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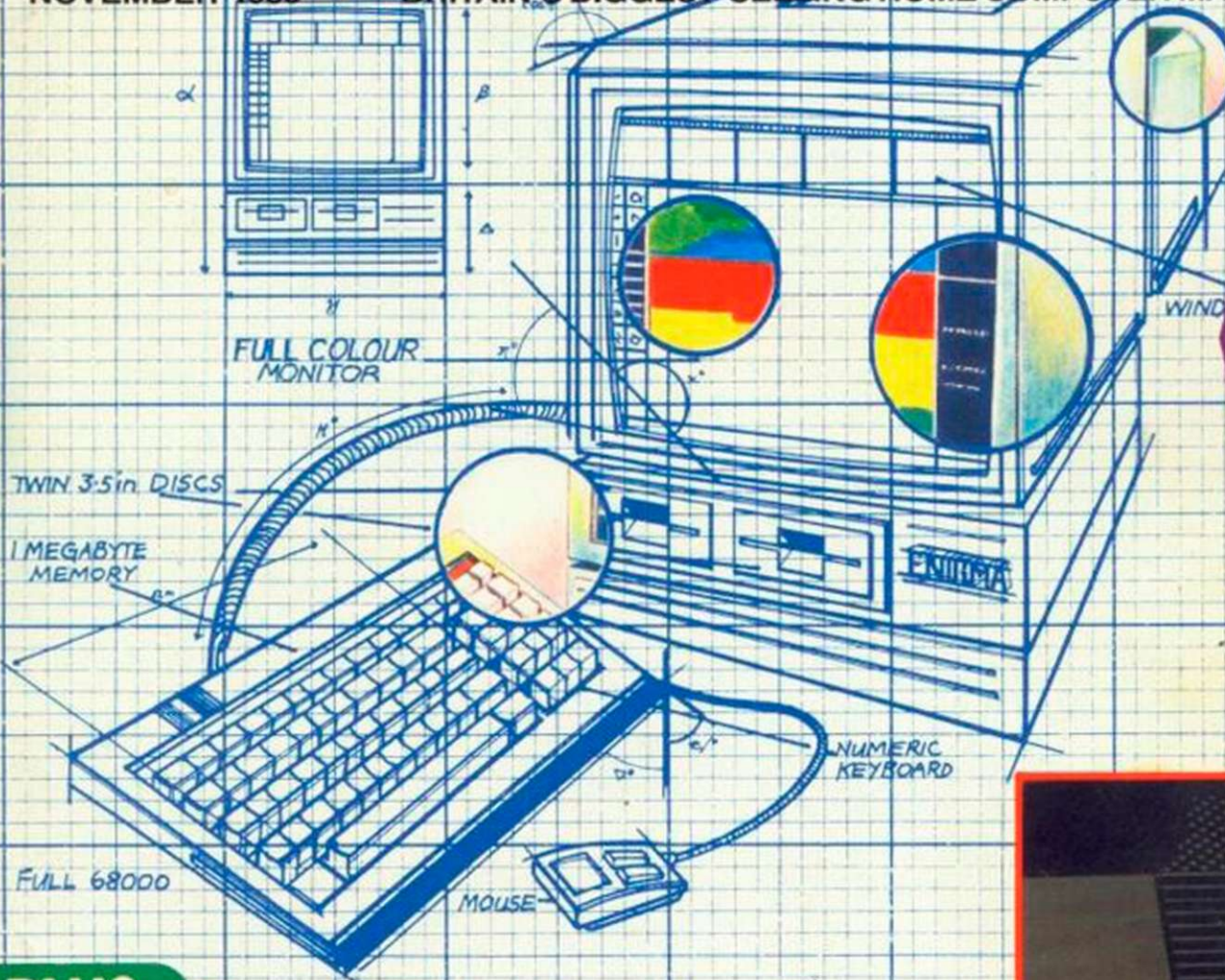
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COMPUTER

NOVEMBER 1985

BRITAIN'S BIGGEST-SELLING HOME COMPUTER MAGAZINE

Vol.5 No.11



SCOOP!

Next year's Sinclair Enigma

PLUS Spectrum 128



PLUS

What to buy for Christmas: top micros and disc drives

CBM-64 Tower of Antics and BBC Kung Fu

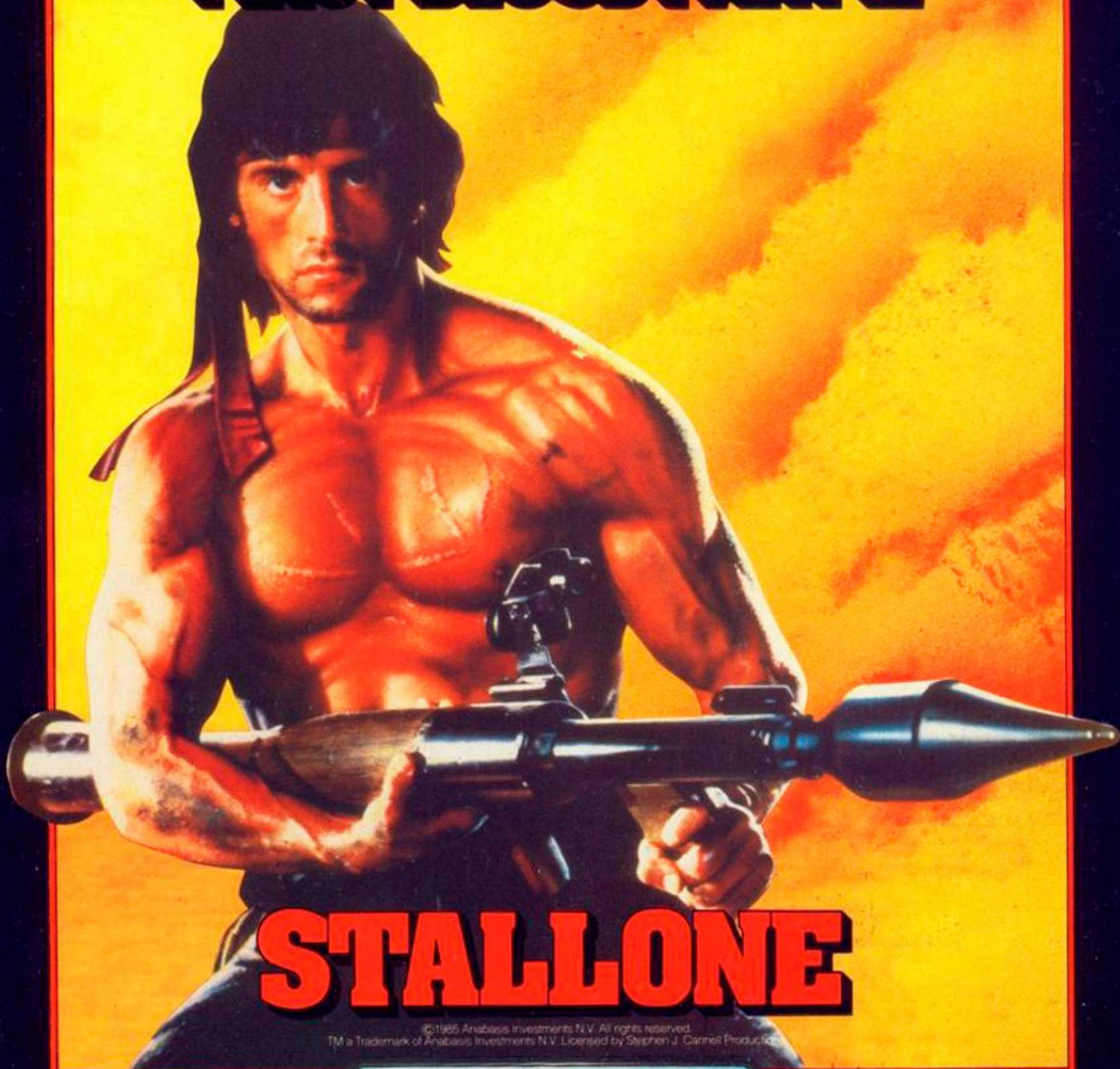
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78 HOTSHOTS: Hints, tips, features and bugs. Hotshots is here to help you. We provide a map to help you rid the village of the plagues — yes, Nightshade.

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Most home computers.

As you can see, the Amstrad CPC 464 is no ordinary home computer.

For a start, it comes complete with an integral cassette datacorder.

And in addition, you get the choice of either a superb quality green screen or a full colour monitor.

With £100 of free software to get you going all you have to do is plug in and start computing.

The 64k of RAM means you'll have plenty of memory to play with. And there are over 200 Amsoft games, that you

can play, many exclusive to Amstrad.

But games are only half the fun on the Amstrad CPC 464. In fact using it can also be quite an education.

The kids can learn spelling and arithmetic with software like Wordhang and Happy Numbers.

Whilst adults will love the way it helps around the house with budgetting and accounts.

Put the 464 to work and it will take care of a number of business-like functions, such as wordprocessing and spreadsheet.





The complete home computer.

To help you get the most from your CPC 464, there's the Amstrad User Club as well as a number of books and user magazines devoted to this most versatile home computer.

And your 464 will be made even more complete with the simple connection of joysticks, printers, disc drives, speech synthesisers and light pens.

But perhaps the most extraordinary thing about the Amstrad CPC 464 is the price.

Just £199 with green screen, or £299 with full colour monitor.

For more information about the complete home computer, all you have to do is complete the coupon.



Please send me more information

YC/464/1

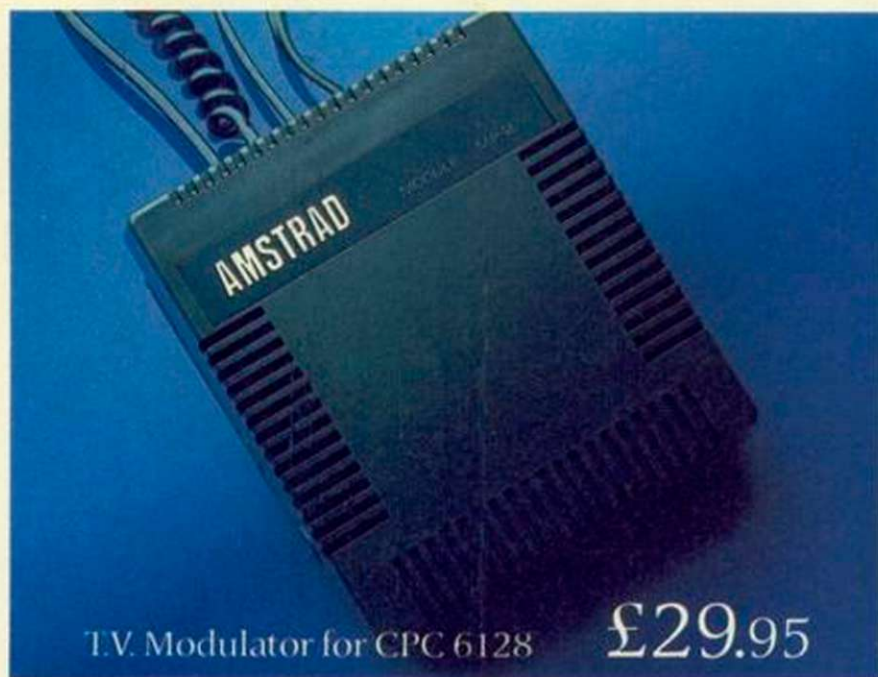
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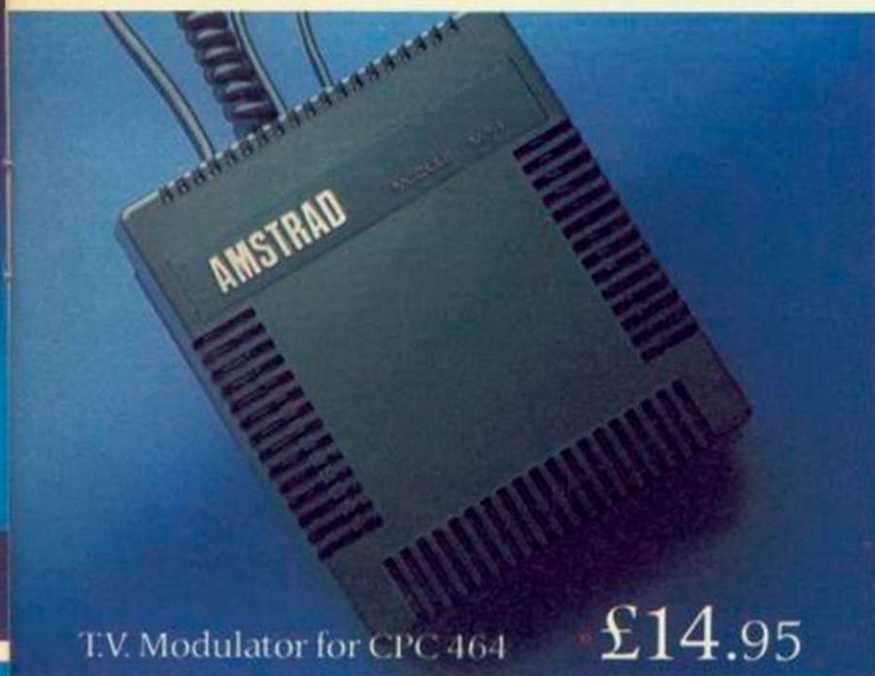


Light Pen complete with graphics software £19.95



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ACHED TO YOUR AMSTRAD.



T.V. Modulator for CPC 464

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Additional Disc Drive

£99.95



DMP 2000 Printer

£159.95

Amstrad owners start out happy, and get even happier as time goes on.

The first delightful discovery is that both the CPC 6128 and the CPC 464 are complete and ready to use as soon as you get them home.

The CPC 464 comes with built-in datacorder, and the CPC 6128 with built-in disc drive. And both have either a full colour monitor or a green screen.

But Amstrad owners can become even more attached to their computers with the simple addition of the peripherals featured here.

They'll make your Amstrad faster, harder working and more entertaining.

And they're very easy to attach. Simply plug in, and away you go, there's no need for extra interfaces.

You may of course wish to get into some even more serious computing, for which you will need the Amstrad RS 232C specialist interface. This opens the door to modems, networks, and serial printing.

But whichever additions to your Amstrad you care to make you'll find their low prices an additional pleasure.



Tell me more about the Amstrad range of peripherals.

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Amstrad peripherals

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THE COUNTDOWN HAS BEGUN

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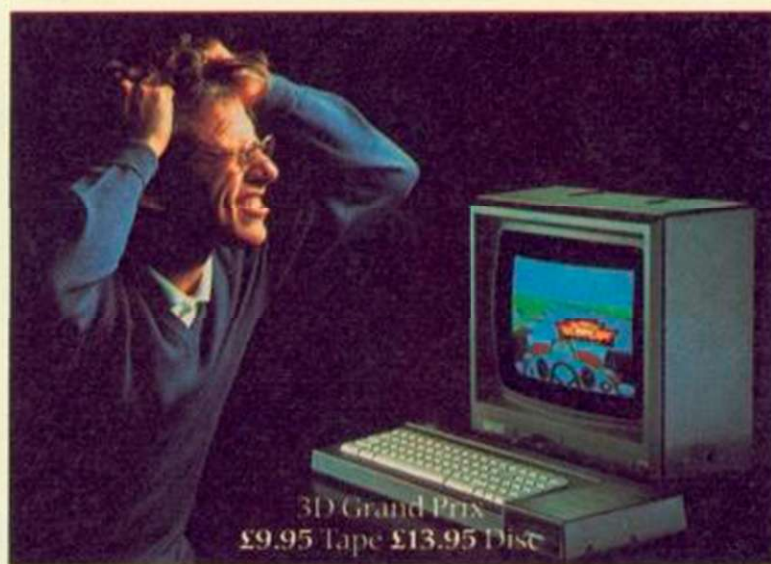
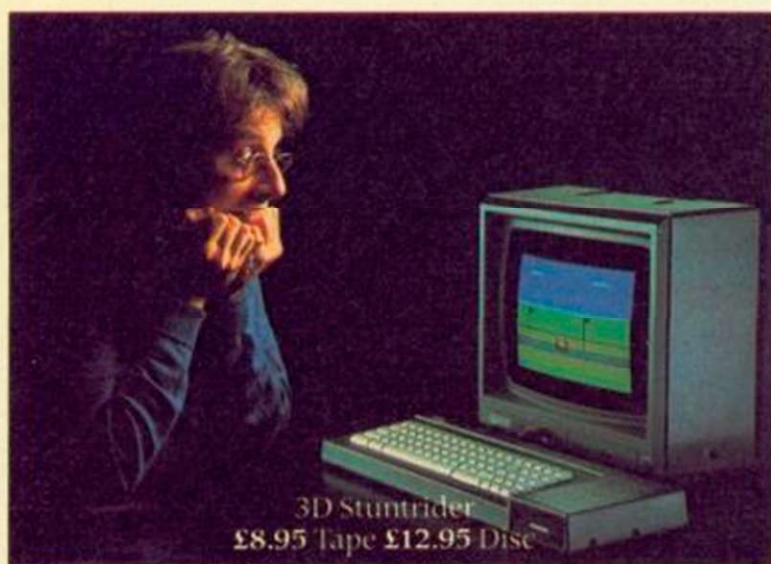


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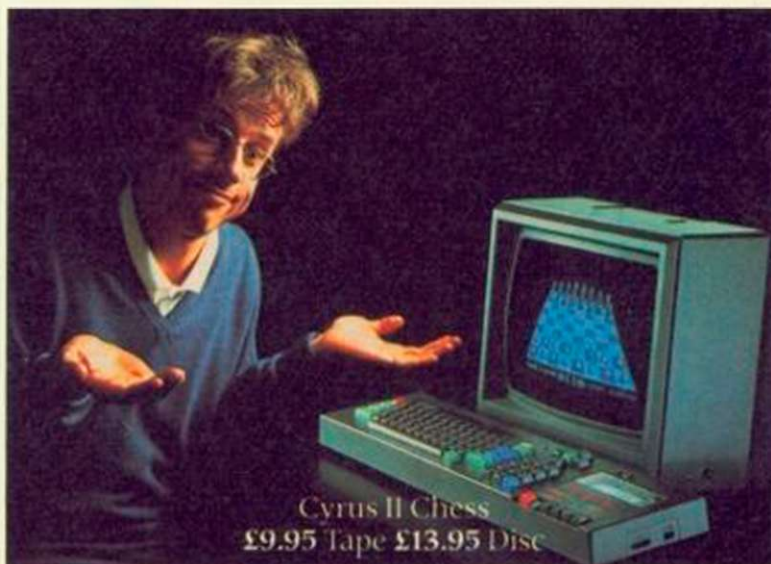
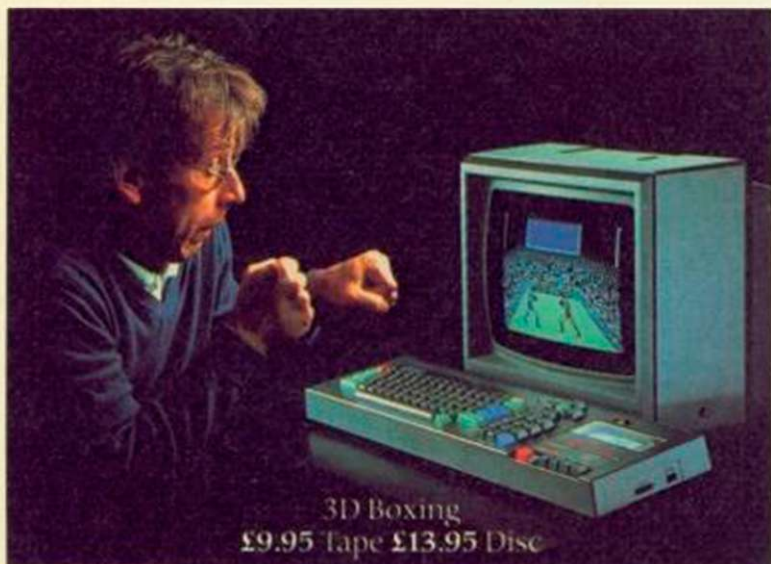
Commodore 64

Spectrum

DURELL sales dept.,
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When it comes to computer games you can't beat an Amstrad.



We've enlisted the help of some particularly wicked program designers to put our entertainment software range together.

They've come up with over 200 Arcade and Adventure games.

Many of them exclusive to Amstrad (like those shown above). All of them mindbenders you'll find hard to beat.

And all at prices that are as competitive as the games, from £12.95 on disc and £8.95 on tape.

But the software is only one of many good reasons for buying an Amstrad computer.

The 64k CPC 464 computer comes complete with built-in datacorder and a choice of green screen or full colour monitor.

The CPC 6128 is a big memory 128k computer with built-in, fast-loading disc

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The Evil Crown: an icon-driven animated simulation game of power and politics in the middle ages. Easy to play, very difficult to beat!

Retail price £9.99 on both Commodore 64 and Spectrum 48k.



**M'LORDS, LADIES, & GENTLEMEN... FRESH FROM AMERICA
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From time to time a software title is released, so innovative that it breaks new ground in graphical and technical achievement — Fight Night, the first animated simulation on the C64 is more than a game, more than a simulation — it is a revelation!

"It has class, it has style — forget the rest, Fight Night is quite simply the absolute best."
— Tony Takoushi Computer & Video Games/Computer Trade Weekly.

"It's like watching and playing a cartoon computer version of Rocky. Fight Night has pushed the graphical capabilities of the C64 to its utmost limits" — Zzap 64 November.



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A truly remarkable series of educational software, with the unquestioned quality for which its originators are renowned.

◀ A FUN-FILLED WAY TO LEARN ALL ABOUT MONEY
Donald's mischievous nephews – Huey, Dewey, and Louie, would love to have a playground of their own. You can help kind-hearted Uncle Donald build them one.

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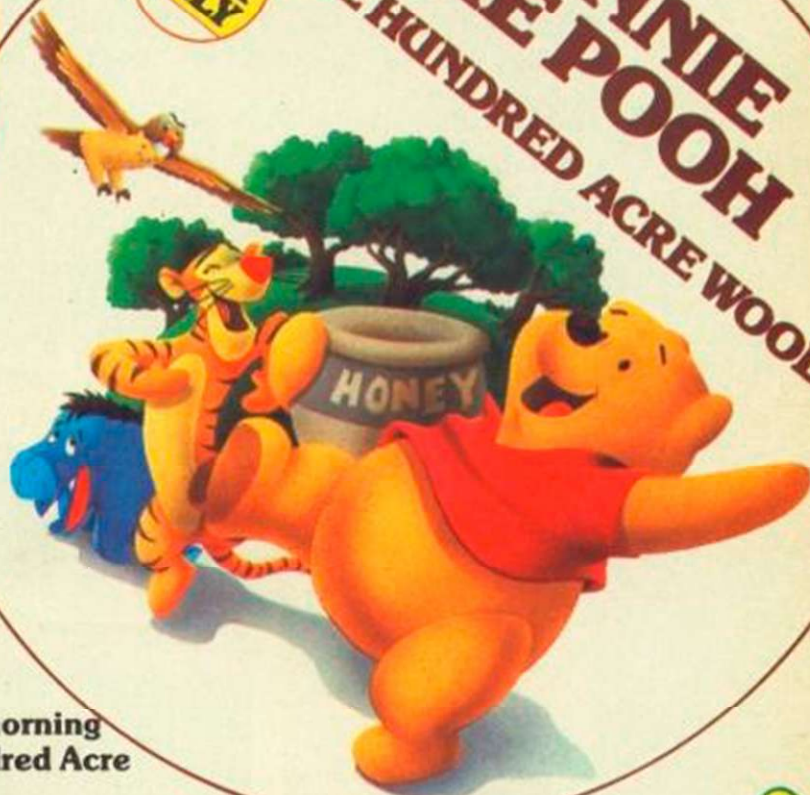


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IT'S A DIFFERENT GAME EACH TIME YOU PLAY

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You, Mickey, and Pluto can help put back together the shattered "memory crystal" of a far-off planet. Broken into nine pieces scattered throughout our solar system, the missing crystal stores the entire history of Oron and its inhabitants. Fire up the spaceship that's been sent for you, and be on your way.

MICKEY'S SPACE ADVENTURE



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POWER

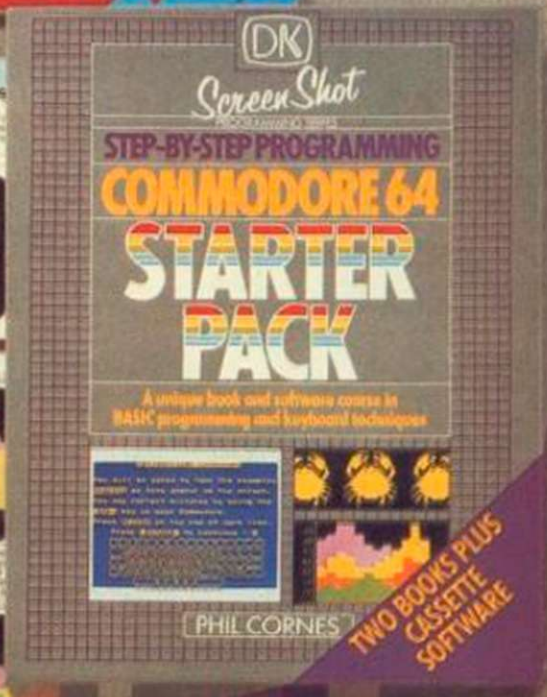
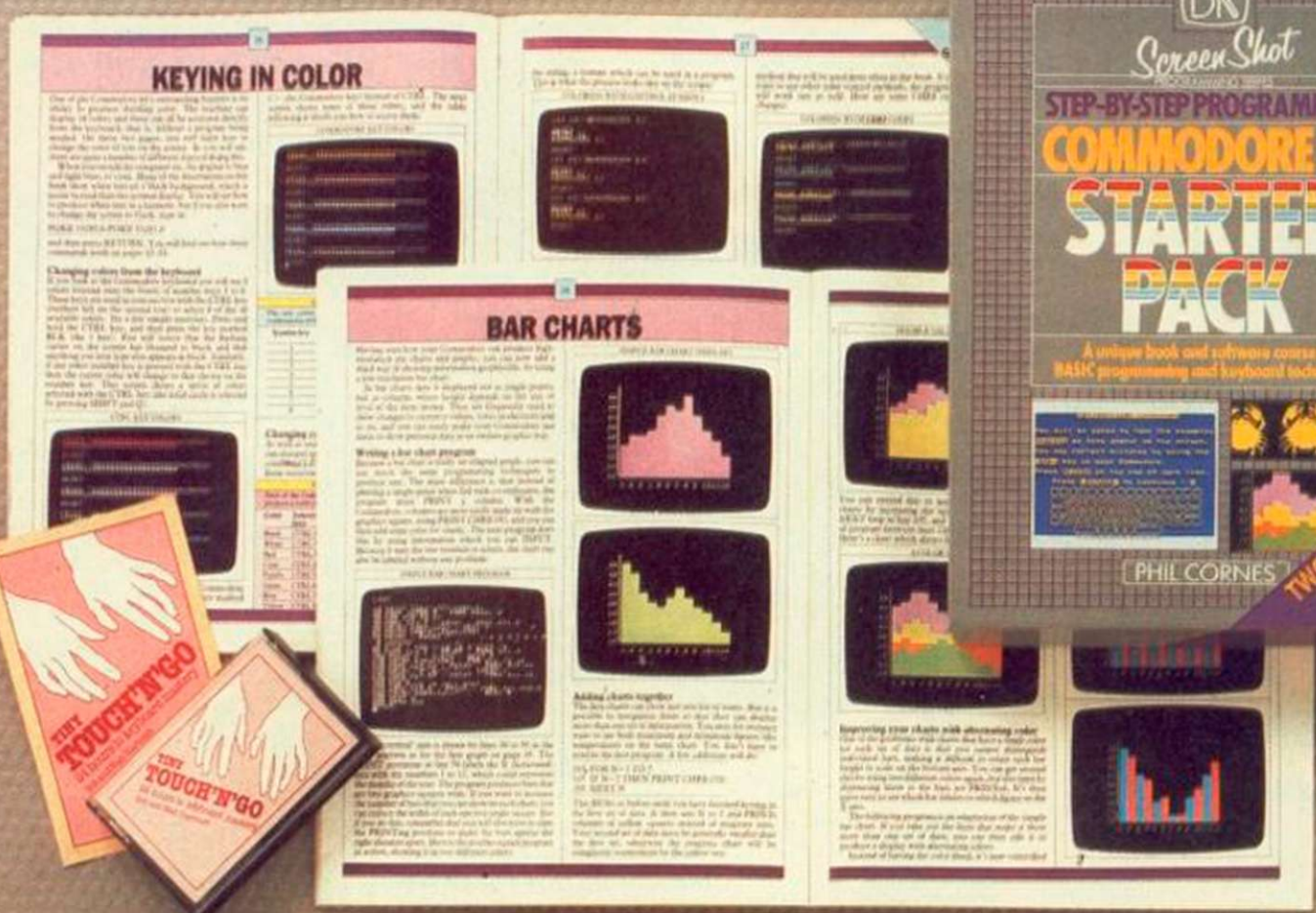
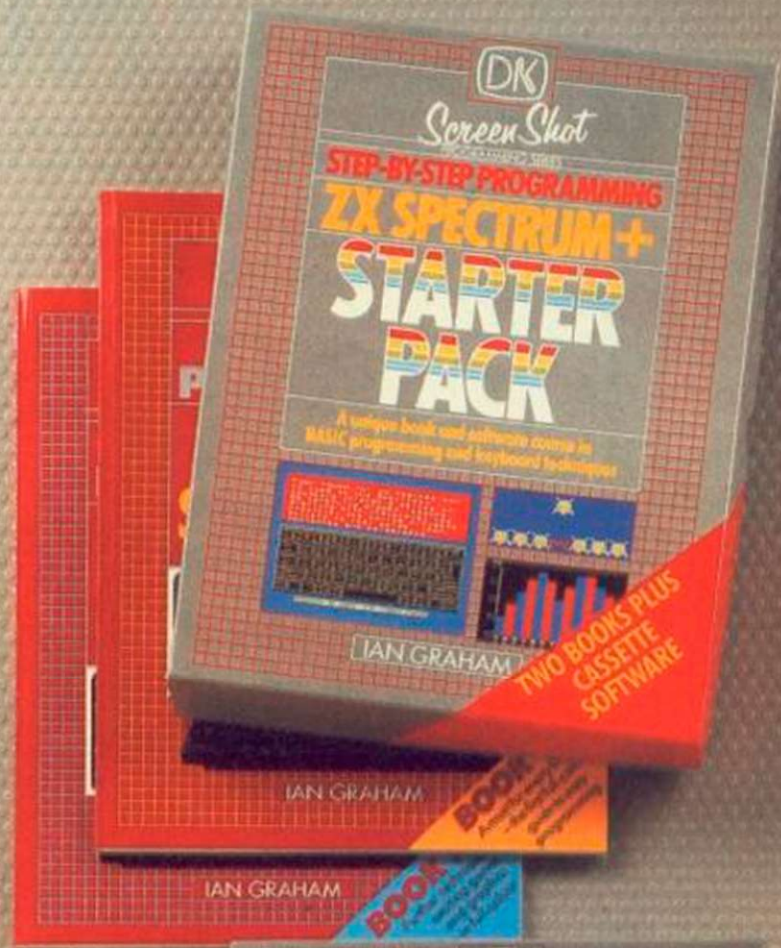
Two powerful packages of personal computing programming techniques made instantly usable by Dorling Kindersley's unique 'Screen Shot' presentation.

What you see in the pages of the books is what you get on the screen when you follow the step-by-step programming guidance in the text. The crystal-clear illustration is easy-to-follow and guaranteed free from typographic errors.

