (the loop) is performed many times over.

Machine Language (or Code)
The lowest (and most tediously detailed)

level of *program instructions*. All higher level coding must be converted to *machine language* (by *compiler* or *interpreter)* before a *processor* can obey it.

Memory Map
Chart showing how *memory* is used by a computer. The arrangement of *data* and *program* within the memory.

Menu
A set of options displayed on-screen by a computer program from which the computer user can make a selection to implement.

Modulator
A device, included in every good hobby computer, which takes the computer's output and converts it to an RF signal on a suitable TV channel, giving you a cheap, convenient visual display.

Monitor
(1) The first level of computer *operating systems:* the *program* which turns *machine code* commands into action, managing input, output etc.
(2) A TV-type device which is specially constructed to handle video signals from a computer that does not have a *modulator*.

Parallel / Serial
Denotes the manner in which the computer's output is sent to its peripheral devices. Serial means that the information is passed out one byte after another and it uses a system of special characters to signify control codes of the device. Parallel communications are sent out along a series of wires using the high or low state of the wire to indicate which bits are set and therefore making up a byte.

Pascal
A very powerful, structured computer language, available on a variety of microcomputers.

Peek
This BASIC command reads a value from a location in the computer memory. It can be used to access either RAM or ROM.

Peripheral
Device attached to a computer, eg *printer, plotter, disc* unit, but not necessarily essential to its use.

Pixel
The single dot that is used to create characters displayed on the VDU. Also the smallest display unit when using high resolution graphics.

Poke
This command places a value in a location of the computer's memory. It can only be used to access RAM or control registers.

Port
Terminal which the *CPU* uses to communicate with the outside world.

Print At
A BASIC command telling the computer where to begin printing.

Print Out
Same as *hardcopy*.

Program
A set of *instructions,* which tells the computer to perform a sequence of tasks also called software.

PROM
Programmable Read Only Memory. Proms are a special form of *ROM,* which can be individually programmed by the user.

Qwerty
The traditional typewriter keyboard layout adopted by computer designers.

RAM
Random Access Memory. *Data* may be written to or read from any location in this type of memory.

Register
A general-purpose *memory,* or set of memory *locations,* built into the *microprocessor* itself. Sometimes, particular registers may be designated for a specific purpose.

RND
In BASIC this stands for RANDOM and instructs the computer to select random numbers, it is often used in games programs. Because the numbers thrown up are mathematically related to the number preceding they are called pseudo-random numbers, not true random-numbers.

ROM
Read Only Memory. *Memory* device which has its *data* content established as part of manufacture and cannot be changed.

Routine
A whole *program* or part of a program designed to perform a single function or action.

RS232
A communications *interface* used for *modems* and for serial *printers*.

Sequential File
This is a data file that can be created on either a disc or a cassette system. As its name suggests, the information is stored one piece after another. If this information is to be changed or modified in any way then the whole file has to be read back into memory and then written back again once the changes have been made.

Software
The different kinds of *program* required to work a computer.

Source Code
Program written in one of the *high-level languages* and requiring *compilation* into *machine language* before use.

String
A sequence of characters used in a program.

Subroutine
A part of a *program* which performs a specific task and which is available for use elsewhere in a program, as often as you like.

Syntax
The grammar of a programming *language*.

Tab
Really stands for tabulate and allows you to automatically put figures and/or words into columns, forming a table.

Toolkit
Name given to a piece of code that runs in a computer independantly of any other programs and adds commands to the machines language to make the process of programming or debugging easier. Commands such as Renumber, Auto and Trace are common in toolkits. Toolkits take the form of a program that is loaded into the machine on power-up or a chip that is inserted on the circuit board which is then initialised by a SYS or USR call from the operator.

Variable
A symbol used in programming which is assigned a numeric memory address. You can change the value of variable at will to suit the program you are writing.

VDU
Visual Display Unit. Usually a TV set in hobby computers, but may be a video monitor which accepts the output directly from the computer.

Z80
Widely used microprocessor. It is used in the ZX81, Spectrum and TRS-80.

6502
Another widely used microprocessor. It is the heart of the PET, Apple and Atari computers.



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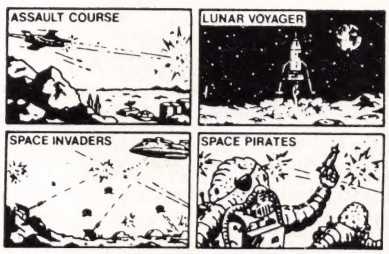
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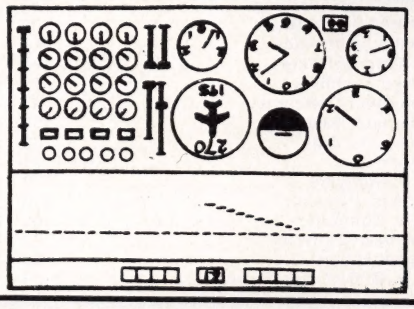
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AD INDEX

A B & C Computers 22
Acorn Soft 65/66
A & F Software 17
AGF Hardware 82
Akhter Instruments 23
Algray 69
Anirog Computers 113
Apex Trading 114
Arcade Hardware 108
Artic Computing 7
Atari 67
Audiogenic ..... 8 & 9
BBC 74/75
Bi-Pak 60
Buffer Micro Shop 12
Cambridge Learning 114
Carnell Software 18
Castle Electronics ..... IFC
Mr Chip Software 60
Clwyd Technics 81
Computer Concepts 94
Computer Rentals 108
Computer Aids 93
Cobra 61
C. P. Software 57
Crowther Cosina 113
D. A. Computers 81
Database Software 93
Digital Fantasia 26
D. R. G. Business Systems ..... 38 & 39
Electronequip 9
Foilkade Ltd 26
Forest Software 94
Gamer 93
Games Centre 81
G.C.C. 6
Haven Hardware 35
Hilton Computer Service 110
ICS 108
Imagine ..... 116 & 117
Impact Software 68
Institution of Analysts 108
John King 93
J. K. Greye 12
Laserbug 114
Leisuronics 30
Level 9 Computing 81
Melbourne House 58
Microcomputer Software 110
Microdeal 76
Micromania 6
M. P. Software 82
MST Consultants 94
New Generation 12
Nottingdale Technology 39
Oasis 68
Oric 112
Personal Software Services 19
Phipps Ass. 77
Power International 80
Program Power 60
Quicksilva ..... IBC
Readout/Newtech 111
Redshift 115
Richard Shepherd 43
Silica Shop ..... OBC
Silversoft 73
Sinclair 49, 50, 51, 52
Sir Computers 30
Soft Toys 91
Statacom Ltd 91
Stack Computers 59
Stone Chip 27
Sulis Software 110
Sumlock Manchester 31
Superior Systems 113
3D Computers 22
Titan Programmes 80
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