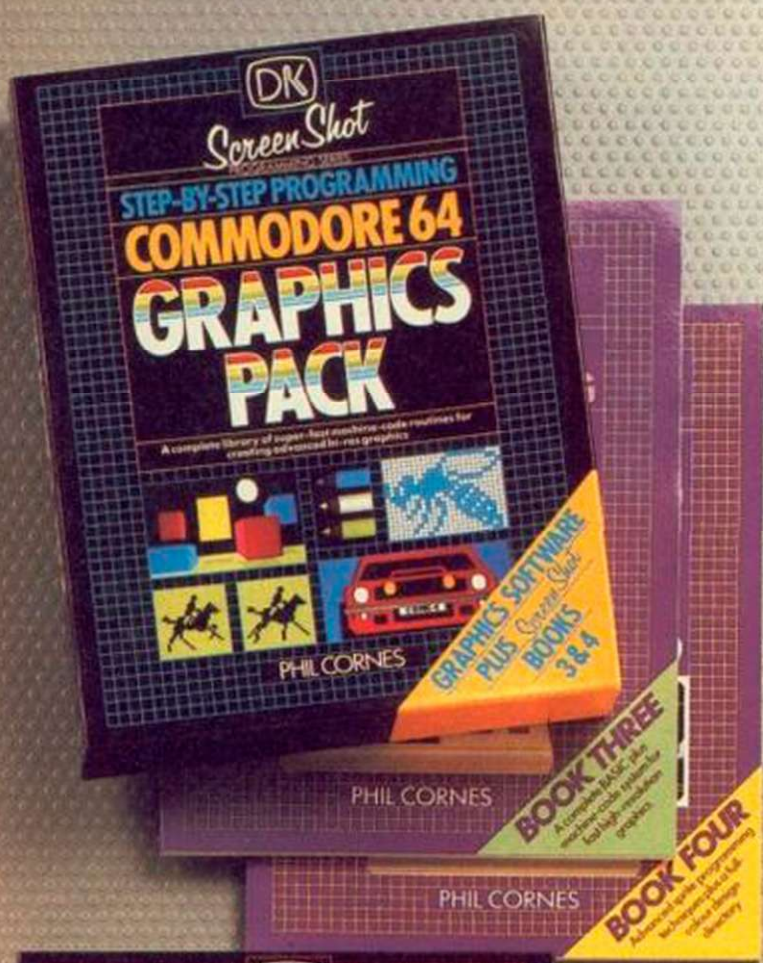
STARTER PACKS

The Starter Packs for the Commodore 64, ZX Spectrum+ and BBC Micro get you going quickly with BASIC programming.

The accompanying software offers carefully graded exercises leading to rapid keyboard familiarity.



PACKS



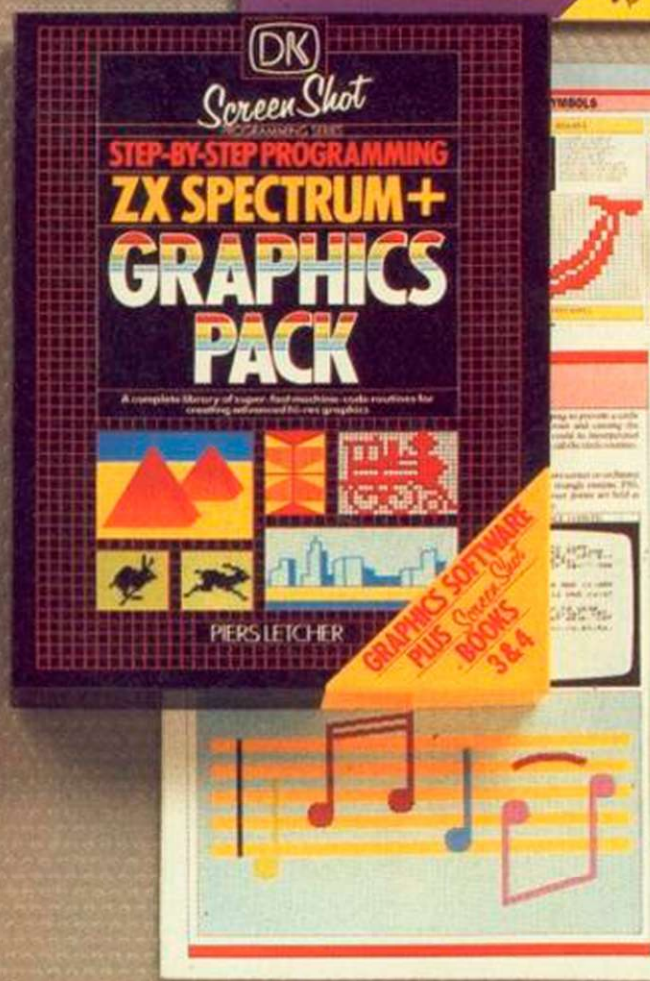
GRAPHICS PACKS

The Graphics Packs for the Commodore 64, ZX Spectrum+ contain a fabulous collection of more than 200 graphic images, each with its machine-code program. The keyboard-controlled graphics editor enables you to create and manipulate the images.

In-pack software contains the complete machine-code library of images, demonstration routines and the full graphics and sprite editor programs.

Each pack contains two full-colour Screen Shot programming manuals plus library cased cassette software. Superb value at £15.95 inc VAT for the complete pack.

Available from larger branches of Boots, Menzies, W H Smith and leading bookshops and computer stores. In case of difficulty, write to Dorling Kindersley Publishers Ltd, 1-2 Henrietta Street, Covent Garden, London WC2E 8PS.



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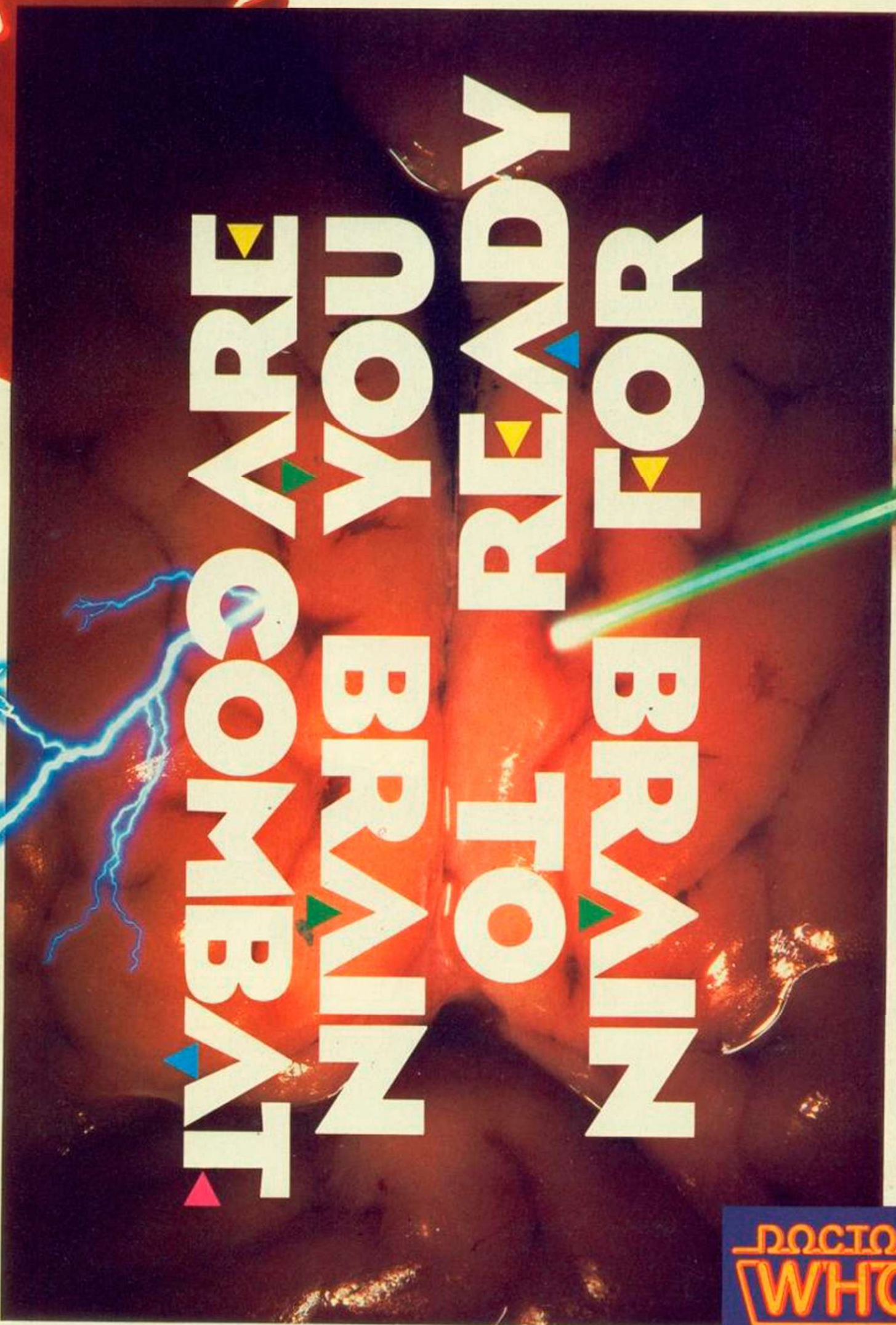
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UPGRADE

But Cumana's range now covers much more than just disk drives; there's a growing range of exciting new

computer products designed to uprate and extend the uses of the most popular micros. Products like the Cumana Upgrade - a major expansion to the BBC and QL micros, enabling real-time minicomputer performance with .5Mb of RAM and high level applications software. 10Mb and 20Mb Winchester systems are available for both the QL and BBC using Upgrade.

TOUCH PAD

There's the new, improved Touch Pad graphic input device with powerful Screen Artist software - an infinite variety of graphic design or artistic

uses for the home, business or education, taking you another step towards the professional league. Ask us about the new Touch Pad library!

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Cumana the very best name in memory.

THE LAMPS ARE GOING OUT...

THE PULL OF profit and prestige sucked Britain's biggest computer manufacturers Sinclair and Acorn into their great American disasters. If only they had looked closer to home. There, right on their doorsteps waited the huge and largely untapped European markets.

At least Sinclair and Amstrad seem now to have cottoned on. Amstrad's impressive £20 million profit figures owe much to very healthy overseas sales — it's pushing its computers hard in West Germany under the Scheider marque, chosen to appeal to the Teutonic sensibility. Ironically the name Amstrad in this country scores with its overtones of Scandinavian efficiency.

Sinclair on the other hand has gone Spanish. Granting Investronica of Madrid the right to build a 128K machine may prove to be one of the most intelligent moves the company has made since the launch of the Spectrum itself back in 1982. Spain may not be in the same league as the U.K. in terms of computers per capita, but then that's the perfect reason for going there. Potentially it also opens up the vast Spanish-speaking South American market.

The Spaniards have already proved their skills in the car-building business: they took on contracts from major automotive manufacturers to build cars under licence. Now they are among the biggest car builders in Europe and are selling their own models into other countries.

Even British products written off as failures in the U.K. have been eagerly scooped up by other Europeans. Now alongside the Camembert factories you'll find Orics being churned out in Normandy, or Dragons being bred in Spain by Eurohard.

Two years ago Britain was a long way ahead in terms of volume and sheer variety of computers. If more energy had been spent then in spreading the risks and making a mark in Europe and less on the notoriously volatile U.K. scene, many of the financial disasters of 1985 could have been avoided.

The sun may never set over the British computer Empire, but that's because it never rose in the first place. If companies are to survive it must be on a broader footing. Europe may be the last chance they get.

Editor: TOBY WOLPE; Assistant Editor: MEIRION JONES; Production Editor: IAN VALLELY; Software Editor: SIMON BEESLEY; Commercial Software Editor: PAUL BOND; Editorial Assistant: LEE PADDON; Editorial Secretary: LYNN DAWSON. Editorial 01-661 3144. Advertisement Manager: NICK RATNIEKS 01-661 3127; Assistant Advertisement Manager: KEN WALFORD 01-661 8548; Advertisement Executive: KAY FILBIN 01-661 8484; Northern Office: CHRIS SHAW 061 872 8861; Advertisement Secretary: MAXINE GILL; Classified: SUSAN PLATTS 01-661 3036; Publisher: GAVIN HOWE. Your Computer, Room L221, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. ©Business Press International Ltd 1985. Printed in Great Britain for the proprietors Business Press International Ltd, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Tel: 01-661 3500, Telex/grams: 892084 BIPRESG ISSN 0263-0085. Printed by Riverside Press Ltd, Whitstable, Kent, and typeset by Instep Ltd, London EC1. Subscriptions: U.K. £14 for 12 issues. ABC 131,769 July-December, 1984.



"Take that, Fion the Magic Circle."

BATTLE OF WIZARDS

BRITAIN'S WIZARDS are locked in battle over who shall control the market for micro magic. One man, David Hambly from Knights Way (yes seriously) Ilford is taking on the whole power of the Magic Circle. The Magic Circle is releasing a book and tape which will allow you to perform 15 different tricks on your Spectrum, Commodore or Amstrad. "When you learn from

this book and software the secrets of magic, remember that you must keep them to yourself," says John Salisse, Secretary of the Circle "They are not yours to give away". But despite John's claims that the Circle suite is unique David Hambly can show micro magin books and software that he has produced over the years. Contact Sardi's Software (01) 551-5908 for details.

Future plot

FLAT BED plotters are no longer the play things of the idle rich.

Future Music is selling Roland DXY100 A3 sized plotters at the remarkable price of £259. The plotter is connected to the computer via the centronics port, so, theoretically could be used with most home micros. However, the company only supplies

software for the BBC. Supplied with the plotter is a ROM as well as some examples of 3D plots on cassette. The ROM routines include music and graph plotting, arcs and hatching. Resolution is to .1mm with a plotting speed of 70mm/s. You can find out further details from Future Music on (0245) 352490.

AMSTRAD BOOM

664 problems solved

AMSTRAD CONTINUES to confound the prophets of doom in the micro industry by announcing record turnover and profits up to £20 million compared to Commodore's announcement that it is losing \$1 million a day and Acorn and Sinclair's dismal results. What is more Amstrad's boom is based almost entirely on computer sales. When the British market started to flag Amstrad just sold them abroad instead.

The PCW 8256 all-in-one word processing package is selling briskly. Unfortunately companies like Dixons had neglected to stock up with the 3 inch discs it uses, leading to shortages in many areas.

Another problem for Amstrad 664 owners who found themselves ditched by the rapid introduction of the 6128 has been solved by DK'tronics. DK will sell an £50 64K extra memory unit for the 664 which will work with



PCW 8256 sells too fast for Dixons.

switching and system calls but not from Basic since the 664 Rom has not been overlaid. DK will also introduce a 256K expansion pack for £100 — the same price as a

16K expansion for the ZX-81 four software which uses bank years ago. A 256K silicon disc is also on the way.

SECRET DIARY OF SIR CLIVE, AGED 45¹/₄



No grey 128s here, please.

SINCLAIR SAYS Spectrum Plus and QL sales are booming — selling at twice the rate of Commodore and Acorn put together.

But Commodore is now fighting back hard with an Adrian

Mole promotion for the 64, delivery at long last, of the 128 and announcement of the Amiga's official launch in January.

Behind the scenes neither company is having an easy time with Commodore announcing

\$124 million losses for March, April and May while Sinclair is moving out of its prestige headquarters in Willis Road, Cambridge, sacking 20 of its 120 employees and losing the likes of Robb Wilmot and Nigel Searle.

Rumours that the Spanish Investronica-built Spectrum 128 would be unofficially imported to Britain have been quashed. The only "grey imports" will be to software houses preparing products for the British launch next February. Commodore's Christmas promotion meanwhile will bundle a 64, cassette recorder, Music Maker, Designer's Pencil and the book and game of The Secret Diary of Adrian Mole.

The Commodore 128 is now on sale as a standalone but because the cost of the original 128 including 1571 double-sided drive looked prohibitive it will now be bundled with the 1570 single-sided 0.5 Mbyte drive for \$450.

DIARY

WHICH COMPUTER is "the BMW of the home computer business" and who called it that?

HERE'S A CLUE for the BMW question. the designer of one of the chips inside it "Dave" also designed the three-wheeler which won the Euromouse 1985 micromouse merge race in Brussels last month.

SMELLYVISION will hit your screens on October 20. Brother, the computer printer makers, are launching a scratch and sniff TV promotions for their high speed cookers. The idea is that you will pick up copies of TV Times impregnated with the smell of roast beef, pies and bread. If you live in the Granada or TVS areas and see a Borthor commercial starting the idear is that you will race to your paper rack and then wait for a "scratch now" caption to appear as the oven door is opened. That could be fun with computer games, we could have scratch 'n sniff pads in *Your Computer*. A prize for the best suggestion.

BRITISH TELECOM is enjoying what it is learning from the home computer market. The little birds, which we diarists use in preference to those nasty leaky phones, tell us that Firebird tasted so nice that BT is buying Beyond as well.

STEVE JOBS, who gets the credit as co-founder of Apple with Steve Wozniak for starting the home computer revolution, has left the company on acrimonious terms. Apple is suing Jobs for stealing information and employees now that he has left to set up a company making educational computers.

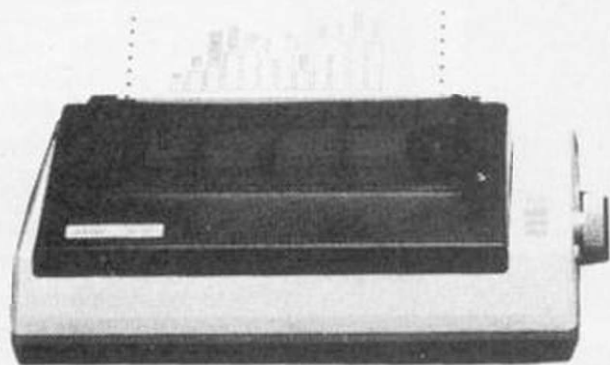
MEANWHILE that once-mighty school micro maker Acorn has turned out to be a participant in the "Euro-rival to MSX" project. Olivetti is of course involved but the third participant is not Philips as expected, but Thomson which dominates educational computing in France.

BMW Enterprise of course. Who said it? Enterprise's Mike Shirley. Dave Woodfield, who designed the chips and the mouse works for Intelligent Software.

Elsie Dee

OPEN SUNDAYS 10-1

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UPDATE

Better late than never, but sometimes it's difficult to tell the difference. Digital Integration, who rocketed to obscurity after over-night success, look like finally releasing *Tomahawk*, a helicopter simulator after keeping the punters waiting for over a year.

Despite this, they might be forgiven if it turns out to be as wonderful as they say it is. Air combat, vector graphics, ground targets, lots of instruments, it may well have the same impact as *Fighter Pilot* did when it came out in what silicon archaeologists like to call the early dursic period. Novagen still insists

Mercenary is on the way, leaving the answer phone to cope with the calls of anxious punters. Novagen assures us the delay is simply due to wanting to make it even better!

Spectrum Elite nears completion. Unfortunately, Firebird have had to leave out most of the missions that other, less scrupulous magazines reported were in their "review copy" due to memory restraints. However, it still promises to be wonderful. Apparently Firebird's Gyron team has virtually re-written the structure so that it won't slow down when a lot is happening. A new launch sequence and revamped display is promised.

Activision has forsaken the humdrum world of the shoot-em-up, for the philanthropic pursuits. Apparently, they discovered the presence of **Little Computer People**, and unlike you or I, would simply have given the thing a violent shake and hoped the little debugger would fall out, Activision, gave it a house, coaxed him out of the innards and on to the screen. Of course, they are all different, Activision just give you the house, and the little chap takes on his own individual character. Not only that, **Hacker** is an attempt to spare NASA's blushes, and many parent's phone bills by diverting code breakers from the real thing to a game with the highly laudable task of saving the world.

ARIOLLAMA

Minter joins Zombies

MINTER IS back with a vengeance — the label may have changed but the psychotropic dreamer maintains his firm commitment to fast-scrolling all-action shoot-'em-ups that leave the player with much deeper comprehension of the traumas of shell-shock. *Batalyx* — not so much released as allowed to escape — from Ariolasoft is obviously Jeff's compilation album, sitting well on his shelves next to the Pink Floyd Relics cassette, no doubt.

Six games for £12.95 on Commodore 64 disc, £9.95 on cassette: kick off with *Hallucin-O-Bomblets*, a freaky asteroid derivative; then *AMC II*, a dub version of *Attack of the Mutant Camels*; next, the very abstract *Activation of Iridis Base*. This gives you a driver's-eye-view of a mutant camel approaching a pyramid. When the base is activated a —



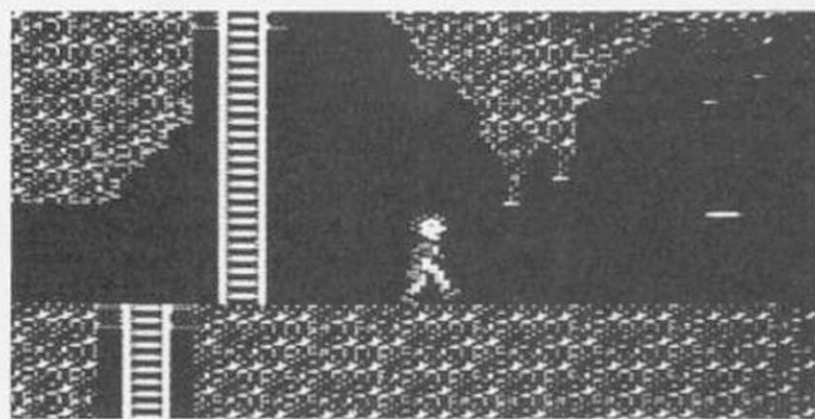
Recognisable Jeff Minter.

you guessed it — *Dark Side Of The Moon* album cover effect is generated. The *Ancipital* returns in *Cippy on the Run*, followed by a geometric puzzle called *Syncro II*. Finally a re-run of *Psychedelia*. Review next month.

Scarabeus sees Ariolasoft's phalanx of Hungarian pro-

grammers producing good graphics, great sound and an absorbing arcade adventure. Aim of the game: find the fabulous Emerald jewel of the Pharaohs by zooming around a 3D maze in *Scrollerama*. On each of the three levels you must assemble or find a key to get to the next level by capturing ghosts or entering places of information. *Zombies* and spiders conspire to prevent you getting into the Pharaoh's tomb. This ranks with Ariolasoft's *Skyfox* as an attempt to market good original material, rather than the older US games. *Wizard*, the third release, includes a screen construction set, so if you get tired of jumping the climbing through 40 dazzling screens as you reach for diamonds, gold and pearls, you can change the game. Both *Wizard* and *Scarabeus* are £12.95 on C-64 disc, and £9.95 cassette.

DOCTOR WHO AND THE MICRO ROMS



"The Daleks are off but can I recommend the TARDIS".

ROM chips have got cheaper — some EPROMs are reportedly available for a quarter of their January price — which has literally created ROM to move for claustrophobic programmers sweating away trying to produce epics in 32 or 48K of memory. At least two software houses are using sideways ROMs to expand the memory of a specific computer so it can run a specific games program. Means you have to dig a little deeper into the piggy-bank, but they claim it's

worth your while. At £14.95, *Mikro-Plus* (alias *Mikro-Gen*) are confident that *Shadow of the Unicorn* is value for money. Not only do you get 64K of program on you Spectrum and a 120-page illustrated book, but you also get a built-in joystick port, and back-up to microdrive or tape facility, plus a diagnostic checking and tape alignment routine for trouble-free loading.

Shadow of the Unicorn is the tale of an unwitting farmer who opening an old tomb he has

discovered releases evil forces. There are 10 fully-animated characters all with their own part to play in helping you to reseal the book. There are 2,800 locations and 11,500 views according to *Mikro-Gen's* Tony Bentley. "It's a very deep and complex adventure — it will definitely appeal to people who like *Valhalla* or *Lords of Midnight*."

Dr Who and the Mines of Terror is *Micro-Power's* foray into the land of the sideways ROM. For your £18.95, you get another 16K of memory (19.95 for disc version) and very large platform game. The aim of the game is to recapture the plans of the TARDIS time machine and destroy the Master's factory. Based on the popular sci-fi TV series, it lacks Daleks, but has plenty of problem-solving.

Mikro-Gen see a future for ROM: two more expanded games are under development. *Battle of the Planets*, licensed from BBC TV, and the ultimate Wally game, *Wally in Paradise*.

THOUGHTS & CROSSES

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POP★ TOPS

TOP 20

1	The Way of the Exploding Fist	Melbourne House	Sp/64/Am
2	Frank Brunos Boxing	Elite	Sp/64/Am
3	Nightshade	Ultimate	Sp
4	Hypersports	Imagine	Sp/64
5	Barry McGulgans Boxing	Activision	64
6	Hyway Encounter	Vortex	Sp
7	Summer Games II	US Gold	64
8	Frankie goes to Hollywood	Ocean	Sp/64
9	Sky Fox	Ariolasoft	64
10	Arnhem	CCS	Sp/AM
11	Thats the Spirit	The Edge	Sp
12	Death Star	Superior	E1/Bc
13	Impossible Mission	US Gold	64
14	Southern Belle	Hewson	Sp
15	Cyru	Firebird	Sp/64
16	Chopper	Sparklers	64
17	Nodes of Yesod	Odin	Sp/64
18	Booty	Firebird	Sp/64
19	Desert Burner	Sparklers	Sp
20	The Red Arrows	Database Software	Sp/Am

Source: WH Smith

TOP 3 BY MACHINE

1	Crazy Cavey	M. Tronic	Vc
2	King Tut	M. Tronic	Vc
3	Rockman	M. Tronic	Vc
1	Now Games	Virgin	64
2	Sky Fox	Ariolasoft	64
3	Summer Games II	US Gold	64
1	Now Games	Virgin	Sp
2	Way of the Exploding Fist	Melbourne House	Sp
3	Frank Brunos Boxing	Elite	Sp
1	Match Day	Ocean	Bc
2	Terrimolinos	Melbourne House	Bc
3	Beachhead	US Gold	Bc
1	On the Ball	Thorn EMI	At
2	Bounty Bob Strikes Back	US Gold	At
3	Pole Position	US Gold	At
1	Formula One Simulator	M. Tronic	16
2	World Cup	Artic	16
3	BMX Racers	M. Tronic	16
1	Repton	Superior	E1
2	Overdrive	Superior	E1
3	Football Manager	Addictive	E1
1	Frank Brunos Boxing	Elite	Am
2	Syrus II Chess	Amsoft	Am
3	3D Stunt Rider	Amsoft	Am
1	Killer	M. Tronic	Ms
2	G. Busters	Activision	Ms
3	Pitfall II	Activision	Ms

Source: Websters Software

Write to: Your Letters, Your Computer, Room L221, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Our Prestel mailbox number is 019991800.

YOUR Letters

Dear Sir Keith,

I would like to paint a small scenario. There you are early one morning eating your third Shredded Wheat. Your complimentary Daily Maxwell lies open on the kitchen table. The teachers pickets outside are still in their tent. Suddenly the peace is broken. A bulky figure plods up the garden path. It is none other than Chief Superintendent Robert Hay coming to feel your collar. Why?

This Conservative government, of which you are quite rightly a senior member, is responsible for many great achievements. The sinkings of the Belgrano and Arthur Scargill perhaps being the best known. Our concern however is two lesser known successes. The micros in schools' scheme and the Copyright, Computer Software, Amendment Act 1985. It is the combination of these that will attract the attention of the aforementioned Chief Super.

The micros in schools scheme made two Cambridge based trainee businessmen unfairly rich. It also made our schoolchildren the most computer literate in the world. So far so good. The downside is that it has made our schools hotbeds of criminal activity. The problem is that the scheme has provided plenty of money for hardware and very little for software. Without lots of good software a computer is only useful as a paperweight.

It is not that teachers condone copying software. It is not even that they approve. The fact is that it is the teachers who are doing the copying. On the grand scale. Copying software is theft of intellectual property. Stealing. Just think of the effect on the moral judgment of our schoolchildren when they see that. Here are their elders and supposed betters, their peers in society, to look up to and emulate. Criminals.

These schoolchildren may be the most computer literate but do they know the right things? The fact is that the educational software market is a complete mess. The combination of lack of money and mass copying makes writing software for schools a waste of time. All the talent that could be writing educational software, raising our national educational standards, are writing games. They have to earn a living. Software piracy has led to the formation of the Federation Against Software Theft (FAST). The Federation has lobbied parliament and the result is the new Copyright Act. To enforce the act FAST has employed the gentleman from the scenario, Robert Hay. Anyone he catches copying software is liable to an unlimited fine or up to two years in jail. Surely as Secretary of State for Education there must be a degree of vicarious liability for the actions of your teachers?



Hence the scenario.

The solutions are straightforward. To provide hardware and not software is like providing text books with nothing but blank pages. For every pound spent on hardware at least two pounds must be spent on software. This might result in less hardware but it will definitely produce better educated children. Teachers must be sent directives not to copy software and those that do should be severely disciplined. If only to provide the correct moral example to their charges. The directive must extend to school computer clubs, where school equipment is used to copy the latest games under teacher's supervision.

This country needs a computer literate population to face the future successfully. This is the responsibility of you and your government. The above action is merely a step in exercising that responsibility.

Bruce Everiss
Bruce Everiss.

ALIENATING!

IT IS WITH growing concern that I note the ever-increasing popularity of the so-called "shoot-em-up" type of arcade game.

A craze which started with Space Invaders has now progressed to a cult dedicated to playing far more addictive and complex games. Why, you might ask, am I so concerned about this seemingly harmless pursuit? Well, let me elucidate...

During man's exploration of space, it is inevitable that, sooner or later, he will encounter extraterrestrial civilizations. It is imperative to man's survival that

he realises the only way to approach these aliens would be peacefully, preferably followed by a scientific and/or cultural merger.

But when we are instilling into our populace the innate urge to destroy anything alien — through the aforementioned games, — we are simultaneously placing an ominous black cloud over man's very survival. An even more worrying facet of the shoot-em-up cult concerns terrestrial monitoring by alien beings.

We have absolutely no way of knowing whether the Earth is being monitored by a technically-superior civilization, but let's suppose for one moment that it is.

Now, assuming that they haven't gone through a similar "shoot-em-up" phase in their past, and that the very concept of a "game" is incomprehensible to them, then what do you think they will think when they see half the Earth's population squatting over VDUs and zapping pixelized aliens with an apparently insatiable gusto?

My guess is that they would be unlikely to permit the continued existence of the human species. Perhaps we could provide the answer to the problem by persuading computer firms to stop manufacturing these games.

However, I'm realistic enough
(continued on page 29)

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IN ★ TOUCH

How to write for Your Computer

We called this magazine *Your Computer* precisely because we welcome your views, tips and hints and even your criticisms of machines and software in general. Here's how you go about getting your name into print. Your article should be typed, double-spaced, on A4 paper. A name and address on each sheet would help. Don't forget to tell us which machine it runs on. With programs please include a cassette or disc and some indication of how long it is. Please put what machine it's for on the envelope. Don't forget full instructions to us how to load and list your program and how to enter it for the readers.

The article must be submitted exclusively to *Your Computer*. We pay £35 per published page — that's as it appears in the magazine and includes illustrations.

Telsoft

Telsoft is *Your Computer's* software downloading service. Any program for the Spectrum or the BBC — and soon the Commodore — which has a telephone symbol next to it is available on the service. Both 1200 and 300 baud speeds are catered for. For more details call Colchester (0206) 8068. No more lonely nights typing in endless pages of hex digits.

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(continued from page 27)

to know that they won't, and hence the reason why I'm writing this letter. I'm pinning my hopes on two things: i). the aliens can read English, and ii). they subscribe to this magazine. If so, and they read this letter, then humanity will be able to breathe a sigh of relief, and once again continue on its weary path to eternity.

Harry Seldon,
Grimsby.

SCREEN DUMP

SCREEN DUMP — YC Software File, August 85 — will be welcome by ZX Spectrum/Interface 1 users as Basic screen dump routines take some 30 minutes to copy a screen. In fact, Brother HR-5 control codes do not fully match Epson ones so a half-height overprinted copy results from the unaltered code.

HR-5 owners need only change one byte at address 32829 from 04 to 08 hex to correct the routine for this popular printer.

A. J. Torlesse,
Helensburgh,
Dunbartonshire.

AMSTRAD ANGER

SO AMSTRAD have finally blown it! After introducing a strong influence of confidence and stability into the home computer market they have withdrawn the CPC-664 after just three months.

I am one of the unfortunate many who purchased the 664 and, after I read of the 6128 introduction, I thought that Amstrad would at least offer some means of upgrading the 664 to a 6128. Then I wondered what support would be available for the 664 in the future.

I wrote to Amsoft asking these questions and received a reply full of sales waffle which totally avoided answering these questions and seems to typify Amstrad's attitude to 664 owners. I would not be at all surprised if Amstrad had seriously miscalculated the date on which the 6128 development would be complete, which it almost certainly was when the 664 was released, and went through with the 664 launch in order to recover its development costs from the unsuspecting 664 purchasers.

I was amazed to hear Alan Sugar on *Database* stating that the 664 would be supported as it is compatible with the other Amstrad computers. What rubbish! I have already

YOUR Letters



encountered compatibility problems with 464 programs, and 6128 programs will aim to use the extra memory so they certainly will not run on the 664.

Amstrad owes it to 664 purchaser to offer an upgrade or trade in on the 6128 and I hope other 664 owners and magazines like *Your Computer* continue to pressure Amstrad until they do.

Prospective purchasers of the PCW-8256 beware. What will you do if this is dropped after such a short period and after the 664 experience, can you be sure that Amstrad won't?

J. F. Palmer,
Crawley,
Sussex.

'BRAVE GAMBLE'

ON READING Stephen Meadows' letter in October's *Your Computer*, I was amazed at its content.

Mr Meadows explains to us that the TMS 9900 has an eight bit data bus, it does in fact have a 16

bit data bus. Its major handicap is that it has a 15 bit address bus which only allows it to access 32K of Rom/Ram directly.

He also claims petty reasons for the machine's failure, such as the position of the power switch. There are quite serious reasons for the lack of popularity:

the machine was initially over priced, due partly to the high chip/discrete component count and partly to the bad marketing strategy.

early models needed a special American monitor.

the software was overpriced and I personally have never seen any third party software for the machine.

the TMS 9900 chip was marvelously suited to control systems but not suited for a micro.

the expansion was
a) all supplied by Texas.
b) expensive.

the Basic was, to put it politely, double-plus-mega-slowwww — not to mention the dreaded Call extension.

I am not a fan of the QL or Uncle Clive, I crack up if someone says 28 days. However the QL was a brave gamble which would have paid off if the designers had used 3.5 inch drives instead of the Microdrives.

Sinclair is a pioneer but a little eccentric, though not completely incompetent.

6800 v 9900 ??????

For me its a 68000 every time.

D. M. Platt,
Maltby,
Rotherham.

Line 64504 in Listing 3 of October's *Spectrum game, Impulse*, was left out. It should read:

```
501617DCQAD718B1 = 711
```

In the same issue line 55 in Listing 2 for *Midnight Express* should read:

```
Q=0:FOR T=1 TO 39 STEP  
2:X$=MID$(Z$,T,2):GOSUB 90
```

To increase the number of lines available in BBC *Pikchachanja* it is not enough just to alter the value of NUMLN as suggested in the article. Instead, replace every occurrence of C2 with C1+6*L, and delete the fourth statement in line 80. If you also replace BOO in line 750 with DOO you can have up to 80 lines.

ATARI COMPUTERS



Atari 520ST computer with 3.5" disc drive, mouse, monitor and software £675 (€670) £730. Atari 130XE computer £158 (€163) £183. Atari 800XL computer + recorder £118 (€123) £143. Atari 800XL computer + disc drive £229 (€230) £260. Atari data recorder £34 (€37) £47. Atari disc drive £172 (€171) £191.

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ADD-ON EXTRA

LP-1 Lightpen

CPC-464 or 6128
Amstrad
£19.95

Simple to use menu driven software for tape or disc that works in Mode 1 in 4 colours and Mode 0 in 16. Line drawing, box, circle and triangle facilities are provided as well as zoom and copying screens can be saved at either speed but dumping to printer is only on Amstrad's DMP1. A strategy game and use of the lightpen in your own programs instructions are included.

AMX Mouse

Graphics Package
Amstrad
£79.95

A conversion of the highly acclaimed BBC package for the Amstrad. For your money you get an art package, an Icon designer, and Basic extensions to allow you to use Mouse control in your own programs. Advanced Memory Systems are on 0925 602959/602690.

Delta

Second Processor
BBC
£115

This board consists of a 65C2 processor and 64K Ram. Watford claim that the board doubles the speed at which any program will run, and is 50 per cent faster than the official Acorn version. They also claim complete software compatibility. Tel 0923 3774/40588.

Pacesetter

Interface/Controller
Spectrum
£14.95

Space Invaders still zap you? Just can't get through that room in Jet Set Willy, well this could be the product you're looking for. You stick the Pacesetter in the back, and as well as a Kempston interface you have a control which allows you to slow a game down virtually to a standstill if desired. Any game which doesn't mess around with the interrupt procedures will respond to the treatment. Nidd Valley Micro are on (0423) 864488.

HARDWARE

Camel Polyprint

■ Spectrum
■ Cambridge Microelectronics
■ £44.95

NOT ANOTHER parallel interface! Yes, but this one's different. It will allow the usual LList, LPrint and small screen copy — bit image, somewhat oval circle — like the well-tried Kempston but without the option to copy using the printer's character set.

The customary and rather insubstantial add-on box with through port has eight 1K banks on Eprom, any 1K displacing the 15-16K area of the Spectrum Rom containing English, French, German, Danish, Swedish, Italian and Spanish, and a bank to change Tasword 2's character set to any of these.

It is specifically designed to be used with Epson's FX80, and Cambridge Microelectronics provide information to software switch the printer in conjunction with the character set changes. A list of addresses in Masterfile could thus be printed each in an appropriate character set. The unit is not cheap at £44.95 plus VAT.

However, for the specialist who wants a number of foreign languages and who doesn't relish poking Tasword 2 — I've done it and it takes a very long time — it's very handy. And the nicely mapped bits of Eprom can be used for other purposes — instructions are given for saving the character sets first. Not a hack interface, then, but rather one for the professional user or enthusiast. Cambridge Microelectronics is on 0223 314814.

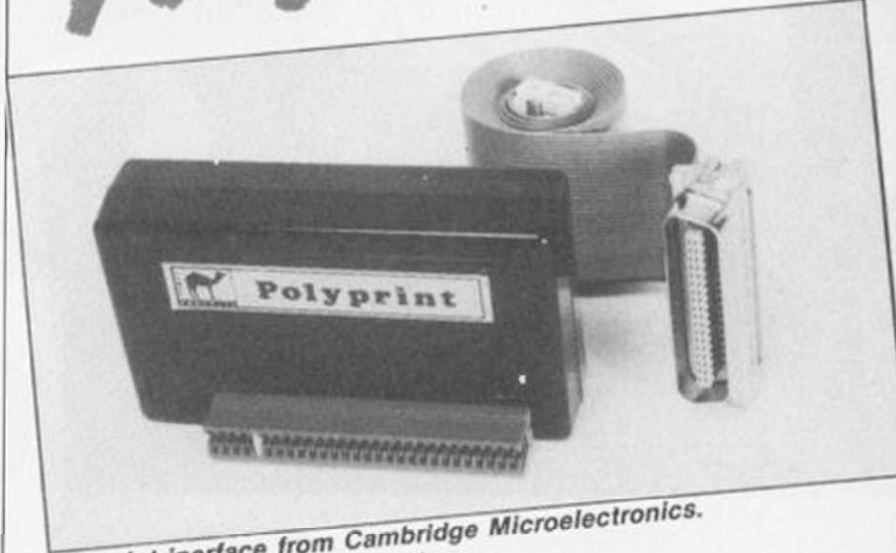
Lightpen

■ CPC-464 or 6128
■ DK'tronics
■ £24.95

WITH THE right software, a lightpen is one of the most useful add-ons you can buy. Graphic design, control of games or business packages are all possible. So how does this offering from an established Spectrum hardware specialist measure up?

On loading the screen uses Mode 0 to display the five main menu's which you can step forwards and backwards through

Hitlist



Polyprint interface from Cambridge Microelectronics.

to select the various functions shown as small pictures or "icons". Screen's can be loaded or saved to cassette or disc although no catalogue function is provided.

The graphic software is not protected so that you can transfer it to disc or alter the speed screens are saved at. Drawing on screen is possible in one of 10 colours and four thicknesses as well as a nice air brush facility, although the lightpen flickers slightly fine movement of the cross on screen can be filled with any of the 10 colours but dark areas or backgrounds are best left till last as the pen has to be moved by the cursor keys across them.

Other facilities allow you to draw curves, boxes and circles and place text horizontally or vertically. Areas of the screen can be duplicated, reduced or enlarged in four set sizes. Fine detail can be achieved using the scratch pad which enlarges an area of the screen for editing of single pixels.

A comprehensive and well written manual gives full details of printing screen's using them in your own programs and writing programs to use the lightpen.

In conclusion a good hardware, software package that will appeal to most users especially the younger ones because of the use of icon's.

The lightpen is available from computer dealers or direct from DK'electronics on 0799 26350.

Rom card

■ CPC-464 and 6128
■ Arnor Ltd
■ £10.39

IT'S A BUMPER month for Amstrad add-ons as independent manufacturers realise there is a serious market out there. Perhaps Alan Sugar's truck driver's do a little word processing on the side. This Rom board takes four Roms and plugs into Arnor's Maxam assembler board; it's useless without it, but cheaper than the Micropower board.

To go with the Rom board, Arnor has launched two packages: Utopia, a utility package, and Protex, yet another word processor. Utopia might not transport you to paradise, but it does seek to patch up a few holes in the Amstrad operating system and the DOS.

Many of the commands will be familiar to Beeb owners, with Help, Spool, Printon, Romoff and many more, it therefore comes as no surprise it is from the author of Toolkit for the Beeb.

A particularly useful command is Romoff which allows any Roms you choose to be switched out. This saves you removing disc interfaces or other add-on's.

Utopia is £26.04 for a 16K Rom, and Protex £34.74. Protex is a comprehensive word processor, with the usual formatting and printer control functions.

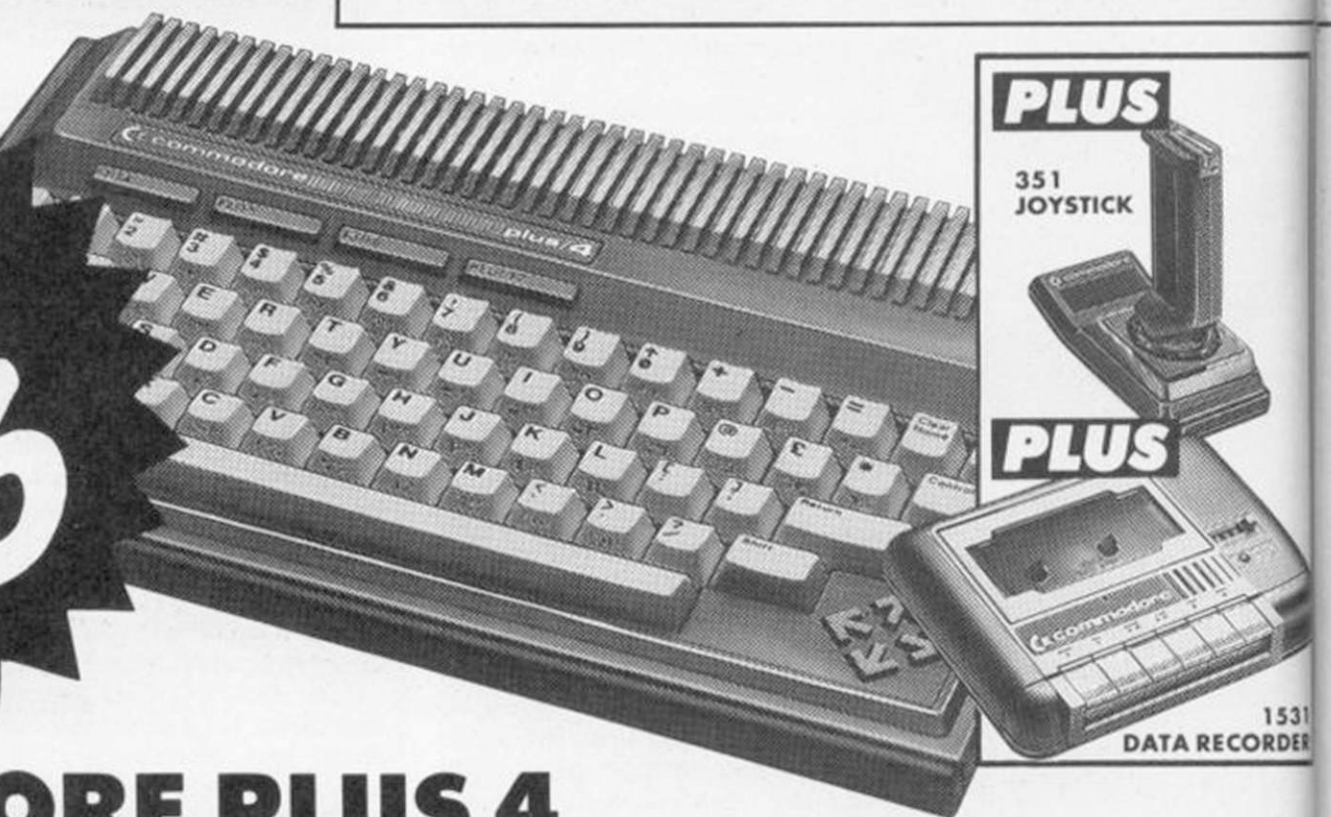
In October's Hardware Hitlist page, Robcom was wrongly referred to as Robocom, a totally unrelated computer company. Robcom can be contacted on 01-209 0118.

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WHAT TO BUY FOR CHRISTMAS

THIS CHRISTMAS may well be a bonanza for manufacturers and consumers alike. Competition is likely to be extremely fierce with attractive deals on offer from most micro makers. Next month, we'll examine budget micro's making a bid for pride of place in the christmas stocking, this month we turn the spotlight on some more up-market machines in the price range of £180 and upwards which loosely come under the heading of home micro.

These range from the QL at its new highly competitive price of £199 all the way up to the ACT F1E and the recently announced Atari ST.

The table gives an outline specification of the 10 contenders. When talking about price, you must bear in mind what you get for your money. Many micros in this price range come complete with some form of storage, and perhaps a monitor or mouse. Next comes the amount of read only memory (Rom), random access memory (Ram), the type of processor and the speed at which it runs.

The amount of Rom gives some idea of the power of the machine's operating system and resident language, although it must be stressed that in the case of the Einstein and the PCW8256, the language is loaded in from disc after power-up.

Lee Padden tests possible Xmas presents.

The figure for the Atari ST is provisional as the operating system is still being finalised at the moment, so it is only available on disc and not in Rom. Atari intend to produce a 260ST in the new year once the operating system has been sorted out, and this may well be around the £600 mark.

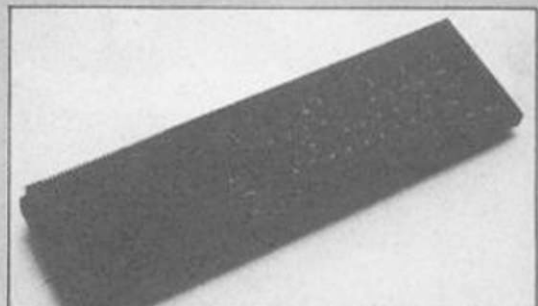
The processor and speed give some idea of the raw power of the system, although this is only a very approximate guide, ie despite the QL running a more advanced processor at twice the speed, its Basic is still slower than the BBC 128.

Graphics are still harder to be objective about. The figures given are the maximum in all cases. Usually, in order to get very high resolution graphics, colour or memory has to be sacrificed. It is also impossible to read 80 column text on a domestic TV.

The QL, F1E and 8256 have no sound save a very basic beep, usually to indicate a mistake of some variety. The rest either go with the ever popular General Instruments chip, which has a large, if not terribly subtle repertoire, or go



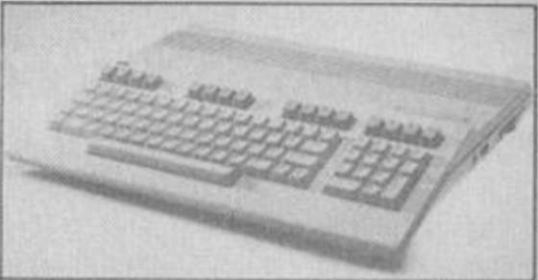
BBC 128



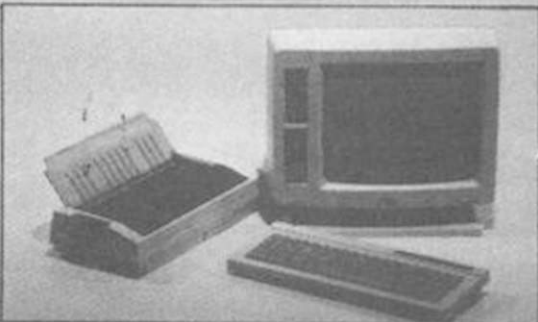
Sinclair QL



Amstrad CPC-464



Commodore C128



PCW-8256

Machine	Price	Memory & processor	Display	Sound	Ports	Keyboard	Peripherals	Software
Amstrad PCW8256	£460 inc mono monitor printer & 3" disc drive	256K Ram — Z80A at 4Mhz	90 x 32 Text 720 x 256 Graph Mono	Beep		Full travel 4 function + WP keys	RS232	CP/M, WP, and GSX bundled
Amstrad CPC6128	£399 inc colour monitor printer & 3" disc drive	128K Ram 48K Rom Z80A at 4Mhz	80 x 25 Text 640 x 200 Graph 16 Col	Voices	Joystick, printer, disc sound.	Full travel 10 function/ number keys	RS232, speech light pen, TV modulator	Games, utilities and business prog. Quality much improved recently
Amstrad CPC464	£299 inc colour monitor & cassette	32K Rom 64K RAM Z80A at 4Mhz	80 x 25 Text 640 x 200 Graph 16 Col	3 voices	Joystick, printer, sound	Full travel 10 function/ number keys	RS232, speech light pen, TV modulator	ditto
Acorn BBC128	£499	128K Ram 48K Rom 6502 4Mhz	80 x 32 Text 640 x 256 Graph 16 Col	3 voices filtering & modulation	Printer, RGB joystick	Full travel, 10 func keys	Modem, speech 2nd processor mouse, net. Disc drive	Lots of utilities and business, few games. Very little, mostly poor conversions.
Enterprise	£249 + Joystick	128K Ram 96K Rom 6502 at 4Mhz	80 x 25 Text 672 x 512 Graph 256 Col	3 voices filtering stereo	Printer, RGB joystick, net cartridge	Membrane type, 8 func keys	Disc, modem printer, joystick	Bundled business software, some languages, few games. CP/M compatible and can run most C64 software
Sinclair QL	£199 inc microdrives	128K Ram 48K Rom 68008 at 8Mhz	80 x 25 Text 512 x 192 Graph 16 Col	Beep	RGB, Net Cartridge 2 x RS232	Membrane type, 4 func. keys	Disc, modem printer, joystick	Bundled business software, some languages, few games. CP/M compatible and can run most C64 software
Commodore £269 C128		128K Ram 64K Rom 8502 1 or 2 Mhz 16 Col	80 x 25 Text 640 x 200 Graph 16 Col	3 voices filter modulate	Video, cart serial, user joysticks	Full Travel, 4 Func, number keys	Disc drive modem light pen, mouse	Business and games software in preparation.
Atari 520 ST	£750 inc 3 1/2 disc + mouse + mono monitor	512K Ram 192K Rom 68000 at 8Mhz	80 x 25 Text 640 x 400 Graph 512 Col	3 voices + midi in, out & thru	Printer, RGB joystick, disc, cartridge	Full travel 10 Func + number keys	Hard disc modem	Not much good software.
Talung Einstein	£499 inc 3" disc + momo mon.	80K Ram 8K Rom Z80A at 4Mhz	40 x 24 Text 256 x 192 Graph 16 Col	3 voices	Net, disc, printer, a/d RS232	Full travel 7 func keys	80 column display	Mainly business, runs MS/DOS, and BBC basic prog.
Apricot F1E	£685 inc 3 1/2" disc	256K Ram 32K Rom 8086 at 5 Mhz	80 x 24 text 640 x 256 graph 16 Col	Beep	Printer RS232, RGB	Full travel 10 func + number keys	Hard disc modem	

for something a little more upmarket in the way of filtering and modulation.

Ports are a problem. Most peripherals such as disc drives, joysticks, printers and modems have a recognised standard port, which it seems micro makers do their best to avoid. Still, at least this is some progress from the "leave part of the circuit board hanging out the back" approach common in cheaper machines.

The much maligned RS-232 interface is a case in point. Only the Atari has a "proper" 25 way connector. The BBC uses an RS-423 interface, which does the job, given the appropriate lead, but the QL uses a totally non-standard format, using phone-type plugs. Most joystick ports are of the "Atari" style nine pin format, the Enterprise needs an adapter. All except the Einstein, QL and Apricot have a cassette interface. Most machines also have an expansion port, but this is of little use to the average user.

You should certainly approach claims that these ports are standard with a fair degree of scepticism, and work out the real cost of attaching any gadgets you've got your eye on.

Keyboards are not usually a problem in this price range. With the possible exception of the Enterprise, the Einstein and the QL there should be few complaints. The BBC in particular has attracted warm praise from key bashers everywhere. The table mentions extra functions keys available over and above the Qwerty set, the obligatory shift, delete and escape keys. A numeric keypad can often speed up data entry.

One unique problem with the F1E is the keyboard is coupled to the main unit not by a cable, but by an infra red link, so you have to keep a nice tidy desk for this one.

Peripheral availability is rarely a problem with established micro's like the BBC, and most manufacturers give their machines hardware support.

If an RS-232 add-on is available, the machine should be able to use most modems, assuming suitable software is available.

One of the most important factors when choosing a micro is software. After all, unless you're going to get down to programming the thing yourself, how good the machine seems to be to you will largely depend on how good the available software is. Many a potentially good machine has ended up on the scrap heap for want of good software. It is always difficult to gauge how good software support is likely to be for a new machine.

PCW8256: A specialised word processor rather than a true home Micro, amazing value for money, no resident Basic, monochrome low res graphics. Bundled software includes Dr Logo, CP/M+, and GSX — a graphic system.

CPC6128: Possibly the best all round buy this Christmas for someone who wants to get into computers, has a bit of word processing or data handling to do and is not averse to playing the odd game. Hard to fault at the price. Easy to use, fast Basic, rather rudimentary disc system, and a flood of interesting peripherals arriving.

BBC 128: Looking a bit long in the tooth now, Beeb has changed little since its launch over three years ago. It has a massive cult following among hardware freaks. Software is rather patchy with the odd really stunning title among the froth. Perhaps the sudden expansion



Above: Atari 520 ST. Below: Enterprise 128. Below right: Amstrad CPC 128.



in memory will stimulate the software market a bit. The best machine for communications.

Enterprise 128: First rumoured to be on the way in 1983, after a long gestation, it was virtually stillborn. May still recover given a stiff transfusion of good software. Technically superb, it probably represents the end of the line in the evolution of the eight bit home micro.

Act F1E: A cut down version of Apricot's highly successful F1 business machine, it will not only run Apricot's range of business software, but also most programs written in BBC Basic in a bid for the education market. Runs MS-DOS, the most widely used PC operating system.

Einstein: While by no means a bad machine, the Einstein has been unable to make much of an impression on the market and has little third party software support. A bit bulky, it runs CP/M but needs an add on 80 column graphics board to give it full compatibility. Disc software on the pricy side.

Atari 520 ST: Very much an unknown quantity at this stage, possibly a better bet for next Christmas. Still, if you must have the best set of wheels on the street, this is definitely the



micro getting the most column inches devoted to it at the moment. If it's all true, with a user friendly operating system, MIDI and superb graphics, it'll be a huge hit.

Commodore C128: As yet it isn't certain this will be around in time for Christmas. Compatible with all CBM-64 software, with CP/M thrown in for good measure, it has superseded the C64 in the States, and presumably will do here as well, once Commodore have got rid of their stocks of CBM-64's. May well be a good compromise between a business and games machine.

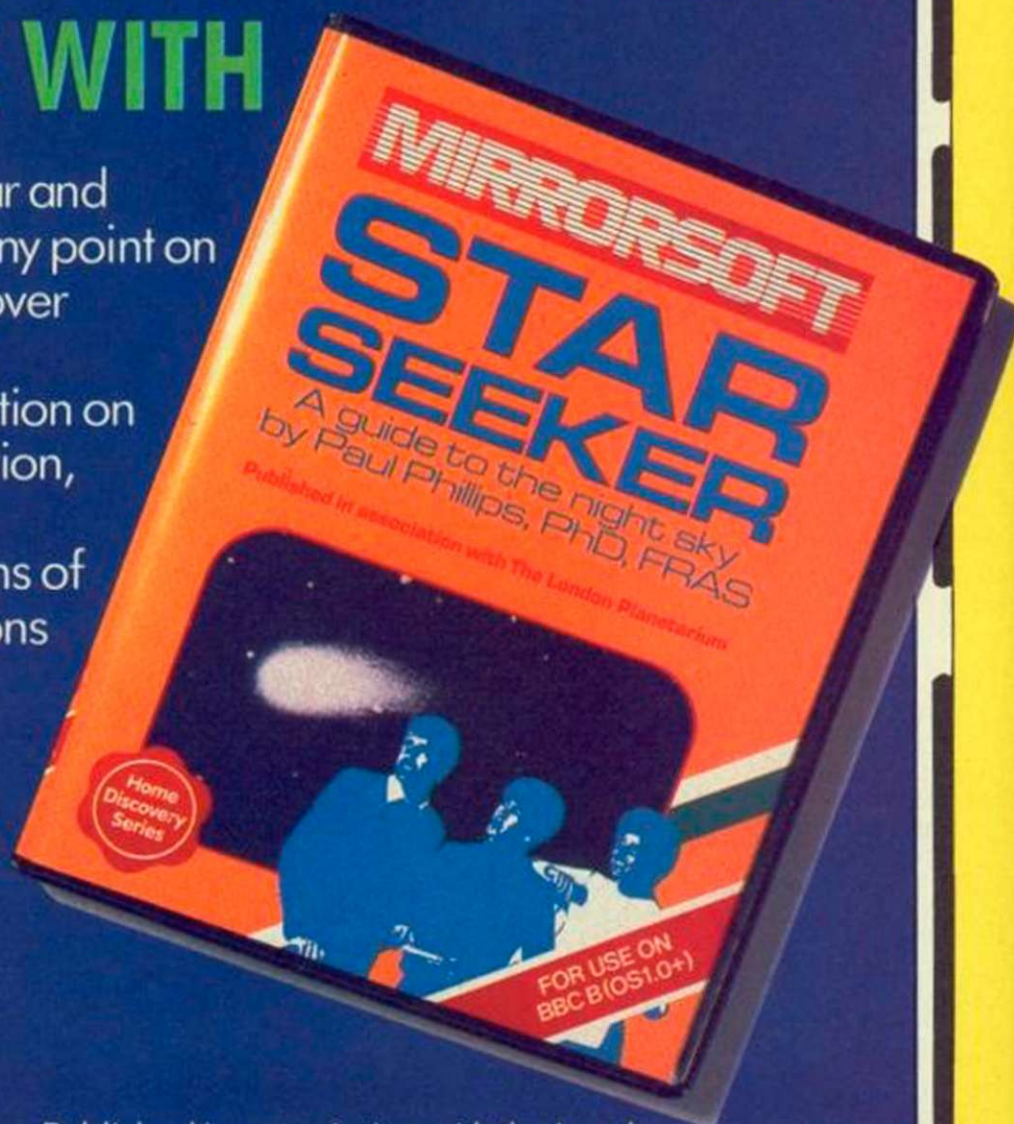
Sinclair QL: Virtually given up for dead after an apparently never ending series of teething troubles, the price cut and the new improved versions of the bundled software might just rescue this one from the realms of academic curiosity piece. Slow and cumbersome Basic, awful keyboard, and of course Microdrives. Monitor is specially adapted.

Amstrad CPC464: Older brother of the 6128, it suffers in comparison. But if £300 is your absolute limit, and you're happy with cassettes, you could do a lot worse. If you want a printer, make sure it's the new 2000 rather than the awful DMP1.

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BEHIND THE SCREENS



Andrew Braybrook.

Andrew Braybrook, author of *Paradroid*, first started games programming the hard way — in Cobol on a mainframe, when working as an accounting packages analyst/programmer at Marconi in Chelmsford. Pioneering real-time computer games with *Space Invaders* built out of greater-than/less-than signs was good schooling for getting the best out of the Commodore 64. "On the mainframes there were no real graphic facilities, and the action only took place when you tapped a key. That *Space Invaders* game as the first one at Marconi that went on playing by itself."

Initially the *Paradroid* backdrop was planned to be a plain blueprint, but Hewson decided this would look too primitive. Having experimented with a pressed metal title screen, Andrew extended the concept to one deck, then to the whole ship.

How did the game's transfer sequence come about? "I couldn't think how to show the takeover so I thought of making a little game out of it. Steve (Turner) was playing about with one of those logic circuit designing programs on the Spectrum and I thought I can use this."

And the smooth-etc scrolling? "It doesn't scroll the screen as such. You would need to access all the screen area. We found that's OK if you just go up and down or left and right but if you go diagonally you get a sort of step effect. So we refresh the whole of the screen all of the time, 17 times a second."

SOFTWARE

Paradroid

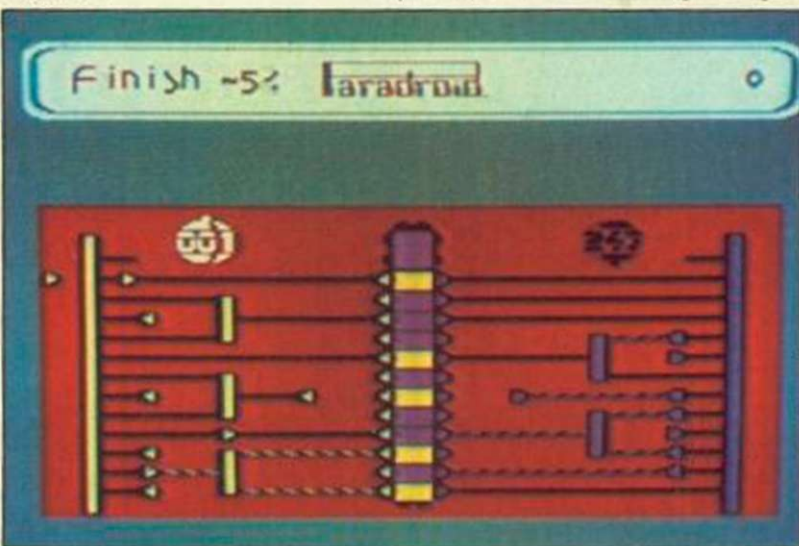
■ CBM-64
■ Hewson Consultants
■ Shoot-'em-up
■ £7.95

★ ★ ★ ★ ★

THIS IS PROBABLY the most original and striking game to appear from a dark horse software house since Llamasoft released *Gridrunner*. And it is far more than just a shoot-'em-up, though a certain amount of zapping is essential to survival in this highly addictive game.

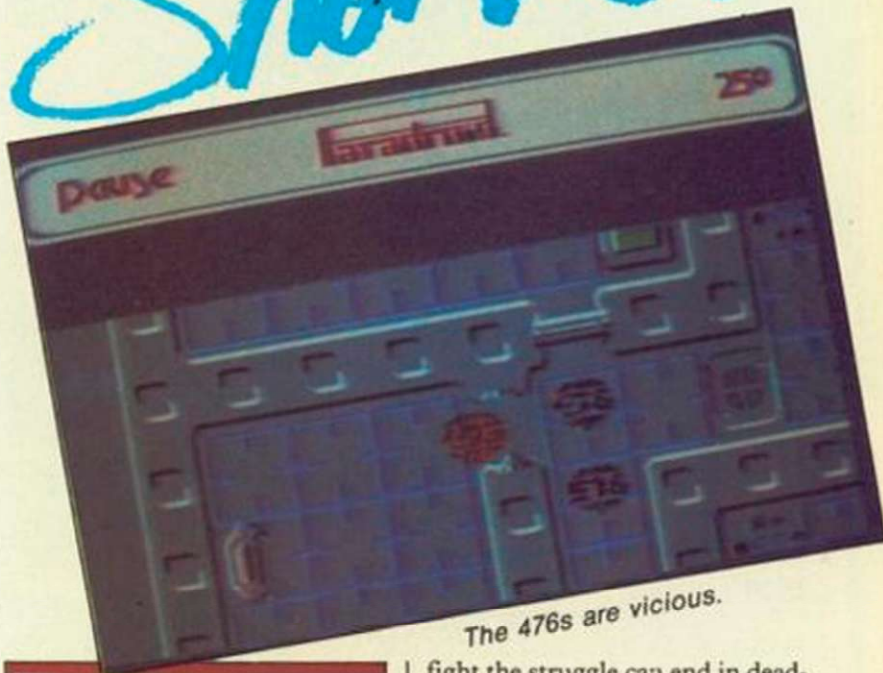
Your *paradroid* materialises on board a space freighter where mutiny is rife among the robots. Your job is to clear each deck of the dissident droids. You can either shoot them in the traditional way or take them over. You start out as a humble 001 influence device but you can work your way up through the social scale by taking over insignificant 123 disposal droids, 249 servants all the way up into the eight or nine hundreds. All the different types of droid are represented on the main screen as floating numbered globes, but when you taken one over you get a portrait of the machine you are and the one you are about to become together with specifications.

The takeover sequence is highly original and calls for a deal of quick thinking and pattern recognition. First you centre your joystick — your current host changes colour, then crash into your proposed victim. The description screen appears, followed by a screen depicting the logic circuits of the two machines divided by a central segmented column.

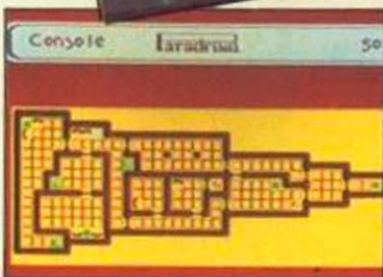


Takeover sequence — you'll need to think fast.

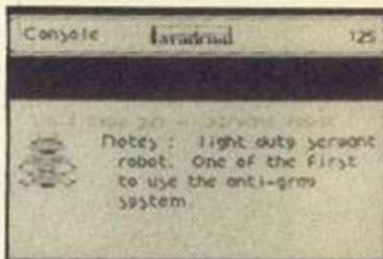
Shortlist



The 476s are vicious.



The deck plan.



Portrait and specification.

By moving the joystick up and down and firing charges along the circuits the aim is to turn the central column to the colour representing your side of the screen. If the victim puts up a

fight the struggle can end in deadlock, rejection or burnout. If you die, a whole load of static comes up on the screen followed by the message "Transmission terminated". Another nice touch of sophistication in this program.

There are 24 classes of robot. Each has its own personality — the 476s are very aggressive and hang round in gangs quite often shooting each other if they get carried away — but they are nowhere near as mean as the 711s which pack disrupters capable of blowing up everything in the vicinity.

The toughest robot of all is the 999. The only way to take this out is to take it over. It is, however, very resistant to your influence so transfer to another robot before it rejects you — there is no lonelier feeling than turning back into a 001 on a deck full of 716s, except possibly catching a train from Shrewsbury which turns out to be full of West Ham supporters.

When the last droid on a deck is eliminated the deck lights go out and the strange background warbling noise — which sounds like someone calling "here, kitty-kitty" dies away and you score bonus points.

With over 400 screens of playing area and 20 decks at £7.95, there are eight spaceships, plenty for your money. Hewson has come up with the goods just when some of its fellow little league colleagues seem to be nightshades of their former selves.

Paul Bond.

(continued on page 39)



ATARI ST 520ST

POWER WITHOUT THE PRICE

ATARI 520ST SPECIFICATION

MEMORY
512K RAM (524,288 bytes)
16K ROM expandable to 320K
Port for add-on 128K plug-in ROM cartridges
300K TOS operating system

GRAPHICS
Individually addressable 32K bit-mapped screen with 3 screen graphics modes
320x200 pixels in 16 colours (low resolution)
640x200 pixels in 4 colours (mid resolution)
640x400 pixels in monochrome (high res)
16 shades of grey in low res mode
512 colours available in low-resolution res
8 levels of each in red, green and blue

ARCHITECTURE
4 custom designed chips
GLUE Chip - MMU Memory Manager Unit
DMA Controller - Graphics Processing Unit
16/32 bit Motorola 68000 processor at 8MHz
eight 32 bit data registers
eight 32 bit address registers
16 bit data bus/24 bit address bus
7 levels of interrupts/56 instructions
14 addressing modes/5 data types

DATA STORAGE
High speed hard disk interface
Direct memory access 1.33 Mbytes per second
CD (Compact Disc) interface
Built in cartridge sockets
Dedicated floppy disk controller

DISK DRIVE
500K (unformatted) 5.25" floppy drive
349K (formatted) storage capacity

SOUND AND MUSIC
Sound Generator
Frequency control from 32Hz to above audible
3 voices (channels) in wave shaping sound in addition to a noise generator
Separate frequency and volume controls
Dynamic envelope control
4 OSC (address, Decay, Sustain, Release)
Noise generator
MIDI interface for external music synthesizers

KEYBOARD
Separate keyboard microprocessor
Standard QWERTY typewriter styling
Ergonomic angle and height
86 keys including 16 function keys
Numeric keypad - 18 keys including ENTER
One touch cursor control keypad

MONITOR
12" screen - high res monochrome monitor
640x400 monochrome resolution

VIDEO PORTS
Display - Low Resolution - 40 colours
Med-High Res - 40/80 plus color
Medium res RGB (Red-Green-Blue) output
High resolution monochrome (Black & White)

COMMUNICATIONS
Bidirectional centronics parallel interface for printers, or modems capable of input/output
RS232C serial modem/printer interface
VT32 Terminal Emulation Software
Maximum baud rate up to 19,200
High speed hard disk interface
Floppy disk controller (Western Digital)
2 joystick ports (one for 3 button mouse)
MIDI interface for external music synthesizers

GEM WIMP ENVIRONMENT
WIMP - Window Icon Mouse Pop-down menu
Two button mouse controller
Icons/Pull down menu/Windows
GEM VDI - Virtual Device Interface
GEM AES - Application Environment Services
GEM SST - Bit Block Transfer
Real time clock & calendar

SOFTWARE
GEM environment with user friendly Macintosh style operation
TOS - Tramiel Operating System
Atari's own system based on CP/M 80K with hierarchical directory & file structure plus a host of MS-DOS & UNIX command structures
BOS - Business Operating System
Do not run standard DOS business programs
GEM desktop with GEM PAINT graphics paint system and GEM WRITE word processor
Personal BASIC and DR Logo (originally written by Digital Research (DR) - try much like those on other machines except for the extensive use of pull down menu, mouse control and windows)

VARIOUS
Dimensions: 470mmx240mmx100mm
Requires external power supplies
Expansion 3.5" floppy disk drives 500K/1,000K
two drives can be connected
3.5" 15MB hard disk
CD (compact disc) interface
Dot matrix & dithered prints (black)
Thermal dot matrix (colour)
RGB & monochrome monitors

LANGUAGES
BASIC & LOGO supplied
Many others will soon be available, including Assembler, COPL, C, Pascal, C++, Modula-2 and Prolog

Note: Some of the above specifications are pre-release and may therefore be subject to change

MACINTOSH v F16 v 520ST

"Imagine a Fat Mac - the 512K Apple Macintosh - but with a bigger screen, a far bigger keyboard with numeric keypad, cursor and function keys, and colour. That gives you some idea of what the Atari 520ST is like, except for two important things. First the Atari seems faster. Second the Atari system is about one third of the price." June 1985 - Jack Schofield - PRACTICAL COMPUTING

FEATURES OF BASIC SYSTEM	MACINTOSH	F16	520ST
Price includes B/W Monitor	YES	NO - extra £200	YES
Keyboard size mm (LxDxH)	330x147x50	450x167x28	470x240x80
Keyboard size mm (LxDxH)	15x34x2	17 1/2x8 1/2x1	18 1/2x9 1/2x2 1/2
3 1/2" Dr/Drive (Unformatted)	500K	500K	500K
3 1/2" Dr/Drive (Formatted)	396K	315K	348K
WIMP (Window, Icon, Mouse...)	Apple	ACT - Activity	GEM
Real-time Clock	YES	YES	YES
Polyphonic Sound Generator	YES	NO	YES
RS232C Serial Port	YES	YES	YES
Centronics Parallel Printer Port	NO	YES	YES
Dedicated Floppy Disk Controller	NO	YES	YES
Hard Disk DMA Interface	NO	YES	YES
Full stroke keyboard	YES	YES	YES
Number of keys on keyboard	59	92	86
Numeric Keypad	NO	YES (16 Keys)	YES (18 keys)
Cursor Control Keypad	NO	YES	YES
Function keys	NO	10	18
16-bit processor	68000	Intel 8086	68000
Processor running speed	8MHz	4.77MHz	8MHz
RAM size	512K	256K	512K
Number of graphics modes	1	4	3
Number of colours	Monochrome	16	512
Max Screen Resolution (pixels)	512 x 342	640 x 256	640 x 400
Mouse included	Single Button	NO - extra £95	Two Button
Replaceable External Power Pack	NO	NO	YES
Cartridge Socket	NO	NO	YES
Joystick Ports	NO	NO	YES (two)
MIDI Synthesizer Interface	NO	NO	YES
Monitor Size	9"	9" - extra £200	12"
RGB Video Output	NO	YES	YES

System Cost with: Mouse - Monochrome Monitor - 512K RAM - 500K Disk Drive

	512K RAM	500K RAM	512K RAM
Price of basic system (exc VAT)	£2,984	£2,995	£2,995
+ Mouse	Included	£95	Included
+ Monochrome Monitor	Included	£200	Included
+ Expansion to 512K RAM	Included	£295	Included
Price of complete system (exc VAT)	£2,984	£3,185	£3,290

PRICE rounded down including VAT

THE NEW ATARI 520ST

Under the new leadership of Jack Tramiel (former boss and founder of Commodore Business Machines), Atari Corporation have marked their entry into the world of business/personal computers with a machine which leaves the competition standing. Tramiel's slogan 'Power Without the Price' has been implemented in the manufacture of the new 512K Atari 520ST colour computer which offers the user amazing high performance at an incredibly low price. Launched as a work-station, this new system incorporates seven software packages as well as the 520ST computer with 512K RAM, mouse controller, high resolution monochrome monitor (640x400), 95 key keyboard (with 18 key numeric keypad), MIDI interface, GEM and a 500K 3 1/2" inch disk drive, all for the package price of only £651.30 (+VAT = £749). Dubbed the 'Mac beater' and the 'Jackintosh' (after Atari's Chief, Jack Tramiel), Atari's new machine has been directly compared with the Apple Macintosh RRP £2595 (+VAT = £2985) which offers similar features and capabilities but at a much higher price. Favourably reviewed by the UK's highly critical specialist computer press, the 520ST is likely to make a great impact in this country as a sophisticated alternative to an IBM PC, APRICOT or APPLE MACINTOSH. Unlike its overpriced competitors, the Atari 520ST can be linked up to a colour monitor to unleash a choice of up to 512 colours. The addition of colour brings out the full potential of graphics packages such as GEM.

USER FRIENDLY GEM OPERATING SYSTEM

The power of the ST is harnessed and made user friendly by the new operating system 'GEM' from Digital Research. GEM stands for Graphics Environment Manager and allows a user friendly colour or B/W graphics interface which closely resembles that of the Macintosh. This similarity extends to the use of moveable resizable windows, icons to represent objects such as disks and disk drives, and the use of pull down menus and a mouse. The advantage of all this is that the computer becomes extremely easy to use. GEM has now been implemented for the Acorn, ACT, Atari, IBM, ICL, and Olivetti. Software written for GEM on one computer should also run under GEM on another computer. This will enable the market to quickly produce a large library of standard interchangeable software.

FREE SOFTWARE AND FUTURE EXPANSION

The Atari 520ST comes supplied with seven free software packages as listed below: 1) TOS - Tramiel Operating System based on CPM 68K. 2) GEM Graphics Environment Manager by Digital Research (DR) giving a WIMP (Window, Icon, Mouse, Pull down menu) environment. 3) DR GEM Paint for creating graphics masterpieces. 4) DR GEM Write for word processing. 5) Logo learning language to enable you to write your own programs easily using turtle graphics. 6) DR Personal Basic a powerful user friendly version of the Basic programming language. 7) BOS operating system giving you access to dozens of business applications packages already available on the market. Designed with future expansion in mind, the ST also features a host of different interfaces to the outside world and an impressive list of accessories is planned. Atari will soon be releasing a 1000K (1MB) 3 1/2" inch disk drive, and a 15MB hard disk storage system as well as a mass storage compact disk (CD) player capable of storing an entire 20 volume encyclopedia on one disk. A full range of inexpensive printers are planned including dot matrix, daisywheel and thermal colour printers. With its unbeatable graphics, speed and software at a price which is far below that of any comparable personal computer currently on the market, the ST is all set to do battle with the competition. To receive further details of the ST from Silica Shop, just fill in the coupon below with your name and address details and post it to us.

Silica Shop Price: £651.30 - £97.70 VAT = £749.00 This price includes:
★ 512K RAM ★ B/W MONITOR
★ MOUSE ★ 500K 3.5" DISK DRIVE
★ GEM ★ KEYBOARD (95 KEYS)

£749

"Atari's new corporate image as an aggressive low cost computer maker is likely to mirror that of Commodore whom Mr. Tramiel established the maxim that 'Business is war'." August 21st 1984 FINANCIAL TIMES

"This is the only personal computer I know of that comes with a MIDI interface as standard." Peter Bright March 1985 PERSONAL COMPUTER WORLD

"The (GEM) version running on the Atari 68000 machine will have the additional advantage of leaving the PC version standing." April 6th 1985 PERSONAL COMPUTER NEWS

"It would seem that GEM offers the ideal operating system." March 7th 1985 POPULAR COMPUTING WEEKLY

"I found it (GEM) extremely easy to use and was very impressed with the way in which it dispenses the underlying hardware and operating systems lurking under the surface." Peter Bright Feb 1985 PERSONAL COMPUTER WORLD

PRESS COMMENT

"The electronics in the machine are a work of art... The heart of the 520ST is a Motorola 68000, one of the most powerful 16-bit processors around and in many respects it is close to being a 32-bit chip... when the machine appears in the shops, it'll be at the front end of the queue to buy one." Peter Bright June 1985 PERSONAL COMPUTER WORLD

"This machine is significantly more powerful than an IBM PC... it's possible to design a sure-fire winning machine... this is it." May 11th 1985 PERSONAL COMPUTER NEWS

"... the use of GEM makes the new range of Atari computers so similar to the Macintosh (with the added attraction of colour), that they are already being called 'Jackintoshes'." May 2nd 1985 COMPUTING

"The new Atari ST computers truly represent to the consumer what Jack Tramiel is saying - easy-to-use computing power without the price." March 1985 ANALOG COMPUTING

"If (the ST) uses the most modern technology that is affordable, in a package that gives a professional impression." May 23rd 1985 POPULAR COMPUTING WEEKLY

"The Atari ST is one of the most elegant designs I have seen... Atari has used an original and elegant method of memory management which should make the ST faster than any other PC on the market - in any price bracket... The 64K dollar question is would I go out and spend money for one? To which the only answer is 'Try and stop me!'" John Lambert July 1985 ELECTRONICS & COMPUTING

"The 520ST is technically excellent... The 520ST hardware is the new standard by which others will be judged." July 1985 YOUR COMPUTER

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At Silica we have been successfully dedicated to Atari ever since their products first appeared on the UK market. We can attribute our success largely to the Atari specialisation which we practice and to the user back-up we provide. Rest assured that when you buy a piece of Atari hardware at Silica you will be fully supported. Our mailings giving news of software releases and developments will keep you up to date with the Atari market and our technical support team and sales staff are at the end of the telephone line to deal with your problems and supply your every need. With our specialist bias, we aim to keep stocks of all the available Atari hardware, software, peripherals and accessories. We also stock a wide range of Atari dedicated books and through us, the owners on our list can subscribe to several American Atari dedicated magazines. We can provide a full service to all Atari owners and are now firmly established as the UK's NUMBER ONE Atari specialists. Here are just some of the things we can offer to our customers.

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- ★ REPAIR SERVICE ON ATARI PRODUCTS

If you would like to be registered on our mailing list as an Atari computer owner, or as a person interested in buying an Atari machine, let us know. We will be pleased to keep you up to date with new Atari developments free of charge. So, return the coupon today and begin experiencing a specialist Atari service that is second to none.

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SEND FOR FREE ATARI ST LITERATURE

To: Silica Shop Ltd, Dept YC 1185, 1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX

PLEASE SEND ME FREE LITERATURE
ON THE NEW ATARI 520ST COMPUTER

Mr/Mrs/Ms: _____ Initials: _____ Surname: _____

Address: _____

Postcode: _____

Do you already own a computer
If so, which one do you own? _____

Star★ chart

KEY

- ★★★★★ Best of its type
- ★★★★ Very good
- ★★★ Good
- ★★ Average
- ★ Below par

Interactive Basic Programming

ZX Spectrum
Eigen Software
Educational
£9.95

★ ★ ★

A very useful set of four cassettes which instead of letting books blow your mind, allow your computer to do it for you. Permitting you to type in and program normally while IBP is resident in the machine, it tries very hard to be a blow-by-blow introduction to hands-on home computing.

I think you would have to hang on to your manual — I'm sure most real novices need to have it pointed out to them that there actually is a Beep key, and if you try to type in Beep, all you get is Border BBB, because there are so many other keys to press first.

But common sense permitting, this looks like a very useful guide for beginners provided they can find a human to help them out when they're really stuck.

Seventh Cavalry

ZX Spectrum
Strategy game
Black Knight
£3.50

★ ★

For only £3.50 you don't expect to get wonderful moving graphics. This gives you basic map screen display with very slow-responding commands. Your troop units are represented by letters of the alphabet.

Watch out for the letter I as this stands for, guess what, Indians: it streaks across the screen and massacres all the Bluebellies. Good luck to 'em, I say.

(continued from page 37)

Stealth

■ CBM-64
■ Ariolasoft
■ Strafe-'em-up
■ £9.95

★ ★ ★ ★

BUCK ROGERS, EAT your heart out. Broderbund's Stealth, now available from Ariolasoft in the United Kingdom, takes the fast-scrolling-flying-straight-down-a-corridor-shooting-at-things format and turns it into quite an addictive scenario. The screen display depicts the rear view of your fighter as it hares at zero feet across the hostile landscape.

In the distance the dark tower casts gloom over the future of your once-proud people. You must blow it up so that they can go back to their former cultural pursuits of bean-eating and watching "V" instead of cowering in the bunker.

You can bank left and right but you cannot change altitude. Nevertheless, the sensation of speed and manoeuvre is exhilarating. You can despatch bunkers, tanks and scouts with gusto and a well-placed rocket. Past the third level you come under attack from heat-seeking missiles which you can dodge by veering to port. At the fourth level, fighters come at you and dormant volcanoes start to figure prominently as features of the landscape. On the elusive fifth level these spew forth lava and present a general traffic hazard.

The scouts are particularly interesting. They bounce down from the sky, accompanied by a ground shadow and then zoom up again, adding a bit more perspective to what might otherwise be rather flat visually.

A couple of rather pale attempts at this kind of thing appeared on Dragons and Commodores 18 months back, followed by the release of the actual Buck Rogers game by which they were inspired. I am sure the concept could be stretched a little further but this is one of the most playable variations I have encountered.

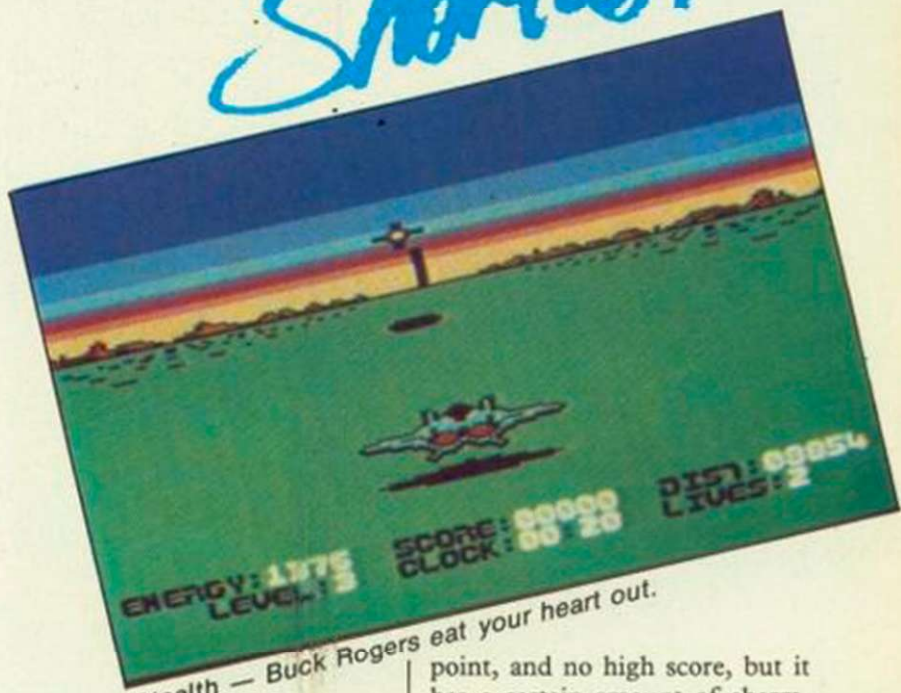
Paul Bond.



Donald goes shopping.

SOFTWARE

Shortlist



Stealth — Buck Rogers eat your heart out.

Donald Duck's Playground

■ CBM-64
■ Transatlantic Simulations
■ Educational
■ £9.95

★ ★ ★

THOSE BOYS at Centresoft again, cunningly launching a new label to cover up the fact they're taking over the entire software market. The spurious reason behind this is that the new label is aimed at a younger market.

This game sets out to teach youngsters the basic ideas of work, money, and buying things with money to build a playground — all good sound stuff which will doubtless come in handy in Reaganite America. There are four different jobs to try your hand at, fruit packing, cargo handling, stacking shelves and signalman. You book Donald in for a shift from one to five minutes, and perform the various tasks. You get paid on a strict productivity basis — with no tea breaks.

After that, its off to Goofy's junk store, or Minnie's hardware store, to buy slides, ropes, ladders and so on for the Playground. After you've picked the item you want, you have to proffer the correct change.

All this is done with pretty 3D graphics showing the various cartoon characters strolling around the screen. There is no real aim, in the sense of finishing

point, and no high score, but it has a certain amount of charm, and will doubtless appeal to the 5-7 age group it is aimed at, and might actually teach something, like if you vacuum the living room, you might get a pocket money raise. Could this be the start of education programs which actually keep their audience switched on long enough to teach them something?

Lee Paddon.

Blast Compiler

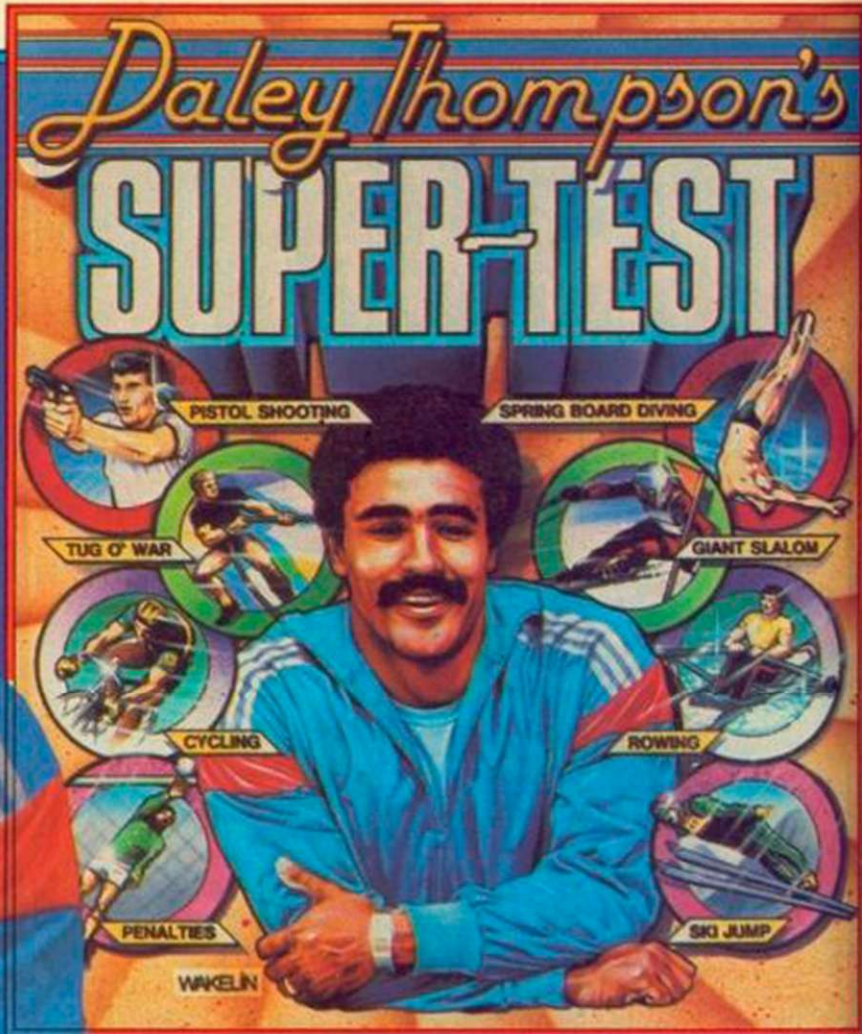
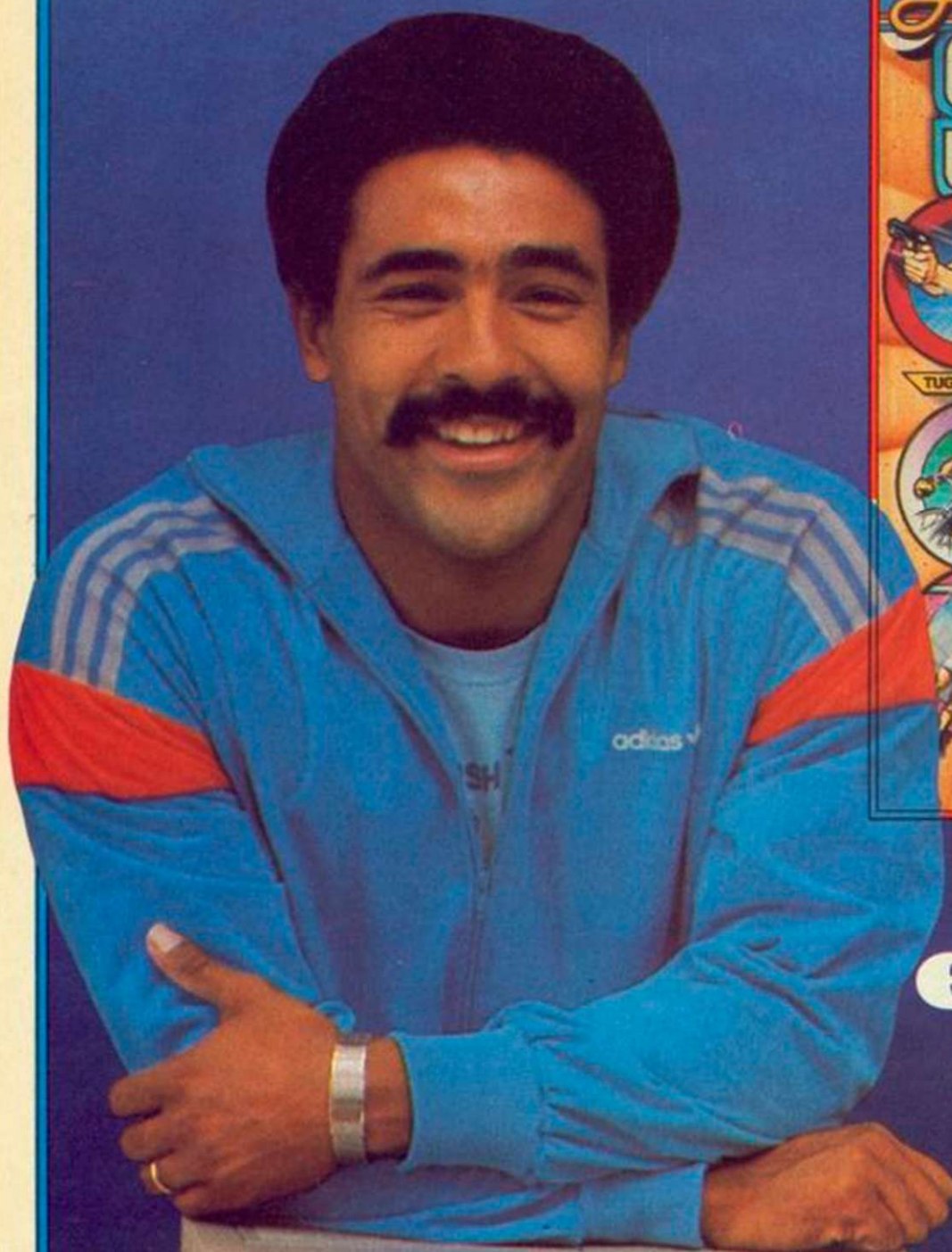
■ Spectrum 48K
■ OCS
■ Utility
■ £26.95

★ ★ ★ ★

THE IDEA of writing a game in Basic and then getting some dumb compiler to speed it up for you is enough to make some machine code purists take to the veil. But, for the rest of us, this utility could put an end to long nights hunting for an elusive bug which resets the machine when you shoot the fifth invader from the left on the third screen. There have been several Spectrum compilers before, but none have claimed to be as comprehensive as this.

On loading up, you are greeted with the cheery message that around 2K of the memory is free. So, any program to be compiled must be loaded section by section, compiled, and then saved; Microdrives are a must here. You can either compile into machine code, or p-code. P-code has the advantage

(continued on page 41)



Summon every ounce of strength and stamina ..rise to the challenge of my 'SUPER' TEST.



SPECTRUM48k 6-95 COMMODORE64 7-95 AMSTRAD 8-95

Ocean Software is available from selected branches of:

Boots, WHSMITH, John Menzies, WOOLWORTH LASKYS, Rumbelows, Greens

Spectrum Shops and all good software dealers.



Star★ chart

Elevator

ZX Spectrum
Platform game
Black Knight
£3.50

★ ★

The horrible Turling dromes have planted 15 time bombs in the kind of architecture you only find in platform games. Defuse the bombs in the correct order and in the specified time.

A faithful recreation of the early days of home computer gaming at a not appreciably reduced price. You have been warned.

Highway Encounter Amstrad CPC-464

Amstrad CPC-464
Vortex
Arcade adventure
£8.95

★ ★ ★ ★ ★

Brilliant Spectrum game re-implemented for the 464, enough to make you hang on to the old machine instead of rushing out and buying a complete wordprocessing system. You guide a crocodile of demented dalekoids up a Zaxxon-esque 3D highway through zones of increasing hostility from totally indescribable things.

As lead droid you must defend the rest of them until you get your ultimate weapon into the final zone and drive these monsters from the planet's surface.

Lords of Midnight

Amstrad
Amsoft
Adventure
£9.95

★ ★ ★ ★ ★

Even a year after the launch of the Spectrum version, this game still looks state-of-the-art. You have to defeat the forces of evil by either going on a quest or recruiting a huge army and defeating them in battle.

(continued from page 39)

of being more compact than machine code, or even sometimes Basic, and, as an undocumented language, may be fairly secure against hacking.

However, it is slower; for this reason, sections of the program can be compiled into machine code. Obviously there are some things which are best done in machine code, and Blast allows users to call machine-code subroutines, and will compile user extensions to Basic. The package is supposed to contain extra Basic commands, but these have been left out due to space; but you do get a useful toolbox of editing commands.

It is difficult to gauge the performance of this program. OCS claim that speed improvements of up to 40 times are possible. This obviously depends on the length of the program, the amount of calculation, and the way the program is written. The manual is currently undergoing revision, but the version with the review copy was hard work. Despite this, it seems that Blast has lived up to expectations, and is by far the best Spectrum compiler on the market. OCS is on 0993 812700.

Lee Paddon

Astro-Clone

■ Spectrum
■ Hewson Consultants
■ Arcade adventure
■ £7.95

★ ★ ★ ★

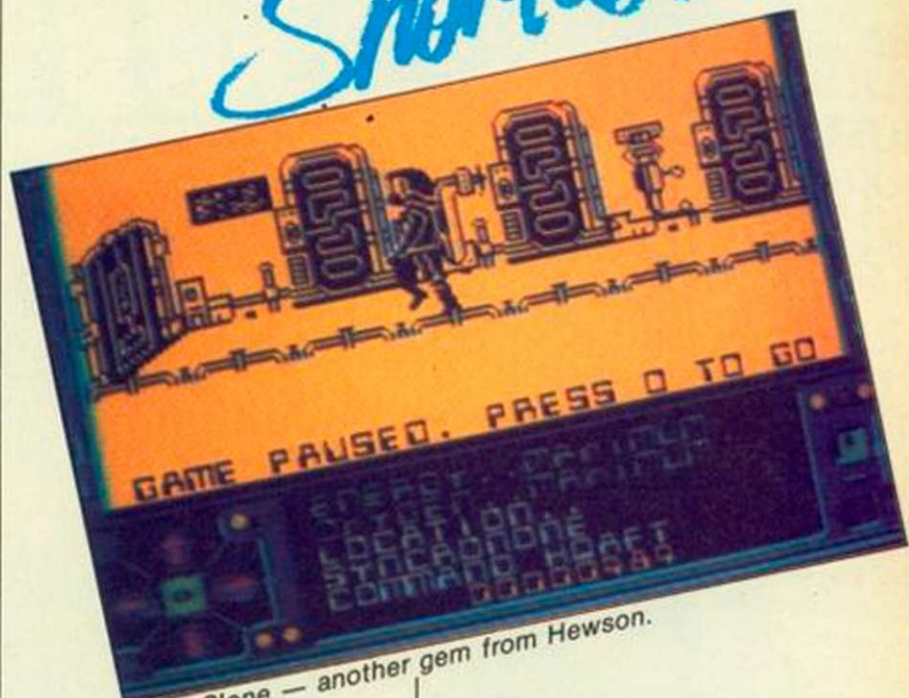
ANOTHER GEM from Hewson matches variety of gameplay with excellent animated graphics. Supposedly the third part of Steve Turner's Dragontorc trilogy, it is obviously something quite different, but is none the worse for that. The game is split into strategic, space combat and ground combat phases. The ground combat phase is where you are on the opening screen, with your Astro-Clone in his two-room spaceship.

On the lower part of the screen lies the control panel. To the left is an icon panel; this tells you what effect the joystick has at any point in the game. There is a message screen next to this, and to the right of this two square alert lights. The top one goes red to draw your attention to the message screen. The lower one goes yellow if those old Hewson bugbears the Seiddab are in the next room, red if they join you.

Your mission is to destroy the main launch computers in all the Seiddab bases to gain control of the stargate sectors shown on the strategic map. But before you access the strategic phase you

SOFTWARE

Shortlist



Astro-Clone — another gem from Hewson.

must take off, enter the space phase — a Defender-style sequence and either dock with a Seiddab starbase or slip through the pulsing diamond stargate to another sector. Either way you have to destroy all the Seiddab cruisers first.

If you fly through the stargate, you enter the strategic phase. If you dock with a starbase, you enter the ground combat phase again. In ground phase you have four modes, selection, movement, arm and laser. The arm mode is quite a nifty bit of programming which allows you to control and throw objects in a way unique to this game.

The game requires tortuous problem-solving capabilities — you need to be able to figure out that if you pass the Gravimag over the grating in room 8 a sonic key appears, for starters. And since the location of seven of the starbases change every time the game is played, the game is always slightly different. Publishing a solution for this game is going to be a bit more complicated than it is for something like Nodes of Yesod.

Hewson have excelled themselves once again — full credit to Steve Turner for producing a game that is destined to become one of the cult non-Ultimate adventure games at Christmas. If only because they've actually brought the game out, unlike some of their more flashy big brothers who are good on hype but slow on delivery.

Paul Bond.



Get your kicks with Karateka.

Karateka

■ CBM-64
■ Ariolasoft
■ Martial arts game
■ £9.95

★ ★ ★

WAY OF the Exploding Fist it isn't, but Karateka has plenty of Oriental charm. Of particular note is the film-like narrative technique: a kind of story is told in the preamble to each fight sequence — we see Princess Mariko thrown into the dungeons by the evil Akuma, and in later sequences we see Akuma sending his henchmen out to work you over as you try to rescue the unfortunate girl.

As rescuer and henchmen approach each other the hypothetical camera cuts between them until they appear on the same screen. You can shorten this process by running forward but it's not advisable as a good kick in the running mode floors you completely.

And here we encounter a major gripe concerning this program. Obviously not wishing to endure the blood, sweat and tears not to mention time consumed in

(continued on page 43)

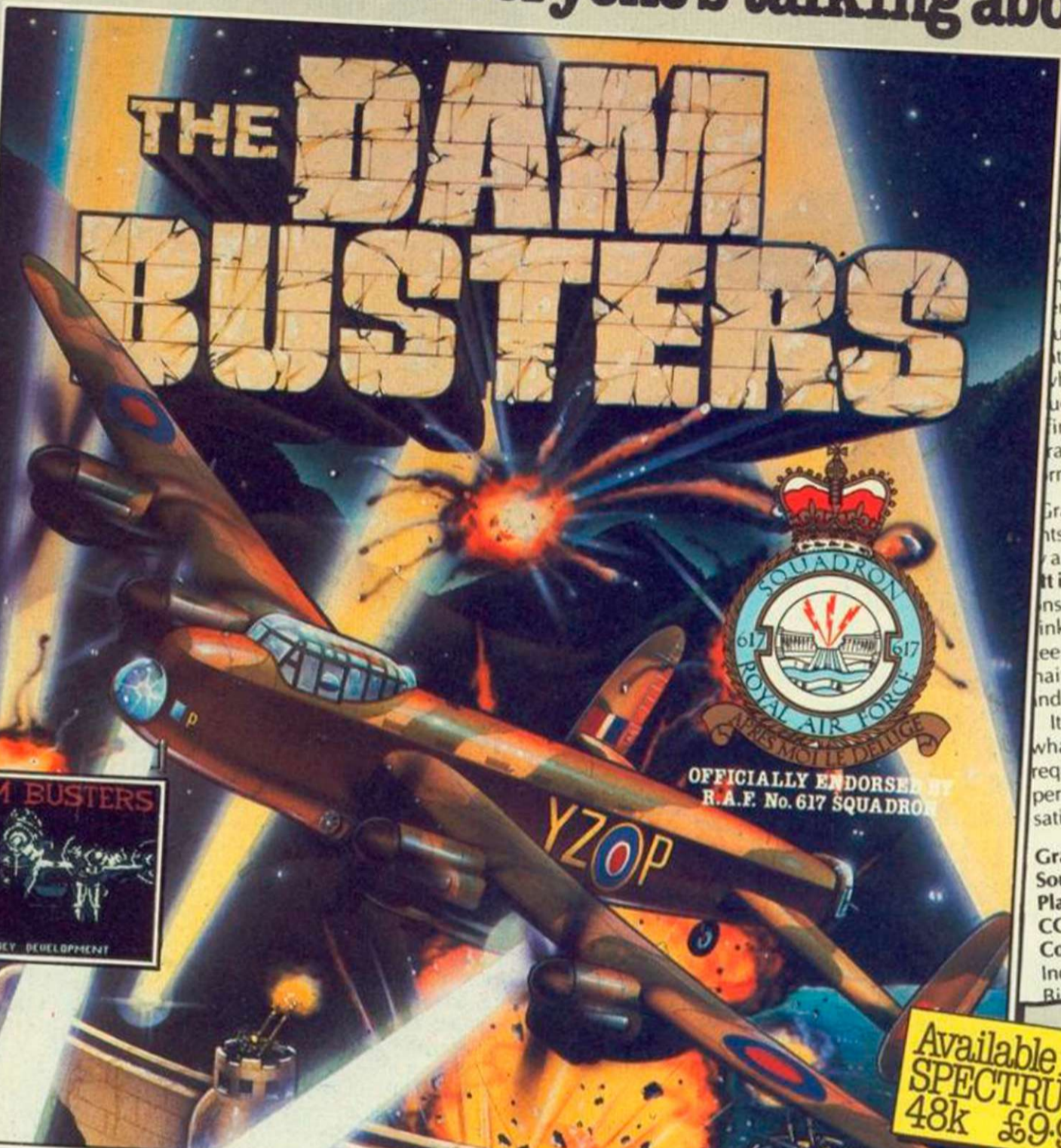
Play THE GAME everyone's talking about:



BUSTERS

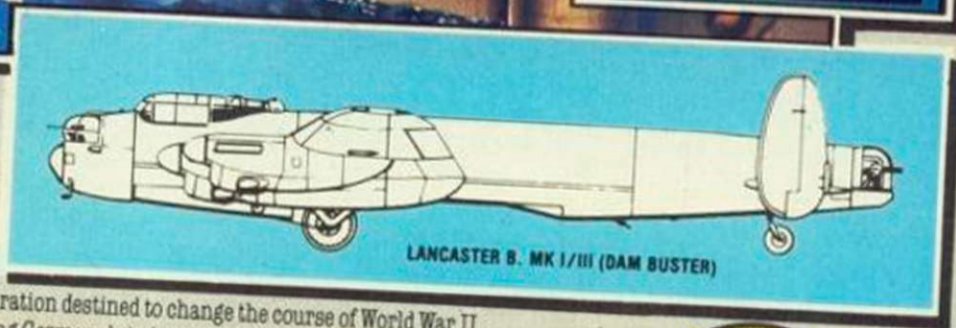
is and you have been on 617. Your mission to power dams of the busters is the latest S Gold, a cross between a simulator and an arcade game that requires you put fingers to work).

It only do you pilot take on the roles of pilot, bomb aimer, navigator, and second engineer. Squadron Leader option monitoring the status of the crew! As you can see your wits about you. Each of these options can be a



OFFICIALLY ENDORSED BY
R.A.F. No. 617 SQUADRON

Available for
SPECTRUM
48k £9.95



LANCASTER B. MK I/III (DAM BUSTER)

It's 21.15 hours on the evening of May 16th, 1943. A flight of specially prepared Lancaster bombers is leaving R.A.F. Scampton for Germany. After months of planning No. 617 Squadron are at last embarking on an operation destined to change the course of World War II. Your objective is to destroy the Mohne, Eder and Sorpe dams, thus crippling Germany's industrial heartland. This detailed and authentic simulation allows you to play the part of **PILOT, NAVIGATOR, FRONT GUNNER, REAR GUNNER, BOMB AIMER and FLIGHT ENGINEER.** You fly at low altitude over Europe, on the lookout for deadly ME110 night fighters, dodging barrage balloons, searchlights and flak. At the target you'll need all your nerve and skill to control the aircraft and release your deadly payload whilst under enemy attack. Game features include: **SUPERB GRAPHICS & SOUND · REALISTIC JOYSTICK CONTROL · PILOT'S SCREEN & INDICATORS · MULTIPLE SCREEN NAVIGATOR'S MAPS · FRONT & REAR GUNNER'S SCREEN · BOMB SIGHT SCREEN · ENGINEER'S INDICATORS.**

Game Package includes: Comprehensive flight instructions, maps and confidential documents including authentic material by Barnes Wallis and Wing Commander Guy Gibson. Designed and Developed by Sydney Development Corporation. Licensed in conjunction with International Computer Group. Manufactured in the U.K. by U.S. Gold Limited, Unit 10, Parkway Industrial Centre, Heneage Street, Birmingham B7 4LY. Telephone: 021-359 8881. Telex: 337268.



64

...vant number between
...n your 64.
...also have the choice
...n (starting near the da
...y action), Flight Lieute
...he English Channel),
...r (taking off from Scar
...substantial accompan
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...where. In addition to p
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...ing documents, inform
...raft and other addition
...rmation.

Graphics add to the ga
...nts below, search light
...and splashes if your
...It is a very complex g
...stantly be on the loo
...inking ahead to plan
...eer you clear of enem
...maintaining the correc
...nd speed of your airo
...It will take a while
...what and the speed,
...required for various
...persvere you will d
...satisfying game.

Graphics: ****
Sound: ****
Playability: ****
CCI Rating: ****
Company: US Gold
Industrial Estate, H
Birmingham. Tel

Star★ chart

Duckworth Highway Code

ZX Spectrum
Duckworth
Educational
£11.95

★ ★

Competent enough question and answer program, though questions along the lines of is it a good idea to drive with badly-maintained brakes? tend to rather lead the user to the correct answer.

The package contains two programs to test and improve your knowledge of the highway code, from the points of view of pedestrian and road user, together with special rules for cyclists. Prepared with the co-operation of Thames Valley Police

The Castles of Doctor Creep

CBM-64
Platform game
Ariolasoft
£9.95

★ ★

House hunting is no fun anywhere, let alone in Transylvania. You've made an appointment to visit 13 of evil landlord Dr Creep's castles with a view to purchase.

Not a wonderfully original setting for a standard platform game. But if you like roaming acres of haunted east wings then this game will certainly give you value for money.

The only catch is that it's unexciting to play — mapping out a whole castle so that you can escape requires a lot of to-ing and fro-ing and repetition.

Mummies and Frankenstein monsters hamper progress, together with plenty of very un-supernatural-looking ray guns and force fields.

Despite the large number of castles to choose from all the rooms are made up of the same components — trapdoors, ladders, doors and sliding poles.

Marginally more enjoyable than moving house in real life.

(continued from page 41)

producing the excellent tape version of Ariolasoft's Skyfox, the cassette version of the game is rather hastily implemented. Every time you lose, you must reload. A highly depressing experience — especially if you do something really dumb, like walk backwards off the cliff at the beginning of the opening sequence. I was only testing the joystick, guv. It takes two and one quarter minutes to reload the game — enough time to play a track off your latest Durutti Column album.

Anyway, if you manage not to fall off the cliff, a member of the local meat-squad turns up and starts chopping away at you. The animation of the figures is slower and more graceful than that in Melbourne House's *Fist*, but they are smaller, and there is less in the way of sound. The type of blow is restricted to kick and punch, controlled by how you squeeze the joystick button; the stick itself controls altitude of kick — high, middle, low.

You can withstand only a limited number of hits from your opponent. The row of red arrows across the base of the screen indicates how much stamina you have left. Every time he hits you, you lose an arrow. Conversely, the blue arrows on the left of the screen gauge his strength. Each guard wears different headgear and has a different fighting style.

Once you cross the porch the scenario shifts indoors. This also means loading a new section of the game. Here more of the same goes on except that the warlord's pet eagle has a go at you as well. So the moral of the story here is — watch the birdy.

Paul Bond.

Fight Night

■ CBM-64
■ US Gold
■ Boxing Game
■ £9.95

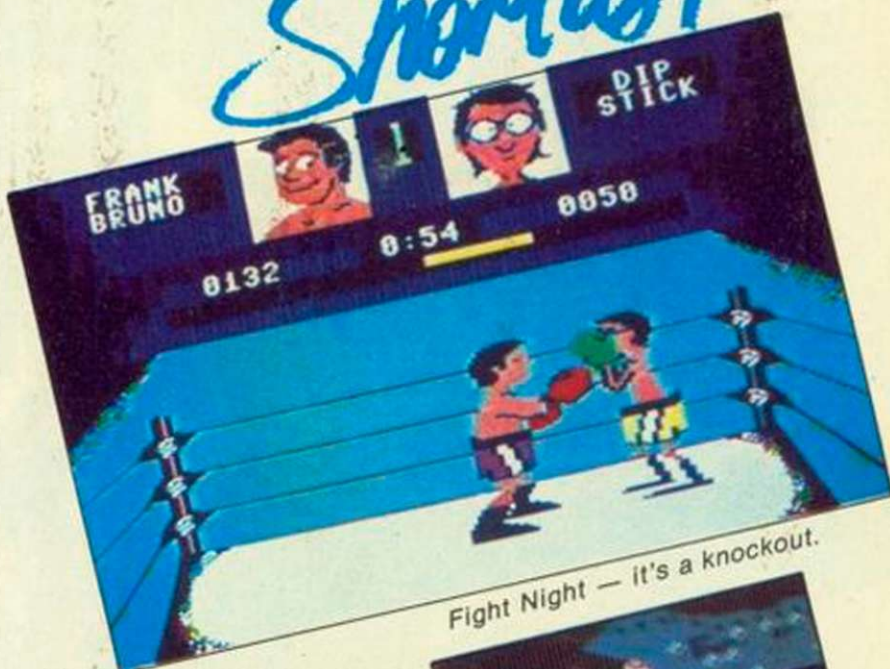
★ ★ ★ ★

THE WELTER of boxing games continues unabated. First the crisp job of Rocco, then the swinging upper cut of Frank Bruno, but US Gold reckons it can deliver the knock out blow with *Fight Night*, despite the rather punch drunk nature of the market.

Once the game loads, you are faced with a menu. You can "construct" a boxer, train him, do a bit of sparring, take on a series of progressively tougher challenges, or fight a tournament, several players taking one boxer each.

SOFTWARE

Shortlist



The important part of construction is to decide whether to make your jab or body blow hardest, and which part of your body can take the most punishment. You also get to choose the colour of your trunks and even skin (including blue, presumably to cater for any aliens who might care for a bout or two).

The actual fight simulation is probably the pick of the bunch. From the ring side seat view, the boxers move back and forth, move their guard up and down, punch and jab. This is no slugfest either, timing is all important. Landing a blow has a number of important effects, it scores you points, it decreases your opponent's endurance, and it puts him off his punch, so a flurry of punches can have a devastating affect, each new punch sending the opponent reeling. Obviously the punch has far less effect if blocked by the opponent's guard, and it is also affected by what the opponent was doing at the time, stepping out, moving in or punching.

There are three three minute rounds, and if no one can deliver a knock out in that time, a decision is given on points. The animation is very nice, with boxers reeling from the punches, and the computer controlled characters have a "special" punch which is great fun to watch (from a safe distance).

Well, Harry, perhaps not a knock out, but I'd say that I've got this one winning all the later rounds after getting away rather slowly and coming out on top in the end. A real contender for the title.

Lee Paddon.



Racing Destruction Set

■ CBM-64
■ Ariolasoft
■ Race Game
■ £12.95

★ ★ ★

REMEMBER SCALEXTRIC? You probably had more fun designing and building the track than actually racing. The cars kept coming off and ending up as a pile of twisted plastic against the skirting board, or worse, you'd get a short circuit and the transformer would blow up. Well, this game is rather similar, most of the effort goes into designing the track, with curves, cross overs, jumps, flyover and so on. You can also customise the car, anything from a fully fledged racing machine to a Morris Traveller.

But then you get to the actual racing bit. A split screen, one or two players, a plan view of the road! I'm afraid this will take a lot of selling to the Pole Position fraternity, used to an over-the-shoulder view. Despite this, it's quite fun, with the usual accelerate, brake and steer.

The jumps are a nice feature, you have to approach these at just

(continued on page 45)

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Star★ chart

Xcel

Spectrum 48K
Program Techniques
Shoot-'em-up
£7.95

★ ★ ★

After one of the prettiest loading screens in Spectrum history, you would expect a pretty devastating game. A log zaps in from both sides of the screen, wow, this must be some game, you start orbiting a planet ready to whiz down onto the surface for a dazzling 3D shoot-'em-up, right? Sorry, wrong.

As long as you don't actually try to play this game, you might think it was something pretty special, but underneath it all is a sort of cross between Zalaga, Galaxians, and every other shoot-'em-up all the way back to Space Invaders. There is a spurious plot and a lot of spurious alien writing which you're meant to pick up clues from, but the guts of the game are to shoot anything that moves, or, on other screens, avoid the trees — simple really.

Ace

Commodore 64
Cascade
Fight emulator
£9.95

★ ★ ★

When Air Combat Emulator was released for the C-16, it filled a need for software, let alone flight simulators for that machine. It's up against tougher competition on the CBM-64, so a few more goodies have been injected into this fight and fly scenario. You can brush up your in-flight refuelling and choose different weather conditions. There are ground and naval targets as well as hostile fighters. It has a co-pilot option and synthesised speech which keeps the crew informed as to their status. One guy does all the flying and the other does weapons control. Tanks, helicopters, SAM sites, all the fun of a serious deterioration in East-West relations is here.

(continued from page 43)

the right speed to come down on the reverse slope of this or the next jump. If racing soon loses its appeal, then you can always shoot the opposition off the road! This does tend to make the races rather short, but fun.

While this game has got plenty of chrome, with loads of different tracks and cars, it doesn't grab you the way Taledaga did.

Lee Paddon.

Adrian Mole

■ Various
■ Level 9
■ Adventure
■ £9.95

★ ★ ★ ★

SEPTEMBER 30: Adrian Mole computer game arrived today. Looks really great. All the old characters there, Pandora, Rat Fink Lucas, Stick Insect, Barry Kent and the rest of the gang. The idea is to make Adrian popular.

October 1: Still playing Mole. Editor starts making noises about deadlines. I said that with over 20k of text loading in four parts, it really needs a long review to get to the bottom of it. He seemed pretty impressed. Managed to get through the game without getting beaten up and scored 55 per cent which makes me a spotty school boy. Its got a load/save option so it didn't matter when the cleaners threw me out at 9 o'clock.

October 2: The editor came to find out how the Mole review was going. I said I was seriously thinking about getting down to it. The game uses a tree structure you see. You make decisions and these affect your rating, and also what happens next in the game. So in one game you'll probably only see about a third of the text.

October 6: The editor just doesn't understand me. Here am I trying to write a masterpiece that will live for ever and all he can think about is his deadline. He just doesn't appreciate that I am a great writer and not just another hack. Even if you've read all the books and stuff, there are still plenty of new situations you can get in. I have now managed to score 78 per cent which makes me a gifted poet.

If you don't know the books, there's a Help system, which gives you some background.

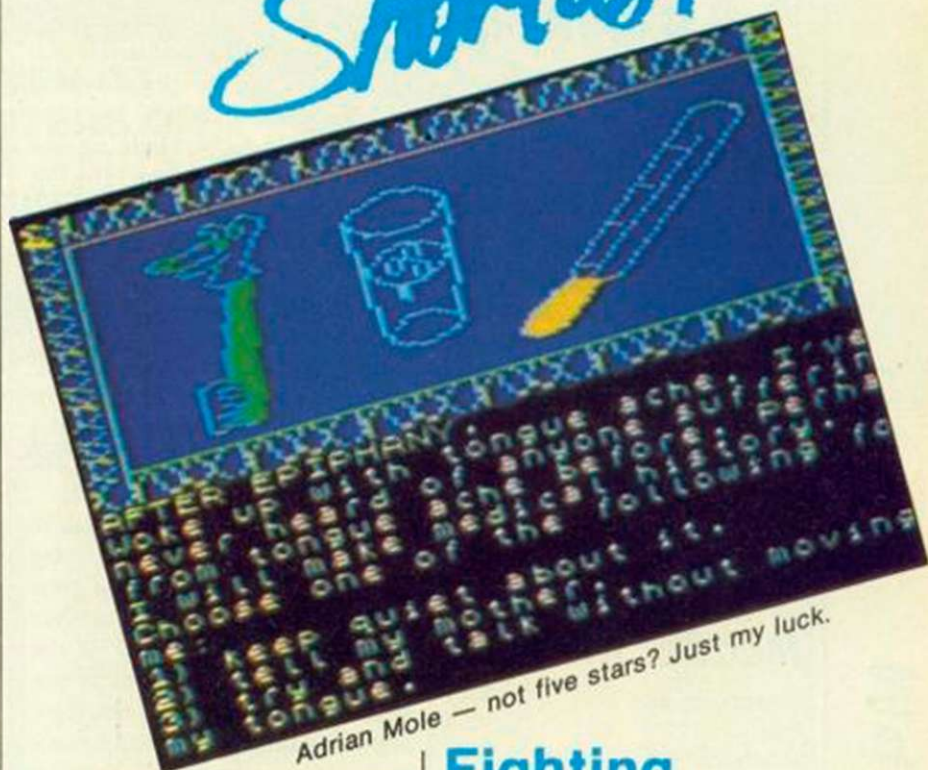
October 9: Magazine going to the printers but, unfortunately, I feel the review still needs a little polishing.

October 10: Get the sack. How ungrateful can you get.

Lee Paddon (aged 13½).

SOFTWARE

Shortlist



Adrian Mole — not five stars? Just my luck.



Fighting Warrior — state-of-the-art graphics.

Daley Thompson's Super-Test

■ ZX Spectrum
■ Sport simulation
■ Ocean
■ £9.95

★ ★ ★

WHEN DALEY Thompson was momentarily dethroned as the world's top decathlete he is rumoured to have said "I lost my world record and took it like a man — I only cried for 10 hours."

Whether or not Ocean's follow-up to the enormously successful Daley Thompson's Decathlon will bring tears to your eyes, it will wreak havoc on your joystick and/or keyboard. Yes, it's another joystick waggler.

The program features eight events only — and suffers strong competition from other sports simulations like US Gold's Summer and Winter Games, not to mention Activision's old Decathlon and the Tour de (continued on next page)

Fighting Warrior

■ Spectrum 48K
■ Melbourne House
■ Beat-'em-up
■ £7.95

★ ★ ★

"THE BEST graphics ever seen on a Spectrum", a familiar line in publicity blurbs. But now there is no excuse. Stephen Cargill has upped the stakes once again with cartoon style animation of stunning smoothness and detail.

You have to rescue a princess again (groan). In order to do this you've got to fight your way through a veritable army of monsters, who, being honourable types, come at you one at a time. Just to add to the fun, arrows come hurtling at you as well. You have three sword strokes, walk forward, back, jump and duck. The controls are easy to get the hang of.

The screen scrolls right to left as you attempt to make your way to the cave where the Princess is incarcerated. In the background, a landscape of Pyramids, temples and sphinxes scrolls past.

The fight sequences are beautifully animated, easily surpassing those in "Fist" or "Frank Bruno". Unfortunately, the process of fighting your way through the local heavy mob is a shade boring. Still, perhaps we can hope for the same sort of technique to be used on more complex and absorbing games.

Lee Paddon.

Star★ chart

Sorcery +

Amstrad
Amsoft
Arcade adventure
£13.95

★ ★ ★ ★

One of the prettiest games for your Amstrad has been improved by the addition of some new screens and a whole new section.

After you've released all the sorcerers, in the old version, you put your feet up for a well earned rest; now, I'm afraid you go on to confront the necromancer himself.

Mcoder III

Spectrum 48K
PSS
Compiler
£12.95

★ ★ ★

A compiler of the old school. Good but not flashy. Copes with most Spectrum Basic, except Microdrive commands. It can cope with floating point arithmetic, produces fairly compact code, and speed increases in the order of 10 to 20 times depending on the sort of commands being used. If you don't need all the flashy extras of the Blast Compiler, or your pocket isn't that deep, this looks like a good second best.

High Rise Horror

BBC
Platform
Rabit Software
£3.99

★ ★

Nasty, brutish and noisy — would be a grossly unfair way of describing High Rise Horror. The game certainly has a crude addictive quality, but not much more.

Armed with only a balloon you must make your way from the bottom of the screen to the top, avoiding or destroying the assorted nasties which whizz mindlessly to and fro at high speed.

Then you can pass to the next stage where the landscape is the same but more crowded.

(continued from previous page)

France. But it has just as much potential appeal as its predecessor.

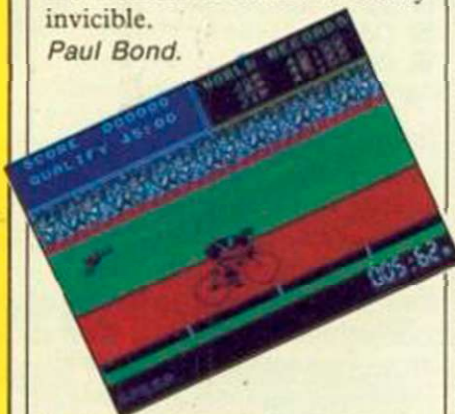
Spread over two days and two sides of a cassette, the events include pistol shooting, cycling, springboard diving, rowing, tug o' war, taking football penalties and two ski-ing events: the ski-jump and the giant slalom.

No time for the blade on the feather lark with the rowing section. Start pumping away to build up your speed shown at the bottom left of the screen. The display shows an overhead view of two kayaks zipping down the river. World records, i.e. hi-scores, are shown at the top right of the screen to encourage the spirit of competitive joystick destruction.

You stagger from you kayak to the football field — the display shows an overhead view of your footballer as he runs up to slam the leather into the back of the reticule. Your player runs as you either use the alternate left/right keys or pound away at the joystick to build up power for the shot. You control the ball's direction by timing the kick — the angle (or elevation) is controled by the amount of time that the firebutton is depressed. You get five shots.

You won't find many footballer's ski-jumping, you may reflect as the pistol signals the gate to open. However, many of them are used to being on the slippery slope or for the high jump. Again continuous left/right movement builds up your momentum, but you must hit the joystick fire-button at the right moment as you come to the lip of the jump. The tug o' war is impossible. You have a choice of 10 opponents, the weakest of which is totally invincible.

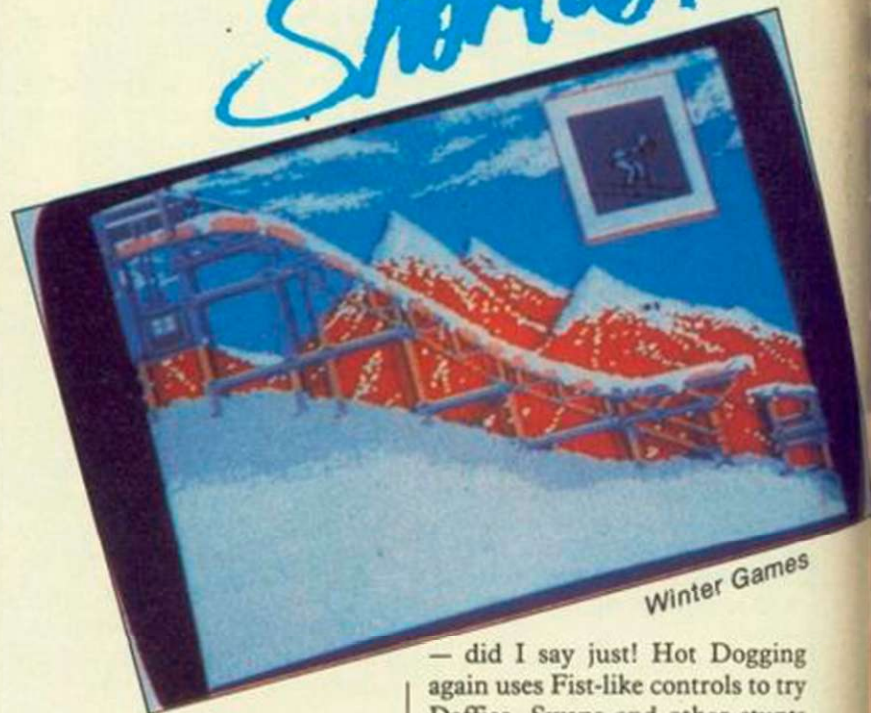
Paul Bond.



Daley Thompson's Super-Test — brings tears to your eyes.

SOFTWARE

Shortlist



Winter Games

Winter Games

■ CBM-64
■ Decathlon
■ US Gold/Expyx
■ £14.95

★ ★ ★ ★

"BREAK OUT the silly hats" was the enthusiastic cry the moment Winter Games hit the office. Up to eight players can choose from 18 countries, and then under their borrowed flags and anthems battle through seven events. Although speed skating and biathlon use the time honoured decathlon — sorry heptathlon — skills of rhythmic joystick waggling, the ski-jump and indoor skating are games in their own right.

The freestyle and figure skating look a little like Exploding Fist on Ice as different joystick movements allow you to carry out Camel and Sit Spins and Double and Triple Axel and Lutz jumps. "Figure" is used figuratively (that's enough figures — Ed) since you keep skating along the same direction for one or two minutes. With bush hat firmly on head Lynn "Call me Sheila" Dawson was moved to twang "She'll be out in the car park soon".

Toby put down his accordion, wiped the sweat off his brow with his beret and proceeded to win France's first ski-jump gold medal by a convincing display of balance and timing just beating Danneberg, of East Germany. Touch the jump button too soon and you just have to keep your balance in the air and land safely

— did I say just! Hot Dogging again uses Fist-like controls to try Daffies, Swans and other stunts off a short ski-jump.

Winter Sports is great family fun — it should appeal to women more than most programs — and looks like being a winner this Christmas.

Meirion Jones.

Chop Suey

■ English Software
■ Atari
■ £11.95

★ ★ ★

KUNG FU seems to be the recipe for success in computer games today, and Chop Suey is English Software's takeaway version for Atari owners. The introductory music is a bit of Bach (Brandenburg control) after which one or two players can get on with kicking each other's heads in.

The two figures appear on a three-dimensional stage, with a few rows of audience in the foreground. The animation is both detailed and colourful. You control your figure with a joystick, though as both figures are identical, it is hard to tell which you're controlling in the melee. The eight joystick positions provide an assortment of jabs, kicks and movements. Blows have to be on target to score. Two "pain-gauges" at the bottom provide a guide to your physical conditions (deteriorating).

The actual fighting seems to be pretty much the same as The Way of the Exploding Fist, so as King Fu games go, this is well done. However, it has few frills (scorpions to jump over; slow and fast modes) so it lacks variety.

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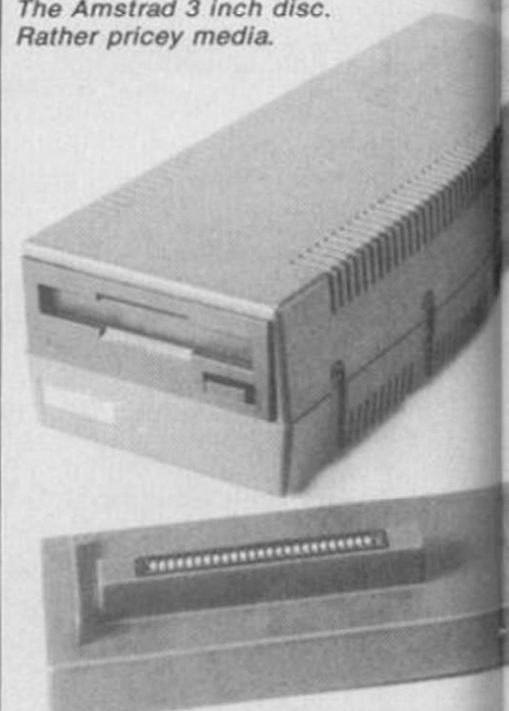
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Enterprise	Enterprise	£99	D 4	NL	— NAMS/DOS	—	✓ — — — —	4K	
DDI	Amstrad	£149.50	D 2	NL	— NACP/M	—	— ✓ — — —	256	Includes 3" drive

The Opus Challenger 3, includes Ram disc and power supply

The Amstrad 3 inch disc. Rather pricey media.

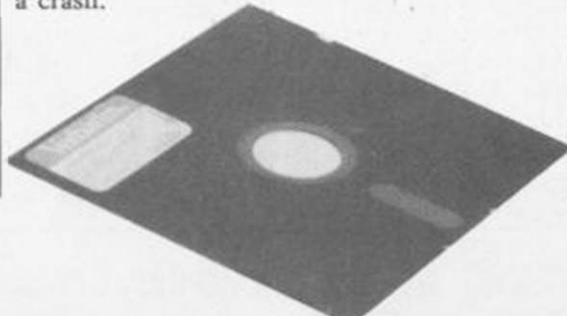


A YEAR AGO a disc drive for your micro might have been looked upon as an expensive luxury, but now, with the price of drives dropping all the time, they come within the price range of many people looking to get more out of their machine. So what are the benefits and possible pitfalls of disc systems, and how do you cope with the conflicting claims and jargon?

A disc is much more than a fast cassette recorder, because, like an audio record, you can get to any track instantly. This means that you can virtually use your drive as an extension of the computer's memory. So databases and spreadsheets are no longer limited to 30K or so work space within the computer. To use a

cassette like this would be tedious in the extreme.

Even if you don't use such heavyweight programs, a disc drive is reliable, and discs less cumbersome to store, although disc based software can be expensive. Also, when developing your own software, you can rapidly back up each new version, and so speedily recover from a crash.



There are three components of any disc system. The drive, which is simply a mechanism which rotates the disc, moves a head across the disc, reads and writes data on the magnetic surface. Then there is the disc interface or controller, which makes the computer electronically compatible with the drive, and the operating system (DOS), the software which drives the interface.

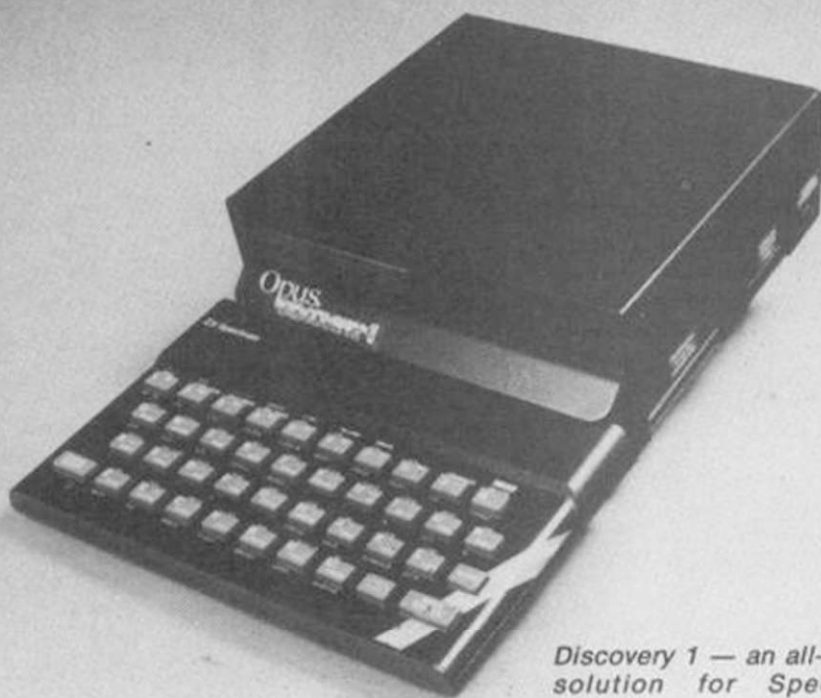
Disc drives come in a number of types and sizes. Most drives not specifically designed for one micro use a Shuggart bus. So you should ensure that any interface you buy conforms to this standard — almost all do. The drive mechanism will either consist of one or two

DISC DRIVE-IN



Opus
CHALLENGER 3

Buying a disc drive or interface? Lee Paddon puts you on the right tracks



Discovery 1 — an all-in-one solution for Spectrum owners.

read/write heads, ie either capable of reading only one or both sides of the disc at once. Whereas once 40 tracks per side was standard, the quality of disc mechanisms means that 80 tracks is fast becoming the norm. Better still are switchable drives so they can read and write to 40 or 80 track discs. Drives come in a variety of sizes. First came 8inch monsters, then 5¼inch, now 3inch and 3½inch are bidding to become the new standard.

Each have their advantages. 8inch is now obsolete, 5¼inch are cheap, reliable and readily available. 3inch discs are electrically identical to 5¼inch and can be substituted at will. 3inch discs come in a rigid packaging, and so will last

longer, but are about three times the price of 5¼inch discs.

3½inch is a relatively new innovation, but since its adoption by Atari for its ST, it may become the front runner. It offers half as much space again as its main rivals, and is just as rugged but a good deal cheaper than 3inch.

Dual drives are a nice luxury, it allows you to protect yourself from disaster by regularly backing up your working disc to prevent a careless error ruining hours of work.

A final consideration is whether you get a built in power supply. If you have to rely on your micro for juice, it will seriously limit the number of drives or other gadgets you can add

on.

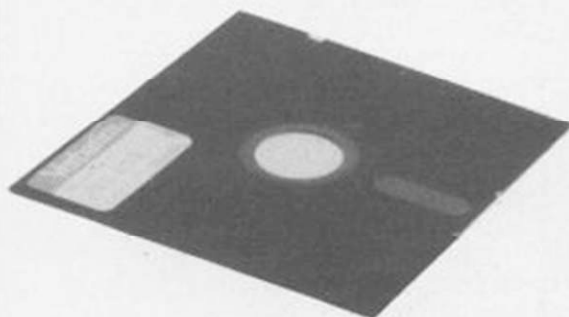
The electrical interface and the operating system are usually purchased as a package. Although each has a clearly defined function, most disc operating systems are designed around the interface hardware. This is where the jargon jungle is at its most impenetrable, and what you get is largely determined by how much you are prepared to pay. So make sure you get the facilities you really need.

Certain terms crop up time and time again. Each track on a disc usually has 10 sectors each holding 256 bytes. So, if storage is a prime consideration, 80 track double sided double density is going to give you 400K storage per drive.

Single versus double density is probably the most important factor. Double density operating systems are quite expensive, but they do give you twice as much room on the disc.

They do this by leaving out synch bits on the disc, and to cope with this, error checking must be more rigorous. One word of caution, you should find out what the formatted capacity of your system will be, unscrupulous dealers might try to tell you the unformatted capacity of the drive which is of no practical value at all.

Random access files are a must for serious



business applications. In a random access file, you can dig out the particular piece of information you need from a particular file and update it without loading and saving the whole file taking up precious time and memory. It is a sad fact that not many budget operating systems offer this facility.

It can, however, be fudged if a system supports serial access files where records can be read in order, and a new file created with the updated record — a poor second best.

Speed is not perhaps the most important consideration in a disc system, since most systems, with the glaring exception of the Commodore 1541 system are fast enough. However, hope is at hand, a new drive, the 1572 is promised. Speed is a function of both the speed of the drive and the efficiency of the DOS software. Whether this is important to you will depend on what you want a disc drive for. Try running two opposing systems side by side, ideally running the program you intend using most.

Operating system compatibility is another term often banded around. The Amstrad DD1 claims to be CP/M compatible, but will only run cut down versions of the standard packages. It claims to use IBM format files, but the IBM PC usually runs under a different operating system: MSDOS. Speaking of which, the new Enterprise disc system claims to run MSDOS and read IBM files, but this is rather pointless when the computer uses a Z-80 processor rather than the 8080 chip needed.

So treat all claims for "compatibility" with a good deal of caution. Another aspect of the (continued on next page)

DISC DRIVE SUPPLIERS

Akhter, 28/29 Burnt Mill, Harlow, Essex CM20 2HU. Tel 0279 443521. Full range of 5¼ inch drives.

Advanced Memory Systems, Green Lane, Appleton, Warrington WA4 5NG Tel 0925 62907. 3 inch drives.

Chase Data, Unit 2, Crabtree Road, Thorpe Industrial Estate, Egham, Surrey TW20 8RN. Tel 0784 38487. Double Sided 5¼ inch drives.

C Tech Computers, 184 Market Street, Hyde, Cheshire SK14 1EX. Tel 061 366 7794. Double Sided 5¼ inch drives.

Cumana, Pines Trading Estate, Broad Street, Guildford, Surrey GU3 3BH. Tel 0483 503121. Full range of 5¼ and 3½ inch drives.

GCC, 66 High Street, Sawston, Cambridge CB2 4BG. Tel 0223 835330 some 5¼ double sided and 3 inch drives.

Keyaki, 44 Terrace Road, Walton-upon-Thames, Surrey. KT12 2SD 3½ inch drives.

Midwich, Gilray Road, Diss, Norfolk, IP22, 3EU Tel 0379 4131. Twin, double sided 5¼ inch drives.

Opus, 55 Ormside Way, Holmthorpe Industrial Estate, Redhill, Surrey. Tel 0737 65080. Full range of 3 and 5¼ inch drives.

Pace, 92 New Cross Street, Bradford BD5 8BS. Tel 0274 488211. Full range of 5¼ inch drives.

Solidisk, 17 Swayne Avenue, Southend-on-Sea, Essex SS2 6JQ. Tel 0702 354674. Some 80 track 5¼ inch drives.

Technomatic, 17 Burnley Road, London NW10 1ED. Tel 01-208 1177. Some 5¼ inch drives.

Twilstar, 17 Regina Road, Southall, Middx UB2 5PL. Tel 01-574 5271. Full range of 5¼ inch drives.

Vigelin, Unit 7, Trumpers Way, Hanwell W7 2QA. Tel 01-843 9903. Full range of 5¼ inch drives.

Watford Electronics, 250 High Street, Watford. Tel 0923 40588. Full range of 5¼ inch drives.

DISC INTERFACE SUPPLIERS

Micro Peripherals, Intec Building 2, Units 2-3&4, Hassocks Wood, Wade Road, Basingstoke, Hants RG24 0NE. Tel 0256 473232.

Kempston Microelectronics, Singer Way, Woburn Road Industrial Estate, Kempston, Bedford NK42 7AW. Tel 0234 856633.

Technology Research Ltd. (Beta), Unit 18, Central Trading Estate, Staines, Middx TW18 4XE. Tel Staines 63547.

Medic Data Systems, Hackwood Lane, Cliddesden, Basingstoke, Hants RG25 2NH. Tel 0256 460748.

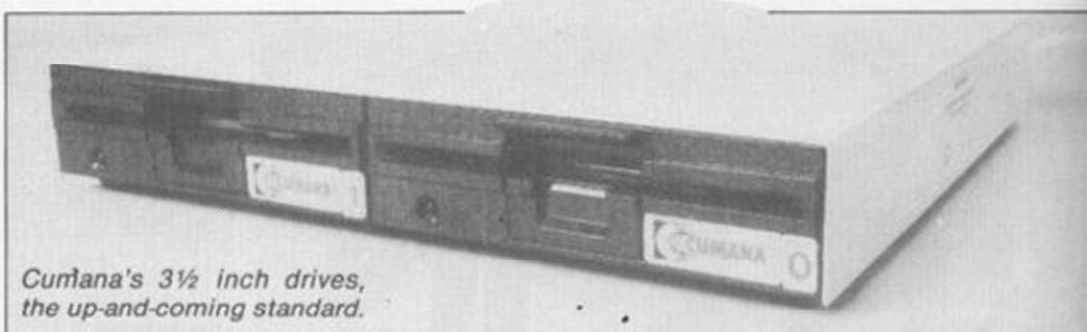
Gordon Micro Ltd, 3 Callender Road, Heathfield Industrial Estate, Ayr KA8 9DJ. Tel 0292 280467.

Watford Electronics, 250 High Street, Watford, Herts WD1 2AN. Tel 0923 37774/40588.

Acorn — Any Acorn dealer.

Enterprise Computers Ltd, 31-37 Hoxton Street, London N1 6NJ. Tel 01-739 4282.

Dudley Langmead Enterprises, (Oric), 93 Bedford Road, Hitchin, Herts SG5 2UA. Tel 0462 31225. Available from end of October.



Cumana's 3½ inch drives, the up-and-coming standard.

(continued from previous page)

same problem is that if you buy a DOS from a third party, it must be compatible with the standard operating system of the micro manufacturer.

Thus any proper disc system for the QL for instance must be compatible with microdrive commands or you won't be able to use the new drive to run the bundled software. Next on your list of questions should be how much of your micro's precious Ram is taken up by the disc DOS and does the DOS support a ram disc.

Pinches over 2K of Ram

The Acorn DFS for the BBC micro pinches over 2K of Ram from the machine's already inadequate supply. Many Spectrum owners encounter problems with their interface 1's due to yanking them out every time they want to load up their favourite games, and a similar problem occurs to Amstrad owners.

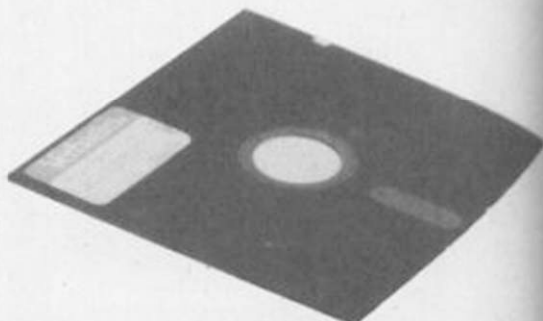
A Ram disc is a data structure which sets aside an area of Ram which, in the eyes of the DOS, looks like a disc, with a directory and files, but with far quicker access times. A new idea is to incorporate Ram into the drive itself as in the new Challenger 3 from Opus, an idea which should become increasingly popular as memory prices continue to plummet.

Next we come to what is perhaps the guts of an DOS: the commands it offers, and their format. A bad example of syntax is the Sinclair system for interface 1. This is mainly due to the fact that you have to specify everything in an inflexible syntax, a good DOS will assume certain default values if the user fails to specify them. It should also be possible to specify files by "Wildcards". A file name normally has two parts, a name and an extension, wildcards allow a disc command to apply to all files with a certain name or extension, or those which start with a particular string.

Most disc systems can list the files on a disc, but ideally they should give more information than this. File size, type, and execution address are all helpful, although in some DOS, this

information is provided by "help" or "info" commands. Obviously it must be possible to save blocks of memory, machine code programs, arrays, and variables as well as Basic.

Another point to watch is some systems limit the number of files you can have per side of the disc. If you intend using a lot of short files, this is obviously going to mean a lot of fumbling around with discs. Rename might seem a rather trivial command, but is vital if random access is not supported. This means that after an updated version of an old file has been created, the old file is erased and the new file renamed



so that when the file next needs to be updated, the name will be the same. Compact tells the DOS to tidy up a disc.

After a time, gaps appear in a disc where programs have been deleted, this can decrease the amount of space available, compact crushes all the files up, freeing more space. Merge allows a large datafile to be created out of two smaller ones, with either one file in Ram, and the other on disc, or both programs on disc.

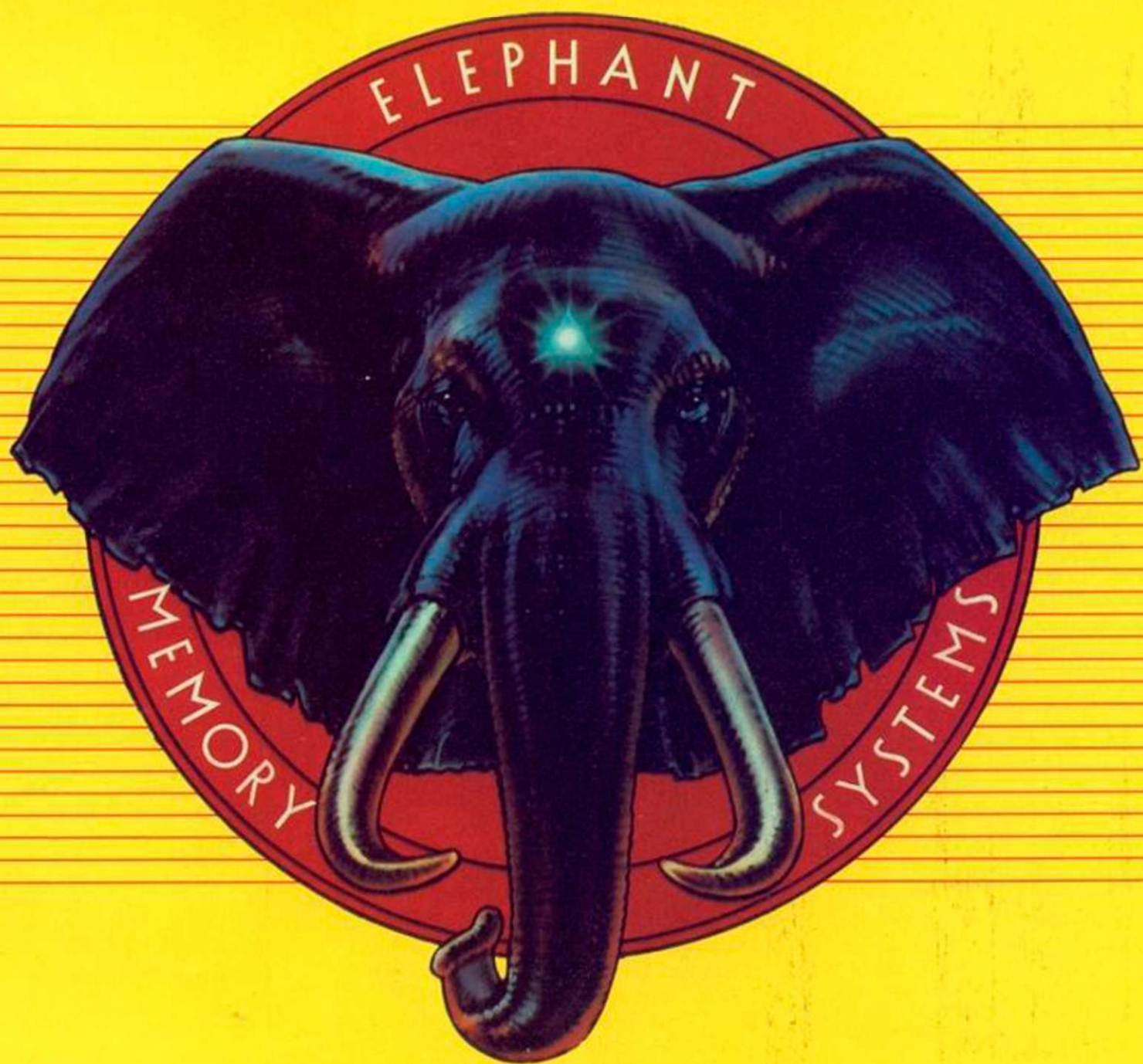
Make sure you shop around

It is obviously impossible to make any definitive recommendations about which system to go for, much depends on what you want and how much you are prepared to pay for it. The main thing is to shop around and make sure the system you go for in the end can actually deliver everything it promises. Apart from the actual purchase of a micro itself, the choice of a disc system is one of the most fraught decisions you can make, and mistakes can be costly.



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SPECTRUM

WHAT DO YOU GET if you cross a mouse with a telephone?

Good taste, the Animal Liberation Front, and the Official Secrets Act prevent me from telling you what I have seen in the Government's genetic engineering laboratories. All I can say is that Sinclair has come close with the weird numeric keypad which is the Spectrum 128's most distinctive feature.

A white 128 badge and an external aluminium heatsink — that looks like it might be a constructivist memorial to all those who perished in the computer wars — are the only other signs that this is a Spectrum Plus Plus. The 128 goes on sale in Spain now, four months before it hits these shores, but if you are thinking of popping over to the Costa Investronica to bring back a new Sinclair and an autumn tan don't bother.

Devil worship

If you wait till the U.K. launch next spring the 128 will cost around £150 whereas a Spanish Sinclair will set you back £100 more, including tax but not including a dictionary to translate error messages such as "Entero fuera de rango". So why is Sir Clive making good old blighty play second fiddle (or maybe that should be Fidel, since Investronica plans to export to Latin America) to Spain?

In short this summer's financial problems have forced Sinclair to sell his soul to the Devil, or rather Dixons. They agreed to take the mountainous drifts of surplus QLs and Spectrum Pluses off his hands if he agreed not to launch any new products here, which might damage their sales, until well after Christmas. But Sir Clive still desperately needed to show he had new products on the way. Hence the Spanish 128 deal.

A close inspection of the 128 shows that the Plus keyboard has survived intact apart from a few cosmetic changes made to satisfy new Spanish government standardisation regulations — the word video in black out of white to show true video and reversed on the inverse video key for instance. The Mic and Ear sockets have been moved from the back of the Plus to the

left hand side next to a new RS-232 port to take the interfacing out of connecting up a printer, or modem to your Sinclair.

The RS-232 claims to double up as a MIDI music connector. But then what's in a name? Everyone knows that Sinclair is a corruption of St Clare — the patron saint of televisions — but no-one takes seriously Sir Flat Screen Clive's claim to be a major producer of bent tellies.

The whole point of MIDI is supposed to be a single standard to make interfacing music machines and micros easy so you can control instruments from the computer, modify pices of music and interpret them on screen. So the 128's non standard MIDI connector will have to be carefully examined on a full production machine before it can be recommended to musicians.

At the back the expansion slot is still where it was and all peripherals are still compatible except perhaps those that initialise system variables. An RGB/composite video port has now taken the place of the Mic and Ear sockets. Because the 128 incorporates an AY-38910 sound chip like the Amstrad et al the internal loudspeaker that was happy enough beeping and purring its way through the death march which every other Spectrum game features, shows its shortcomings. Now like other micros a new modulator feeds the TV socket sound as well as vision. At last turning up the noise is a simple matter of sliding up the TV volume button.

Search as you may you still will not find a joystick port on the 128 — an unforgivable omission — although some software houses will doubtless use the 128's numeric keypad as a touch pad controller.

This numeric keypad is a strange looking creature, like a calculator attached to the front of the computer by a curly telephone cable. If it had a track ball in the base to allow you to spin a pointer around on screen you would call it a mouse — but it doesn't so we'll call it a hamster. You can use this 15 button rodent as a simple calculator which displays the answers on the screen or for entering numeric data into programs — it might make typing in *Your Computer* listings a little less tiresome or in 128 mode as a full screen editor. At last you can edit programs at will including renumbering sending the cursor straight to the area that needs correction.

When you turn on the machine it defaults to 128 mode with a white or blue cursor instead of all the "Ks" and "Es" of the original. If you enter the command Spectrum it changes to 48K mode without losing the contents of memory but the only way to make it revert once again to 128 is by resetting — losing everything.

Basic programs can transfer from one mode to the other easily. If you Peek 80000 in 128 mode you will still get an out of range message because the additional 64K of memory is only accessible from machine code. The 32K Rom includes the old 16K Spectrum as well as the separate 128 operating system. The extra 64K



Ram is paged in 16K blocks.

Memory maps are already in the hands of those software houses that have not had prototypes. Ocean is already demonstrating a 128 version of Match Day which takes advantage of the improved sound with cheering crowds, referee's whistle and so on. Supertest 128 is also near completion as well as the load-in-one version of the three part NeverEnding story

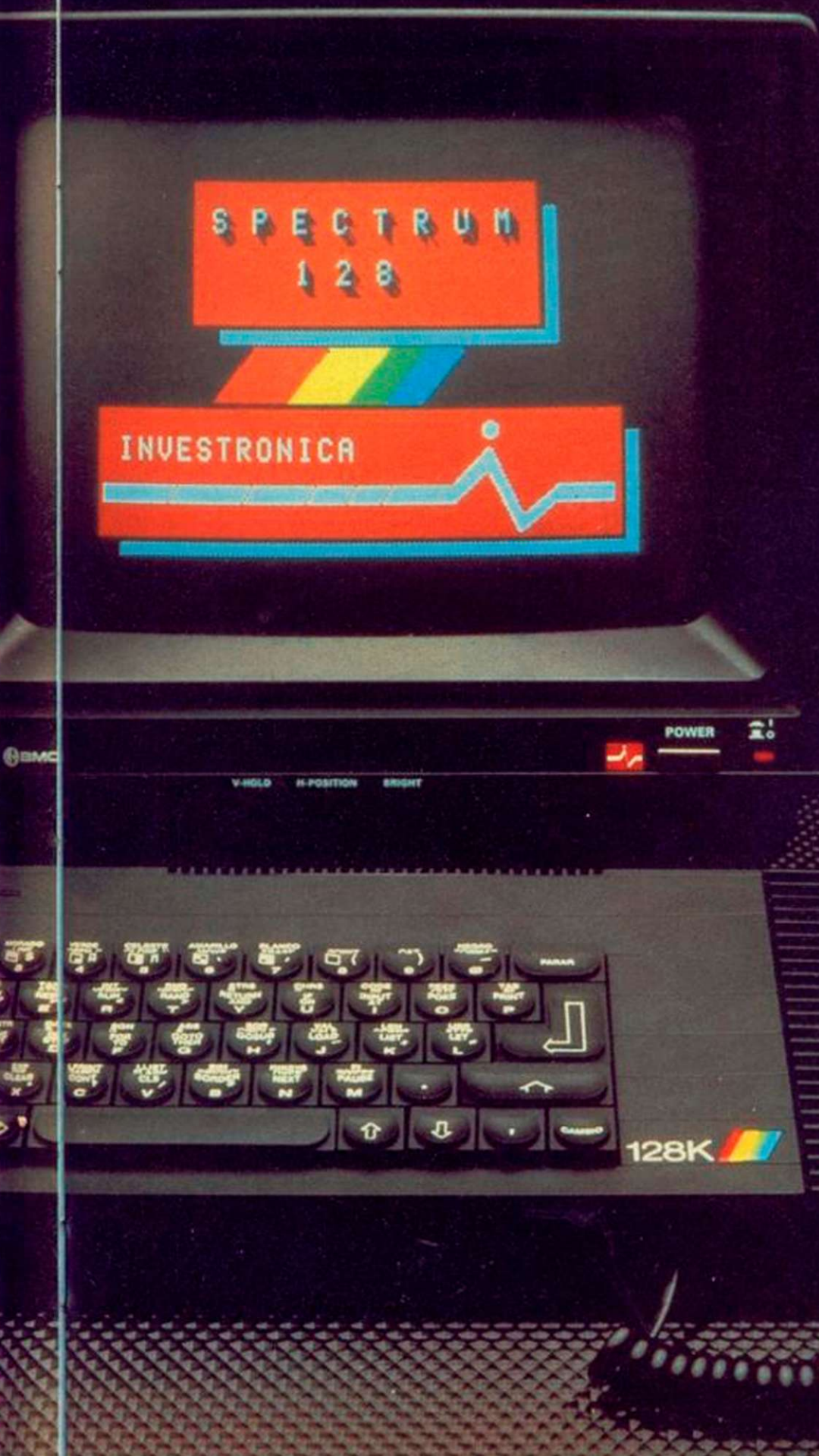
128 COMPARISONS

- Commodore 128. Better graphics, sound, software. £275.
- Amstrad 6128. Includes CP/M, monitor and disc. Less games. £300.
- Enterprise 128. Includes word processor, joystick. Almost no software. £250.
- Atari 130XE. Brilliant games but not as many as for Spectrum. Still tops for sound and vision. £170.

128

SCOOP!

Too little too late, or a new step forward for Sinclair? With a little help from our Spanish friends at Microhobby Week we sneak a look at the Spectrum 128 built by Investronica.



epic. Ocean's David Collier says he has had no loading problems with the Sinclair 128 unlike the Commodore 128 which has a variant of the 6502 processor "which is not as robust" as that in the 64. Ocean has now rewritten its fast loader to avoid crashing the Commodore 128.

The Sinclair 128 has the same ULA as the Plus so resolution, colours and screen management are all the same — 256 × 192, 8 colours.

A Play command gives access to the new sound facilities. Text can be stored as separate pages by storing in the form of variables — AS, BS and so on.

Spring offensive

Of course the machine we have seen is still a prototype, one which Domingo Gomez of Microhobby-Weekly magazine in Spain could

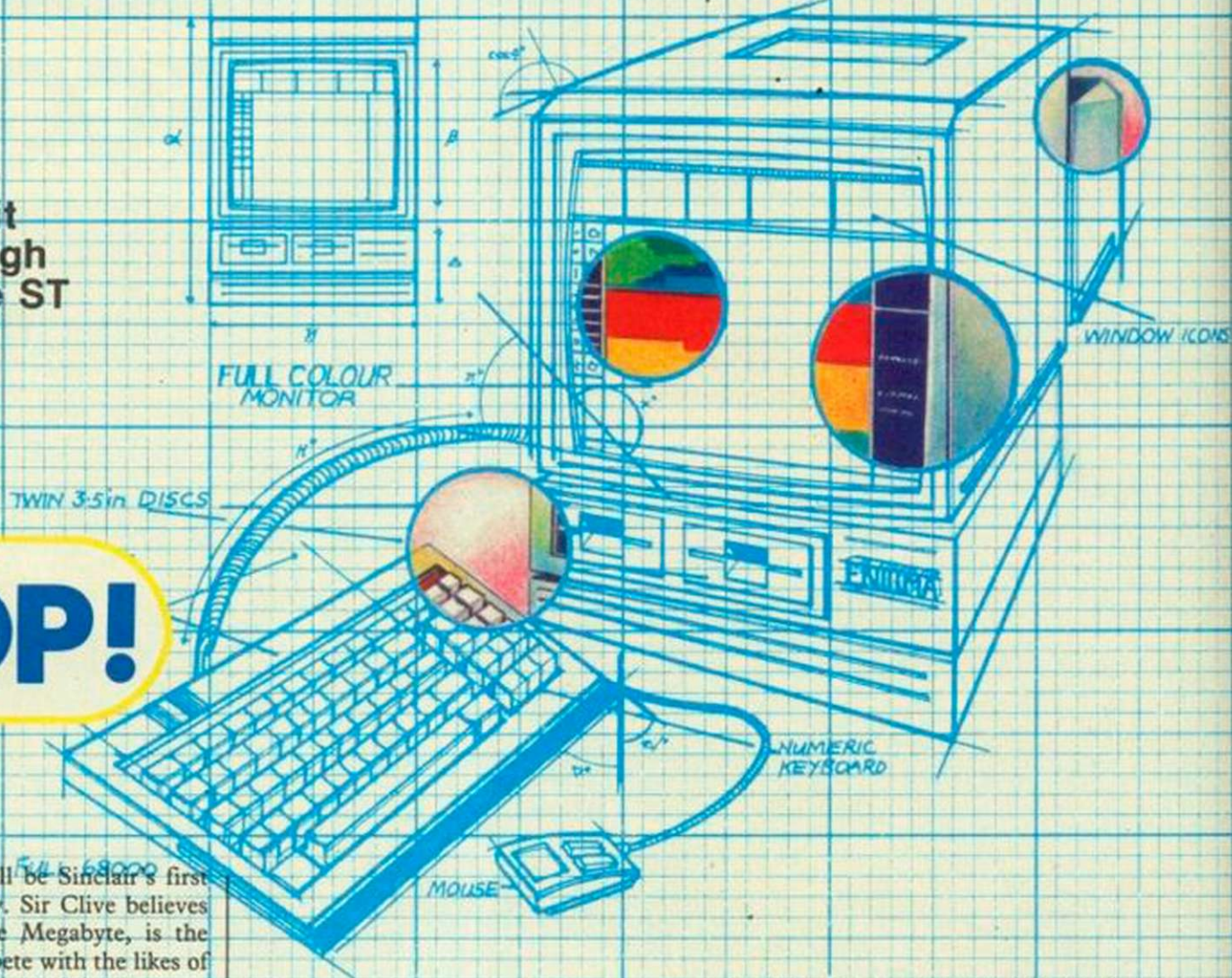
only inspect at the headquarters of Investronica in Madrid but this is not a one-off special aimed only at Spain.

There may be some changes before it appears on the British market next spring but despite its faults the 128 looks like it will be a strong base model for Sinclair's new 1986 model range which will include the portable Pandora and the desk-top Enigma (see over page).

SINCLAIR ENIGMA

Next year's model from Sinclair is the Enigma. Can it be good enough to take on the ST and Amiga on their own ground?

SCOOP!



NEXT YEAR'S Enigma will be Sinclair's first Mega-machine — literally. Sir Clive believes that 1024K of Ram, one Megabyte, is the minimum needed to compete with the likes of Atari's ST and Commodore's Amiga.

He has also bowed to the inevitable and abandoned the Microdrives for a pair of built-in 3.5 inch disc drives. But the portable Spectrum-based Pandora also planned for early next year will still use Microdrives to keep down costs and weight. If Sinclair goes ahead with a portable QL that too may stay with the stringy floppies.

The Enigma is planned for launch in May '86 somewhere in the vague £500 — £1,000 price band. It will have a version of the Psion Quill, Abacus, Archive and Easel suite of programs but on Rom rather than the QL's Microdrive cartridges. The Enigma will also have a full Window, Icon, Mouse environment, probably Gem as used on the Apricot, since Digital Research has been having talks with Sinclair for some time and has publicly claimed that Gem could be ported straight across to the QL. The big question is whether Sinclair can compete with the Supermicros without going for a full 16-bit Motorola 68000 like the Amiga, Macintosh and ST rather than the cut-down 68008 in the QL.

The Enigma will be sold as a complete package; computer, software, two drives, mouse, colour monitor and printer. It might also develop with the addition of a phone and communications into a colour replacement for the Sinclair developed monochrome ICL One Per Desk — which because it was only black and white was known during its development as "Work Station Zebra".

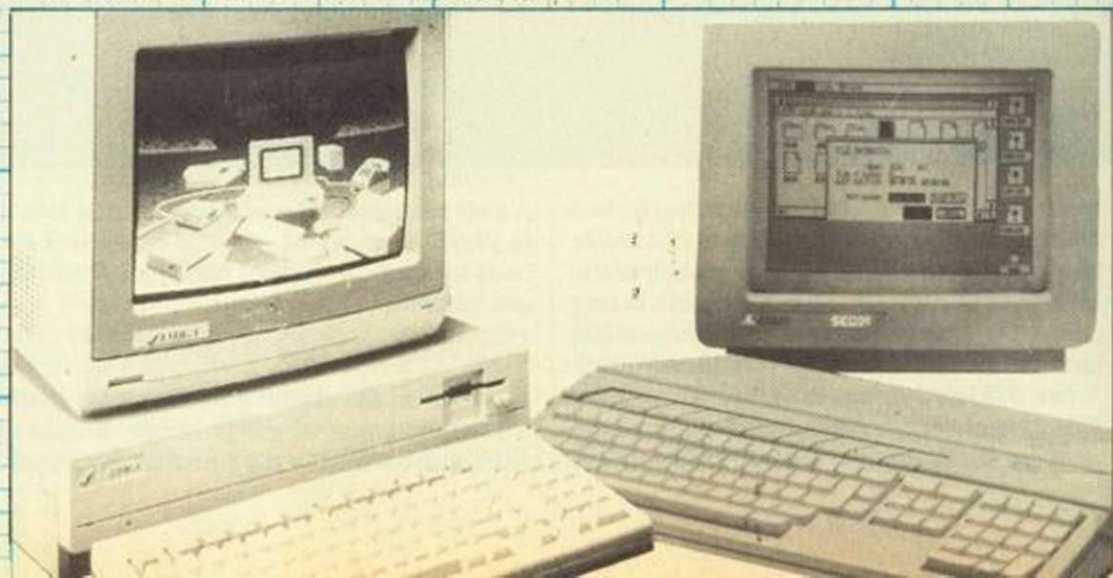
Sinclair is also working on a "personal communicator" a £99 cigarette packet-sized portable phone that would allow you to make and take calls on the already established cellular radio network at any time or place. With the 128, Pandora and Enigma all lined up for launch in the first half of next year there would seem to be no place for the much-rumoured QL 2 as such. This now seems to have grown into the Enigma.

Sinclair's plans look ambitious at a time when the company is making 20 of its 120 staff redundant and such senior personnel as Nigel Searle and Robb Wilmot are being kicked off the Sinclair board. The company is also losing

its bottle — or at least its converted bottle factory headquarters at Willis Road — where development work on new computers used to be concentrated and moving the entire operation to Milton Hall, country mansion of of Sinclair's Metalab.

Nigel Searle had been head of Sinclair's computer side before he was sent on a none too successful trip to America to boost Sinclair sales over there. Searle now loses his position on the board but stays on as Sinclair's top dog in the States. Robb Wilmot, Mr ICL, long-time associate of Sir Clive, was brought in six months ago to develop the Sinclair/Catt wafer scale technology which promised to produce failsafe single-chip mega computers by the 1990's. Now Wilmot leaves the board and the company.

Can Sinclair's Enigma be ST, Amiga beater?



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ADVENTURE INTERNATIONAL HOME OF THE HEROES

FINDING THE headquarters of Adventure International UK is a bit like solving an adventure in itself. The clue is the company sticker in the window of an otherwise nondescript warehouse in Birmingham 19.

"We don't mind being hard to find", says Mike Woodroffe, managing director and general co-ordinator of programmers and projects. "We're happy to talk on the phone, but we couldn't do with hordes of crazed adventure fanatics hanging about outside".

Life in the Handsworth area has been exciting enough without that: "Most of the rioting was only a mile away from the unit, but it affects the locals less than it affects people reading the national newspapers".

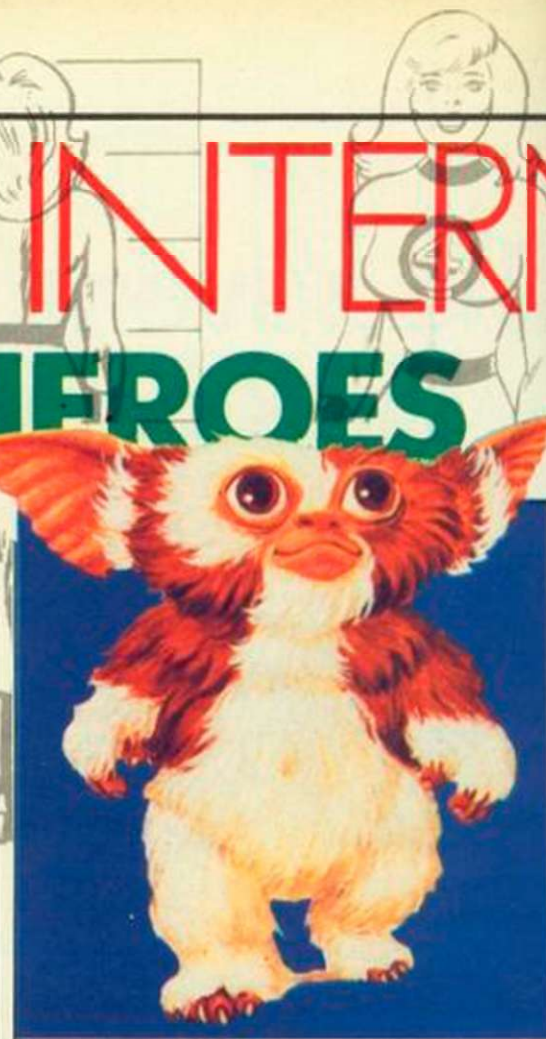
Seas of Blood, AI's next release, has nothing to do with urban unrest, but plunges us into a life on the ocean wave. Based on one of the Fighting Fantasy series of books by Steve Jackson and Ian Livingstone and published by Puffin, the game puts you in charge of a pirate ship. Together with your band of seasoned cutthroats you must scourge the Inland Sea, searching for gold and slaves and defeat your rival Abdul the Butcher in the race to become King of the Pirates. Setting off from Tak, the greatest den of thieves the world has ever known outside of a computer fair, you journey through 180 locations at sea and 83 ports —

Paul Bond goes in search of adventure.

all with graphic illustration. There is a mini-adventure at every stop with 20 treasures to find all defended by gruesome monsters.

"We've taken the basic scenario of the book, changed some of the puzzles and objectives. The book and the game are different, but we've kept the scoring and stamina system. For instance, you don't just Fight Galley — you work out relative strengths to decide the outcome". Other FF games are planned — the next release looks like being Appointment with F.E.A.R. "The Fighting Fantasy books have sold over eight million copies — that's a lot of potential buyers".

A Jand-based outlaw is the subject of AI's Robin of Sherwood series of adventures, notable for their excellent graphics (see Quest Corner, this issue). Touchstones of Rhiannon's sequel, Seven Swords of Wayland, features the Hounds of Lucifer — sounds like Mike Woodroffe would like to unleash them on some nefarious characters in the industry; while the Robin Hood games are officially licensed and based on the books of Richard Carpenter, like the TV series. "There seem to be a couple of other



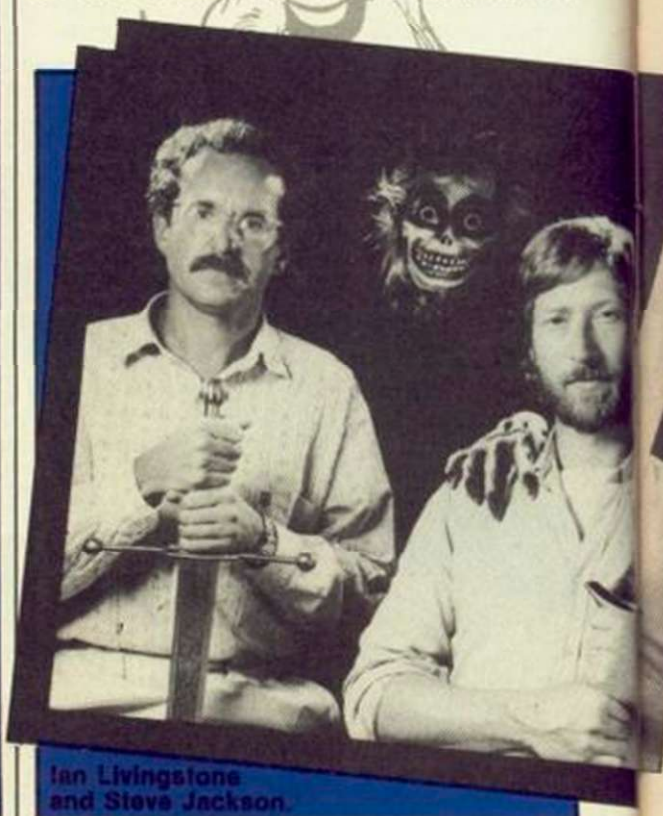
Robin games about. We've sent copies of the ads to the licensing company. It's up to them — otherwise there's no point in our paying the licensing fee in the first place".

Adventure International also plans an assault on the arcade adventure market. Davy Jones' Locker is a joystick-based arcade adventure featuring Pegleg Bob, the lighthouse keeper. He must row to the lighthouse to rescue survivors of a shipwreck. In this sequence he is attacked by a whale, a swordfish and a shark which he has to beat off with his oars. Seagulls also fly about dropping unmentionable things on him. Next he runs across the rocks as the sea rises and waterspouts erupt around him. Now he must find the survivors and put them in a cave, while under attack from crabs. The final sequence is the wreck itself. He must row survivors to safety before being engulfed by a

THE FANTASTIC FOUR



SEAS OF BLOOD



Ian Livingstone and Steve Jackson.

NATIONAL

tidal wave.

This is a long way from American Adventure International's founding father's original vision. Does Scott Adams, the man who originally crammed Crowther and Woods' Colossal Adventure into a TRS-80, let the UK operation have a free hand?

"We're totally different companies, both from the ownership and the financial point of view. We have the licence for Scott Adams' product in the UK and Europe — at the time we got it Tricia (Mrs Woodroffe) and I were importing American software for the Atari 400/800. We did more business with Scott than anyone else."

It struck Mike Woodroffe that the American packaging was unnecessarily large: "We were paying to fly blocks of polystyrene over the Atlantic. Scott suggested that we set up our own duplication operation here — so Adventure International UK was born. We went over to Florida, spent the week in Disneyland — it was great".



Nigel Bamford, Michael Woodroffe and Patricia Woodroffe.

AI-UK also plan an arcade-style Gremlins game (not to mention a second Gremlins adventure proper). More Gremlins? Is this wise?

"Well, the first Gremlins by Brian Howarth, our ace programmer, outsold all our other stuff

by double. It's been translated into Spanish and German with great success, and there's a French version on the way. A new Gremlin movie is due for release at the end of 1986."

The company implements American products like the forthcoming Quest Probe III game, featuring the Fantastic Four in the following way. Scott Adams writes the main story and Marvel comics in New York draw up the artwork. This is then sent to Ken McNair in Florida who codes it all onto an Apple. "Then we take the plot and the disc and convert it to Spectrum, Commodore and so on".

The Fantastic Four game stars the Thing and the Human Torch. It has a revolutionary new method of play for a Scott Adams game. You can switch identities and there are far more Marvel characters featured than in recent games. "The US market is disc-based. Sometimes our cassette versions appear before they get the game over there". Anomalies are common in the adventure market. Adventurers buy strange things and the games can sit on the shelf for a long time. This puts off wholesalers.

"Would you believe, one chain store wouldn't take Robin of Sherwood — it has some of the best graphics I've seen in any computer game, not to mention publicity from the books and the TV series", says Woodroffe. The new series will star Sean Connery's son incidentally. "Only Centresoft carries our whole range."

To solve this, AI created the concept of the Scott Adams Adventure Centre — basically dealers don't need to pay for units until after they've sold them. "We haven't pursued the concept very energetically — there are about 15 Adventure Centres at the moment — we plan on 80 or 100, but we'll get down to that after Christmas". One thing is sure, AI have plenty of new releases planned — apart from Fighting Fantasy, Robin of Sherwood, Gremlins and Quest Probe, they have the rights to Buckaroo Banzai (who is he? — Ed).

Take Indiana Jones, mix a little popstar, throw in some super-hero and space-ace and you've got a Twentieth Century Fox movie awaiting release. "They've actually got the film in stock over here, but it's not being released yet". Could be another first for Adventure International. You've played the game, now see the movie.

ROBIN OF SHERWOOD



INTER ADVENT

PROGRAMMING TEXT-ONLY adventures in Basic is really quite easy, and lots of people tend to have a bash at it at some time during their programming careers. The funny thing is, though, that although an adventure is meant to be a program that interacts with the player, there's one feature that's almost always missing from a Basic adventure game — and that's interactive characters.

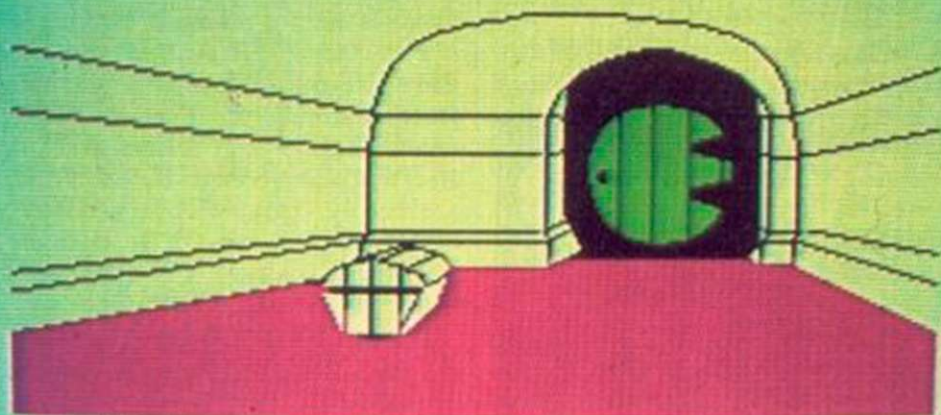
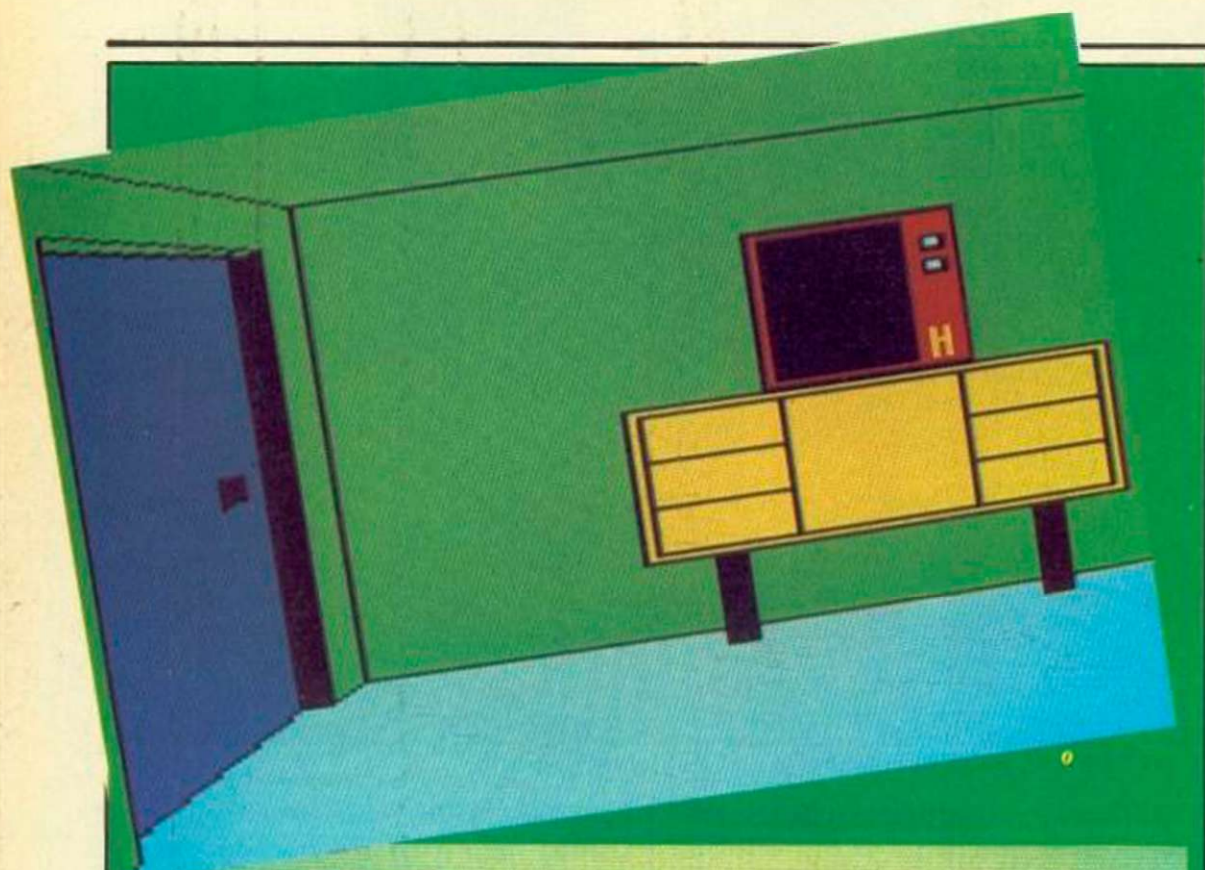
An interactive character is someone like Thorin in the *Hobbit* — a computer-controlled personality who appears to have a mind of his own. You may even, if he or she has been well-programmed, be able to sit down at the keyboard and have a limited conversation together. This particular feature can add enormously to any adventure game, be it of the simple home-brewed Basic variety, or a fully-fledged commercial game. Unfortunately, it's often either badly implemented or left out altogether.

The reasons why so few games have good characters in them may seem obvious. If you're going to include other people in the game, you're also going to have to include a whole load more data for messages — either speeches for them to deliver, or descriptions to tell the player what they're up to. On top of that, you'll also need to test hundreds of conditions to determine when these messages should be output. Obviously all this is going to take up loads of Ram, which you probably can't spare, because adventures tend to take up loads of Ram anyway.

Well, the good news is that there are ways of programming "intelligent characters" into your Basic adventure games, and these methods don't necessarily take up much space. You'll still need to set aside data storage areas for messages, but you can fit an awful lot of messages into, say, 3K — and that still leaves you with lots of room for other things like location descriptions and so on.

In this, and the two issues of *Your Computer* that follow, we're going to let you in on the secret of how it's done, and leave you with a type-in listing that will have characters interacting away to their hearts' content, or until you press the Escape key.

First, for those who may be a little unclear about the subject, let's define exactly what an interactive character is — and what it isn't. An interactive character should have three main attributes: the ability to move from location to location without help from the player; the ability to get, carry, and drop objects; awareness of his/her surroundings. These three main attributes will enable the character to play a significant role in the game. We've already mentioned Thorin as an example of such a character — another example would be one of the characters in *Valhalla*.



You are in a comfortable tunnel like hall

> LOOK
> LOOK
+



Top: Hewson Consultants' *Fantasia Diamond* is a typical 'post-*Hobbit*' program featuring a number of interactive characters, some of whom — the Toy Robot in particular — assume quite significant roles in the game. Middle: The

Hobbit was one of the first popular games to feature true 'interactive characters'. Bottom: *Valhalla* was notable for its interactive characters, one important function of which was their ability to 'remember'.

INTERACTIVE CHARACTERS

MAKE
IT LIVE

Some games do, of course, include characters but include them in such a way as not to qualify for the term "interactive". Such characters are really just objects, which are described in human terms. They can still be quite effective, but the point is that such "pseudo-characters" are 100 percent predictable. Once you've met "the old man by the crossroads", you know that you'll meet him again at the same point in the game every time you play.

If, however, the old man was a real interactive character, you might meet him in the pub, on the street, at the hotel, or even catch him stealing up behind you and pinching your purse — whereupon you can chase him and try and get it back.

All these actions can, in an adventure program, be set in motion by a routine which from now on we shall call the character handler. This is a routine that can accept the data for any character in the game, process it, decide what action (if any) to take — such as moving the character — and then return to the main adventure program. There are two sorts of character handler — asynchronous and synchronous. All this means that in the first case the routine is called independently of the player's actions.

In other words, whatever may be going on in the main program, a call is suddenly made to the character handler to update all the characters. Both the Hobbit and Valhalla use this technique — if you sit back and do nothing, you'll see the characters continue to act out their own pre-programmed lives, with perhaps a message such as "You wait ..." or "Time passes ..." flashing up on the screen every few seconds. This system is rather difficult to implement in Basic, unless you have an MSX or Amstrad computer provided with Basic interrupt commands.

An asynchronous system can appear more lifelike, because the pace of the game doesn't depend on the player, but a synchronous system is easier to program. Using this system, the character handler is called regularly at a certain point in the program — usually when the player enters a command. This is the system we shall be using here.

Before we actually get down to the nitty-gritty of bringing our characters to life, there are just two more possible attributes for characters that need to be mentioned. The first is speech — they should ideally be capable of addressing the player without being prompted, and — even better — answer back if spoken to.

The second is "history" — which means that a character should have some idea not just of what is going on around him/her, but also of what has happened previously. The best example of this is Valhalla, where characters

James Hartley meets interesting people.

like Thor took note of our actions and this influenced their behaviour later in the game.

Allowing the player to address characters does not just involve the character handler routine — it also involves the parser, that bit of your program that accepts input from the player. For this reason, we shall not be including it in our program, but you will find that the techniques illustrated will make it simple to implement in your own games. We will, however, be giving our characters something to say. So much for the background. Now, how's it done?

The first problem we have to solve is how to test conditions, because we're going to have to do it a lot and we need an efficient method. If you look at any book on programming Basic adventures you'll see that there are lines upon lines of If statements, since this is the easiest way of testing a condition in Basic. Here are a couple of examples:

IF (the player is in the dungeon) AND

IF (the rats are hungry) THEN PRINT (Aaaaaagh!!!)
IF (the player is in the dungeon) AND
IF (the rats are dead) AND IF (the player is hungry) THEN PRINT (Mmmmm! Revenge is sweet!)
IF (the player is not in the dungeon) THEN PRINT (Freedom is slavery)
and so on ...

This is all very well, but you could soon find yourself writing a line full of Ifs for every message you want to print on the screen. However, the good news is that we can do without Ifs altogether! The first step is to look at the problem in a completely different way. Let's take the example above and represent the decision-making process as a "tree" — see diagram 1.

A structure like this is called a decision tree. It is composed of different nodes (the rectangles) connected. The nodes fall into two types —
(continued on next page)

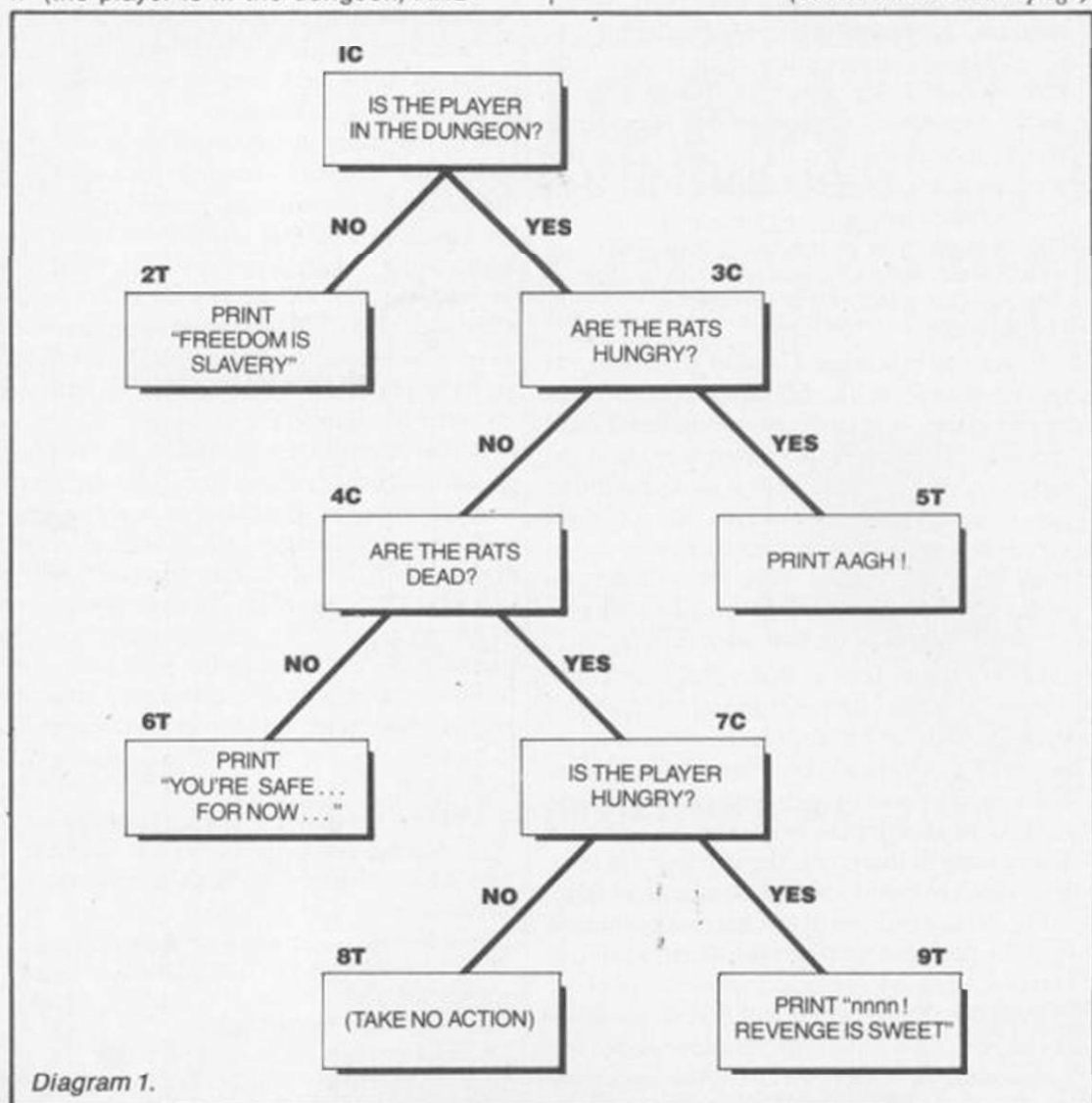
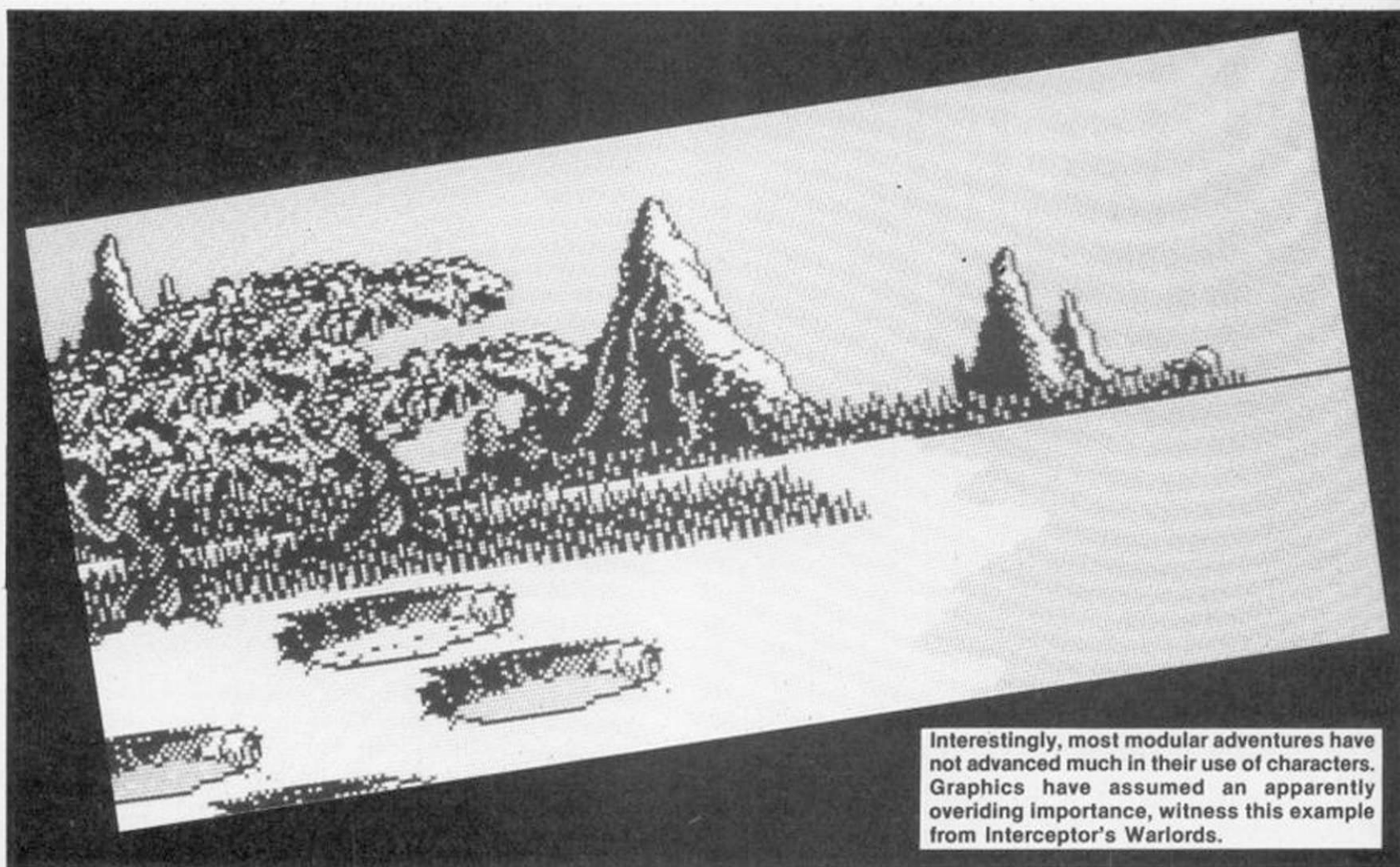


Diagram 1.



Interestingly, most modular adventures have not advanced much in their use of characters. Graphics have assumed an apparently overriding importance, witness this example from *Interceptor's Warlords*.

(continued from previous page)

choice nodes, which test a condition (such as "Is the player in the dungeon?") and terminal nodes, which do not test a condition and have no further branches leading from them. In this diagram, each node has been numbered and given a letter corresponding to its type — C for choice, and T for terminal. The conditions tested correspond to those in our If examples above, though you should be able to see that we have made a simple addition, which could be expressed as:

```
IF (the player is in the dungeon) AND
IF (the rats are not hungry) AND IF (the
rats are not dead) THEN PRINT
(You're safe . . . for now)
```

Instead of executing a load of If statements, we can enter a tree like this into a Basic program as a set of data, and then traverse it using a short routine. Traversing a tree means starting at the top and working our way down along the different branches until we arrive at the right terminal code, since when we arrive at one of these we know that we have reached the end of the decision process, and can take whatever action is indicated by that particular node.

Let's look at how a Basic program might traverse our rats-in-the-dungeon tree. In order to do this, all our Basic program needs to know is what type each node is — terminal or choice. If it's a choice node, the program will also need to know what condition is to be tested, and both which node to jump to if the condition is true, and which to jump to if the condition is false.

For the moment, we'll assume that our player is in the dungeon and the rats are alive but not hungry. Let's see what happens . . . Starting at node one, the program will first check to see if the node is a choice or terminal node. It's a choice node, so next we check the associated condition, and find that it is true.

The program looks up the data for node 1, result true, and finds that the new node to jump to is node 3. The process is repeated and the program jumps to the node associated with node 3, result false. Again the process is repeated for node 4, with the program ending up at node 6. This is a terminal node, so the program stops here and prints the message "You're safe . . . for now".

The tree we've just shown is very simple, but trees like this can develop into enormous baobabs of programming complexity, testing hundreds of different conditions, but still — remarkably — taking up very little Ram. The secret is in the way such a structure can be translated into a Basic program, and this is very easy. The first step is to store all the conditions to be tested in an array, so that we can refer to them by numbers.

So, for example, the condition "Is the player in the dungeon?", which like all conditions can evaluate either to zero (false) or non-zero (true), will have its value stored in conditionarray(1); the value of "Are the rats hungry?" will be stored in conditionarray(2), and so on.

All we need to do then is set up an array holding the information for each node. Let's suppose that this array is called the t array. For our example tree, we should Dimension it as follows:

```
DIM t(9,4)
```

The first subscript, 9, is the number of nodes. The second subscript, 4, is the number of different data items we need to store for each node — these are:

- (1) node type — choice (indicated by a 0) or terminal (indicated by a 1)
- (2) for a choice node, the number of the condition to be tested
- (3) for a choice node, the node to branch to if the condition is false
- (4) for a choice node, the node to

branch to if the condition is true. In the case of terminal nodes, elements 2 and 3 are set to zero, and element 4 holds a number used to select the relevant message from a data store.

As an example, then, the data for node one could be read into the t array from a Data statement as follows:

```
10 FOR n=1 to 4: READ t(1,n): NEXT
20 DATA 0,1,2,3
```

We could extend this to read data for each of the nine nodes into our array.

Now comes the magic — we can traverse the tree simply by setting a variable 'nodenumber' to one and then using the following routine:

```
IF t(nodenumber,1) = 1 THEN (exit tree
because we've reached a terminal
node) ELSE
nodenumber = t(nodenumber,t
(nodenumber,2) + 3): GOTO (beginning
of line and do again)
```

The first part of the routine simply checks to see if we've reached a terminal node and, if so, jumps out of the traversal process. All you really need to pay attention to is the second part, and the way in which the new node number is assigned to the variable nodenumber.

This is done by getting the relevant record for the current node, and selecting from the array the appropriate node number to branch to next by adding the value of the condition number held in t(n,2) to the number 3, giving us either t(n,3) (if the condition was false) or t(n,4) (if it was true). The routine simply calls itself repeatedly until it finds a terminal node and exits.

In next month's issue, we'll show this technique in action, and begin the process of bringing our characters to life.

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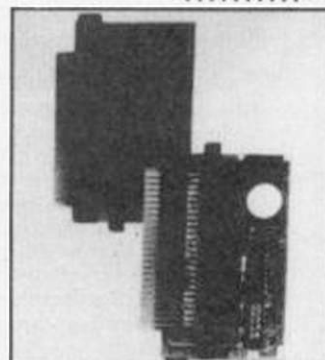
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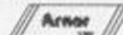
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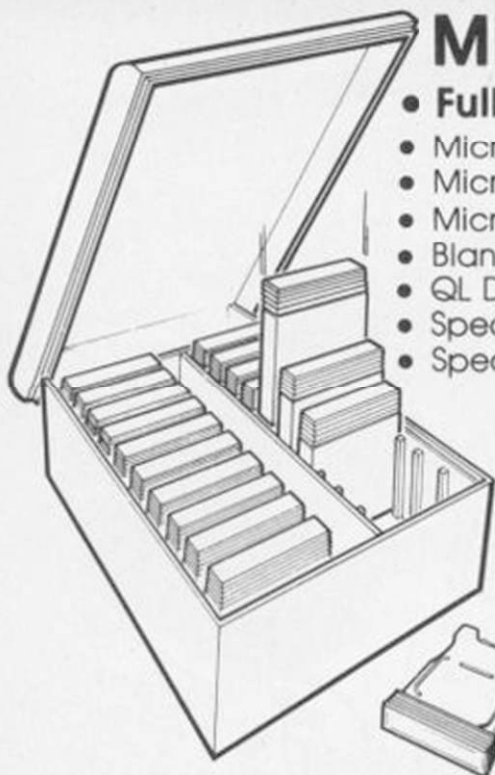
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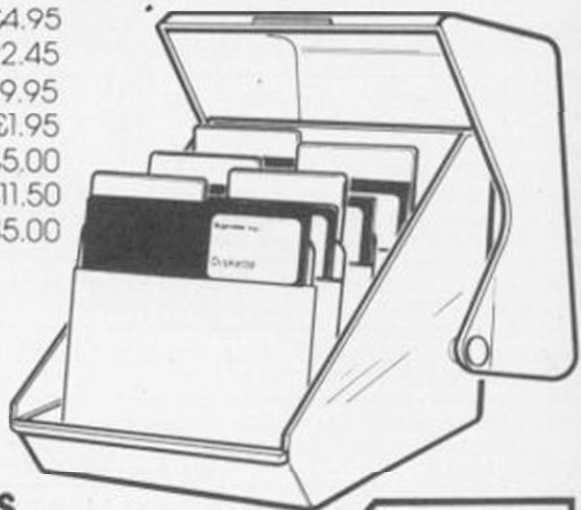


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Advanced Z80 Machine Code Programming, by William Nitschke, fills a serious gap in the literature on programming the Z80. Rather than dealing with the elementary concepts of Z80 architecture, this new book discusses the material you now need to know to advance your skills. The core of the book looks at popular programming applications. Starting with the basics of organising information, generating arrays and tables, block moving, shifting and erasing, string manipulation, data compression and command tables, it moves on to advanced applications like word and sentence decoding. Games programming is then examined in detail, including three-dimensional maze generation, animated graphics and the development and coding of arcade games, and the synthesis of speech and sound effects. There is also a complete set of 'undocumented' Z80 instructions.

You can buy *Advanced Z80 Machine Code Programming* by William Nitschke (ISBN 0 907563 90 2) at £12.95 from most book and computer stores, or direct from the publisher, post free, at:

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NEWS

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The crystal ball

Windam Classics is the title of a new series of text and graphics adventures based on famous children's books. The series is being marketed on disc for Commodore 64 owners by W.H. Smith Distributors.

There are two types of game. Alice in Wonderland — reviewed this issue — and Below the Root — based on the Green-Sky trilogy — are mainly animated graphics with added text. The more traditional type of adventure can be found in Swiss Family Robinson where text plays a greater role.

Others planned for release include Treasure Island, Robin Hood and The Wizard of Oz. The Worm in Paradise, Level 9's sequel to Snowball and Return to Eden, should be with us any time now.

A helping hand

Dean Cooper of Dudley has found Scott Adams' Secret Mission — formerly Mission Impossible — a trifle tough.

Can't get the yellow key?
WODN IWHG UORH TRED
ROCE FWOR HT
Bomb going off?
WODN IWNE KORB YBEG
DABS RUET OBAS ESU
Still no joy?
SNOT TUBE TIHW NEHT
WOLL EYNE HTDE RHSU
PRIA HCNI

Where's the blue key?
POME HTEK AHS



Curiouser and curiouser.

QUEST

Carner

Our man with the brass lamp and the key to a thousand mysteries sheds light on new adventure programs. Lost? Never fear, Hugo North is here.

Robin of Sherwood

■ Spectrum/CBM-64/Amstrad
■ Adventure International
■ £9.95

IN THE DAYS of the Lion spawned of Devil's Brood, the Hooded Man shall come to the forest. There he will meet Herne the Hunter, Lord of the Trees, and be his son and do his bidding. The powers of Light and Darkness shall be strong within him. And the guilty shall tremble.

Or, to use prose of a slightly less purple hue, Robin Hood and his merry men are up and about again and all set to duff up the baddies in this new text and graphics adventure.

If the mention of the aforesaid Hooded Man and Herne the Hunter twanged your memory's bowstring, that's probably because this adventure is based on the popular TV series and has been officially licensed from Goldcrest.

Mike Woodroffe has joined forces with programmer Brian Howarth and graphics supremo Teoman Irmak to produce an adventure that is both mentally challenging and visually stirring. If you're a BBC or Electron owner, you'll have to be content with a text-only version at the lower price of £7.95.

Like many of Adventure International's recent releases — Gremlins, Hulk, Spiderman, Sorcerer of Claymorque Castle, etc — Robin of Sherwood boasts superb graphics, the best you'll see in any adventure. The only others I've seen that come near to A.I.'s standard are those by Terry Greer of Interceptor but you don't



Riding through the glen — Robin Hood.

get many pics per adventure with theirs.

Subtitled Touchstones of Rhiannon, the adventure not only casts you as the bold Robin but also casts you straight into a dungeon at the start of the game. Although the opening parallels one of the TV scripts, you may find it a shade difficult to escape from this early predicament. Despair not — A.I. have thoughtfully given some coded clues on the packaging to get you out of the pit. Before you rush off to Sherwood Forest, you might care to explore the castle. The Lady Marion's in there somewhere and it might pay you to chat her up before you belt off.

Once in the Greenwood, you're sure to meet up with Herne the Hunter, he of the funny headgear. Hatrack-head will tell you that your quest is to find the six Touchstones of Rhiannon and return them home.

Sherwood Forest sure is a large place and you're likely to get lost quite quickly. Keep plugging away though and you'll be rewarded with a stunning animated picture of a waterfall. Elsewhere, you might be lucky enough to stumble across a bewitched John Little, Kirklees Abbey and a grange.

Robin of Sherwood is a visual treat coupled with a testing mission.

Alice in Wonderland

■ Commodore 64
■ Windham Classics
■ Disc £14.95

CURIUSER AND curiouser! Windham have combined traditional interactive text with command menus, graphics, sound and elements of arcade action.

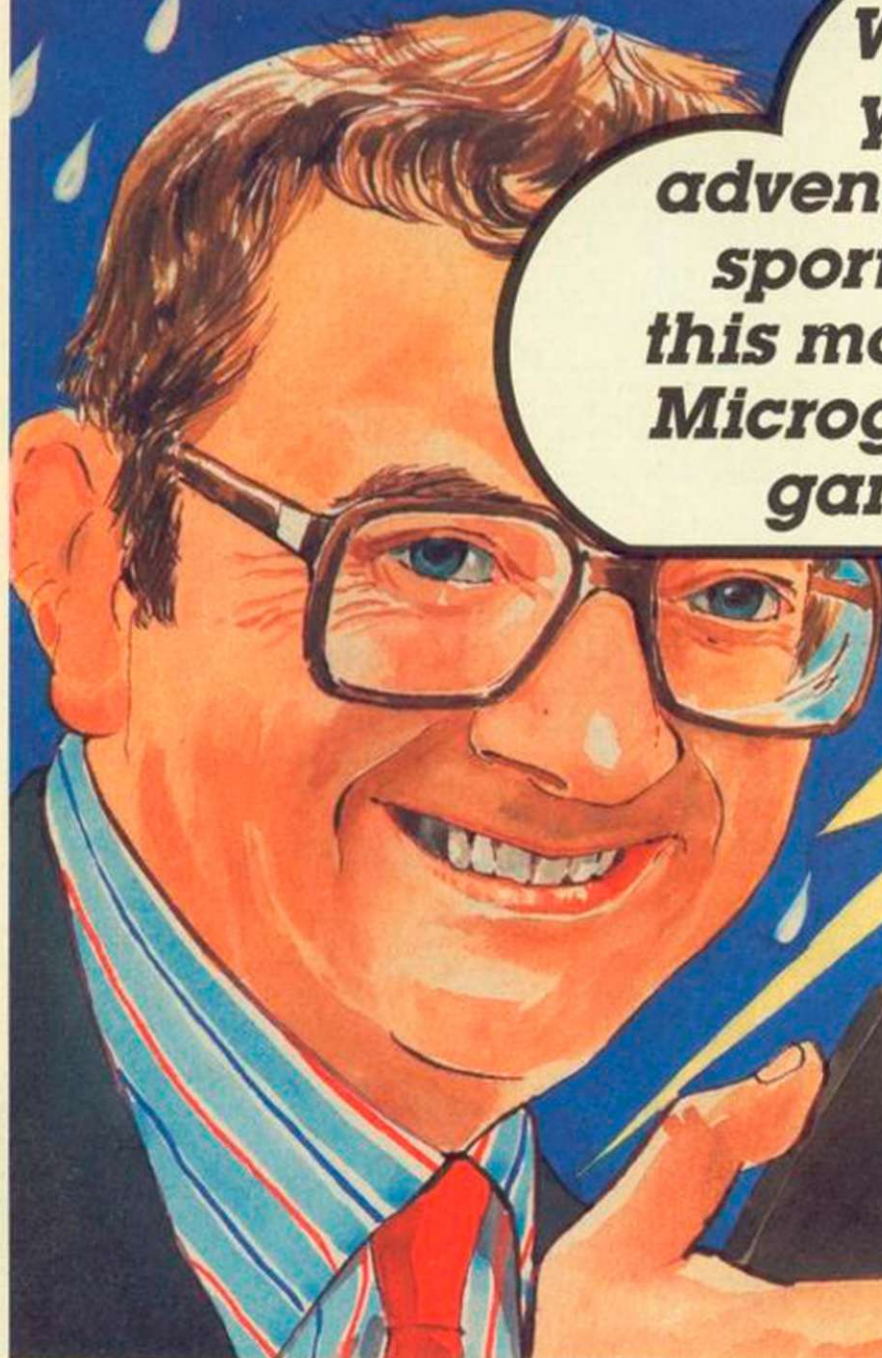
The result is a charming adventure, offering something for the whole family. The game is based on the Alice books with some new ideas and characters added. You guide an animated Alice through some 250 screens, meeting over 60 different characters.

With the aid of a joystick, Alice can be made to walk, run, climb, crawl, stand, swim, and jump.

Part of the screen is reserved for entering commands and for receiving textual information. However, you don't have to type a thing — all input is done by means of option menus controlled by your joystick.

Most of the famous characters are there — all are animated — including the Cheshire Cat, the Mad Hatter, the March Hare, the Walrus — but no carpenter — and the White Rabbit.

Alice is a large, engaging and often humorous game. While it is undoubtedly aimed at younger children, many adults will enjoy this entertaining revisit to Wonderland.



**Weather
you like
adventure, intrigue,
sports or arcade,
this month's mystery
Microgamer has the
game for you!**

'High



"My two sun spots"

1. Souls of Darkon

by Taskset

Sorry about the summer – a wee bit disappointing I'm afraid, but here's something to cheer you up. A super game sizzling with excitement!

2. Scooby Doo

by Elite

This game is full of ghosties and ghoulies and mysterious happenings. Good old Scooby is back and so is my dear friend Mrs McUrioch. (Her name is almost as difficult as mine!)

*"Press the magic button
and the picture changes"*

GEOFF CAPES STRONG MAN

by Martech

Let's hear it for Geoff Capes. The World's strongest man. Did you know he is World Highland Games Champion too? Can you beat that? Well, with this game you can try. Six major challenges in all, and always a blue sky above so no chance of rain stopping play. Versions for most machines.

Cassette

£7.95 and £8.95

Disk

£14.95

ARNHEM

by CCS

1944 all over again, and what's this – a strong front advancing over Holland? Um, yes, of course it's the Allies attacking the Germans and they need your help. With bridges to capture and strategy to work out, it's as complicated as weather forecasting – but much more fun! (Sorry Michael).

Spectrum 48K

£8.95

Amstrad

£9.95



by Mirrosoft

What's faster than a hurricane and more devastating than a tornado? You've got it in one. Strike Force Harrier – the flight simulator that streaks through the skies like lightning. You are loaded with bombs to destroy the enemy – but watch out for the clouds of enemy fighters on the horizon.

BBC B and Electron

£9.95

MARSPORT

by Gargoyle Games

This large dome on your screens is a force sphere protecting the Earth from attack by Sept Warriors. It's a wee bit scary as the sphere is weakening and the strengthening plans are in an occupied town. All in all a gloomy outlook. Can you change that?

Spectrum 48K and Amstrad

£9.95

THORN EMI Computer Software

International Micro Software Division

"Look what my charts are showing"

HIGHWAY ENCOUNTER

by Vortex

Temperatures are rising fast. But it's not a heatwave, I'm afraid. The Aliens have landed. To save the globe from domination you have to activate the 5 Vortons and the deadly Lasertron. Dodging hailstorms of bullets you must boldly go forth to save the planet. (I think I'd rather stay at the Met office.)
Spectrum 48K and Amstrad **£7.95**

SCOOBY DOO

by Elite

The team of top sleuths is back. This lot could sniff out a sunbeam! Stunning graphics and super smooth action give this game a touch of class.
Spectrum 48K **£6.95**
Commodore 64 **£7.95**
Amstrad **£8.95**

WORLD CUP

by Arctic Computing

This league table reads MUCH better than my round the world temperature chart. But then top teams are involved, and you get the chance to pick the players and score the goals. Och, what could be fairer than that, ref?

Spectrum and C16 **£6.95**
Commodore 64 and Amstrad **£7.95**

ScreenShot

GRAPHICS PACK

by Dorling Kindersley
Are you interested in really good value? I am too, and this books plus software pack has loads of routines for

creating lovely graphics. There are over 200 sprite designs alone! Gosh, it's um well unbelievable - top class graphics, super fast speeds and hi-res results.
Spectrum, Commodore 64 and Spectrum+ **£15.95**

Games for Autumn

COMPUTER HITS

by Beau Jolly

A summary chart of all that's the best in computer games. But on this chart not a depression in sight! Every one is guaranteed to keep you smiling rain or shine. There are sports, simulations, arcade and adventures. Oh, and yes, I almost forgot, a version for most machines.

10 games **£9.95**
6 games **£6.95**

GANDALF

by Tymac

Two great games now on Spectrum. Gandalf - a man after my own heart - throws thunderbolts from his fingertips.

FLYER FOX

by Tymac

It's not raindrops falling on your head but fireballs from a Mig fighter.
Spectrum 48K Each game **£7.95**

"Super plays for rainy days"

Souls of DARKON

by Taskset

Not for the faint of heart this one. You must venture beyond the sun and through the gof - oops sorry fog (no, not to Lanzarote) to Megron, where the trick is to free the people from the curse of Darkon. Oh dear, quite a challenge, but YOU can succeed.
Amstrad **£8.90**

Old Scores

by Global Software

Solving this is like finding a snowflake in July (or deciphering one of my maps). Private Investigators will love it, and if you have never been lost around London's South Bank, here's your chance. Solve the mystery, explore the theatres, and become famous!

Spectrum 48K **£6.95**
Amstrad and Commodore 64 **£7.95**

Graham Gooch's TEST CRICKET

by Audiogenic

A super game for all seasons. Complete with googlies, silly mid-offs, authentic scoreboards and starplayers - relive the highlights of summer!
Commodore 64 (Cassette) **£9.95**
Commodore 64 (Disk) **£11.95**

Paintbox

by Audiogenic

The graphics package which gives you much more than squiggly lines and cloud shapes. It has everything you need to produce high resolution pictures. Do you think the beeb would be interested?

Spectrum, Commodore 64 and 16 **£9.95**

The Secret DIARY OF ADRIAN MOLE aged 13½

by Mosaic

It's no fun being me. What with the sun turning to snow overnight and always having to look on the bright side. Now if I was a budding intellectual and poet like Adrian all my problems could be turned into great fun. And maybe they'd make me into a game too. (Well, I can dream.)
Versions for most machines.

Cassette **£9.95**
Disk **£12.95**

"Games to bring you Winter cheer"

BLADE RUNNER

by CRL

Gosh, here's a chance to be a bounty hunter and save the world. Scattered showers of Replidroids have run amok. These human look-alikes have to be pinpointed, tracked down and 'retired' if the outlook is to be at all sunny.

Commodore 64 **£8.95**

Win



SPOT THIS MONTH'S MYSTERY MICROGAMER AND WIN A FANTASTIC PRIZE. TEN 2-PACK PROGRAM PRIZES MUST BE WON PLUS SINGLE GAME PRIZES FOR THE FIRST 100 RUNNERS UP.

If you think you know the answer, send this coupon to us, no later than 14 November 1985. The first ten correct entries will each receive SCOOBY DOO and SOULS OF DARKON. 100 runners up will each receive a super game for their machine type.

I say the Mystery Microgamer is:

Send me your latest full list of software programs.

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Machine _____

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Billy Marshall,
Leeds
William Clark,
Kingsthorpe
David Morris,
Weston Super Mare
Mary Dolan,
Preston
Amil K Seth,
Wantage



Last month's mystery Microgamer was Tracy Ullman. 10 prizes are on the way.

KEY CHOICES

Choosing electronic instruments can be as confusing to the newcomer from the world of computing as choosing a computer is for the musician.

MIDI-equipped instruments and accessories come in a variety of shapes and sizes, with price-tags from under £200 to £40,000 or more.

The first instrument you are likely to want is a synthesiser. Two years ago you would probably have had to spend at least £1,000 for a MIDI-equipped synth. Now you have a choice of models retailing at under £500.

Of these, probably the most attractive from the computer user's point of view is Casio's £345 CZ-101 synthesiser.

The CZ-101 is the smallest of a family of fully programmable digital synthesisers, but the sounds it produces are as powerful as those of synthesisers many times its price. The one noticeable compromise is that its keyboard is smaller than standard, but for £150 more you can get the electronically identical CZ-1000 with a full-size keyboard.

One particular attraction of the CZ-101 for the computer user is that it is "multitimbral". What this means is that in addition to its normal eight-note polyphonic operation (with each note producing a similar sound at a different pitch), it can also operate as four monophonic synthesisers, each with its own sound, responding to different MIDI channels.

Another synthesiser of interest to the computer user is Siel's £399 Expander 80. This is a synthesiser without a keyboard which can only be driven by MIDI signals.

Siel have also just introduced a range of keyboard instruments with preset voices, designed for connection to computers. The smallest of these, the £169 MK370 includes a non-standard interface to link it to the Commodore 64/128 computers. The more powerful £250 MK490 and £325 MK610 instruments also include RS-232 interfaces. Siel also markets a £26 RS-232-to-MIDI converter.

If your budget is big enough, you might look at the recently-introduced DX21 synthesiser from Yamaha. This is a £699 brother for the £1,299 DX-7 synthesiser.

Once you have a synthesiser, the next MIDI instrument on your shopping list will probably be a drum machine. Yamaha could help here as well with its £250 RX-21, a rhythmic companion for the DX-21. Although it has fewer drum sounds and facilities than most other drum machines it is also less than half the price.

Even if you play an instrument other than a keyboard, MIDI can still help you. For example, there are several devices for converting a guitarist's actions into MIDI signals although, at present, these cost well over £1,000.

More affordable is an ingenious Canadian development called the Pitchrider which analyses musical sounds such as those produced by the human voice or woodwind instruments and translates these into MIDI codes. This device, expected to retail for around £200, could open up the world of MIDI to musicians who have previously felt excluded because their instruments operate without an electrical supply.

IF — OR, in the case of Spectrum owners, when — you tire of the music-making capabilities of your micro's internal sound system, don't despair. There are still two avenues you can explore with your micro to extend your musical horizons.

The first of these is to hook an external sound-making device onto your micro. The second is to use the computer's memory to store a digitised version of a real sound which can later be regurgitated in a more-or-less musical fashion. This is known as sampling.

The former option can be divided further into dedicated micro add-ons such as Acorn's Music 500, Siel's Sound Buggy and Commodore's Music Expander and the stand-alone music synthesisers and electronic percussion instruments, commonly known as drum machines, that are a vital ingredient in much of today's music.

The modern synthesiser or drum machine is essentially a computer dedicated to making musical sounds. All that is needed to allow your computer to converse with an electronic instrument is an interface and communication protocol. This exists in the form of the Musical Instrument Digital Interface — MIDI, for short.

MIDI emerged a few years ago when musical instrument manufacturers got together to draw up a standard way for their instruments to talk to one another. As we explained last year — *Your Computer*, September 1984 — MIDI is a serial link operating at 31.25kBaud — more than 60 per cent faster than the RS-232 — along which digitised information about the operations of electronic instruments is transmitted.

At its most basic level, this data defines which notes are being played, when they start and stop, and, sometimes, other factors such as the force with which they are struck and held down. These last two parameters — velocity and pressure sensitivity — can be used by some synthesisers to modify the sound produced thus giving the player more musical expression.

MIDI can also be used to transmit information about the parameter values used to define particular sounds or "voices".

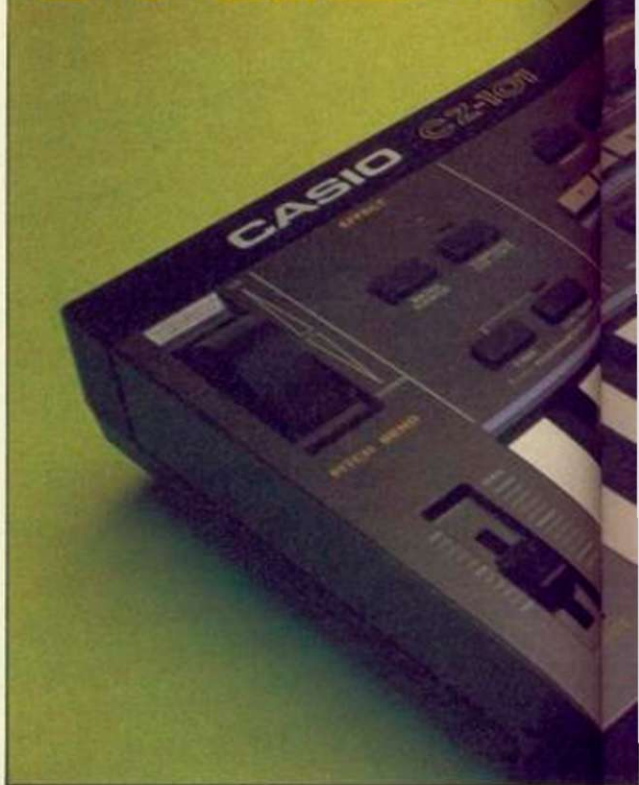
MIDI information is transmitted on up to 16 software "channels" each controlling one or more instruments. This allows complex multi-part musical arrangements to be performed in real time.

Physically, MIDI manifests itself as two or more five-pin DIN sockets without which the modern electronic musical instrument would be incomplete. Separate MIDI In and Out sockets are used to transfer data to and from an instrument, and many instruments have a third, Thru, socket which passes the information fed into the In socket on to other instruments.

Most musicians probably either ignore the MIDI sockets or use them only to link one synthesiser with others. MIDI allows synths with differing or complementary voices to be linked together and played simultaneously from a single keyboard, thus providing a fuller, more interesting sound.

But MIDI also opens up exciting possibilities for linking electronic instruments with computers. Using a simple interface costing as little as £20 and suitable software, your computer can start to talk to synthesisers and drum machines. The resulting conversations

MAG MIDI



can be mind-blowing.

Already there are more than 20 MIDI packages on the UK market and the numbers are growing by the month. Software writers have so far concentrated on the Spectrum, BBC and particularly the Commodore 64 machines, but Amstrad and MSX owners will soon be able to experiment with MIDI when interfaces become available for their machines.

To date, most MIDI software packages have fallen into one of three categories; real-time recording; step-time recording; and voice editing and storage for specific synthesisers.

In all cases the hardware set-up is similar. A MIDI interface is plugged into the appropriate orifice of the micro and is, in turn, connected to a "master" electronic instrument by a pair of DIN leads, one for each direction of MIDI data flow.

In real-time recording, the micro is used to

MIDI Sophistication from Joreth.



GIC



Tony Sacks meddles with MIDI, the digital bridge between computers and synthesisers.

Casio's CZ-101, above, is a cheap way into MIDI. The MIDI beat; right: XRI's Micon, top left; Siel's interface top right; Micro Musical's Musician, centre; and the Passport interface from Rittor, bottom



simulate the operations of a tape-recorder — usually multi-track — except that instead of audio signals, MIDI information is recorded.

As the instrument is played, it transmits a stream of MIDI data which can be stored on one "track" of the simulated recorder. This track can then be "played back", re-transmitting the MIDI signals to drive the same — or other — synthesisers while the musician records accompaniments on other tracks. Software packages with up to 16 such tracks are available.

Each track can be assigned to a different MIDI channel and can thus play separate parts on up to 16 instruments or groups of instruments simultaneously. Although it is dangerous to take the tape recorder analogy too far, it is worth remembering that a 16-channel tape machine could cost tens of thousands of pounds and still not offer all the editing facilities of a good MIDI real-time recorder.

For example, some real-time recorders offer a facility unique to MIDI, known as "auto-correct" or "quantisation". What this does is that if, after recording a track, a musician feels that the timing of some of the notes played was not quite right, the MIDI software can be used to shift all the offending notes automatically so that the timing becomes spot-on.

The second type of package, the step-time recorder, again stores MIDI information, but not in real time. In this case, information about the pitch and timing of each note is specified separately, either from the Qwerty or musical keyboard. A major attraction of the step-time package is that it allows the user to compose

and edit pieces that would normally be beyond their technical ability on the musical keyboard.

The third type of package is designed to make the programming of synthesisers sounds easier. On some synthesisers more than 100 parameters have to be specified when programming a sound.

To cut costs, synthesiser manufacturers often build just one multi-function variable control into an instrument. This is used in conjunction with a digital read-out to alter a single parameter at a time, a time-consuming and often confusing process.

However, if the parameter values are MIDI-encoded and sent to a computer running the appropriate software, almost all of the variables can be displayed simultaneously and graphically on the computer's screen, and adjusted using the computer's keyboard, making the programming process much easier. There are software packages designed to do this for several popular synthesisers.

A variation on this theme is to use the micro to build up a "library" of parameters defining various voices. A synthesiser's limited internal voice memory can usually only be expanded using expensive plug-in Ram packs. MIDI offers musicians the much cheaper option of storing their voice data on floppy discs or data

cassettes via a micro.

In addition to the three main program types, other micro applications for MIDI are emerging. The Italian Siel company, for example, has developed a digital delay program which takes in MIDI information and spews it out again after a predetermined period to produce echoes and similar effects.

A graphic example of the possibilities opened up by MIDI comes from Electromusic Research (EMR), the most prolific British producer of MIDI software and hardware. EMR's £24.95 Vu-Music package for the BBC interprets MIDI data visually in the form of a kaleidoscopic display on the computer screen.

Pressure of space does not allow us to examine individual MIDI packages but there are some general points to bear in mind when looking at MIDI packages for micros.

First there is a confusing bit of MIDI terminology. The capacity of most MIDI recorders is specified in "events" rather than "notes". In MIDI, switching a note on is one event, switching it off is another. So a recorder with a 24,000 event capacity will only record a maximum of 12,000 notes.

But, if you are also recording extra information such as velocity and pressure sensitivity, the note storage capacity is cut back further. More valuable memory is eaten up if you store information which will tell the synthesiser to change voices at certain points in a composition.

The design of any MIDI recorder program is thus a compromise between the amount of memory available for event storage and the facilities offered by the program. The screen displays tend, therefore, to be rather rudimentary compared to games software. Every byte counts.

Another point to watch for in multi-track recorders is whether there is a fixed amount of memory allocated to each track or whether the memory is divided according to the number of tracks being used and the number of notes in each.

You may have noticed that MIDI hardware and software tends to be rather more expensive than other home micro packages. This is partly because there is not yet a mass-market for MIDI packages, and partly because many existing buyers are professional musicians who are prepared to pay extra for what are, to them, tools of their trade.

This price structure is beginning to break down with the entry of companies like Island Logic and Commodore into the market. On the hardware front, for example, there is Commodore's £19.95 MIDI interface. Admittedly, it is more basic than other interfaces but it will meet the needs of most MIDI novices at less than a quarter of the cost of rival products.

There is still, however, a problem with software prices, Commodore's £14.95 Sound Studio and Island's £34.95 TMS represent extremely good value but offer only a few of the facilities included in the up-market MIDI packages.

A more annoying barrier to the wider use of MIDI with micros is that most of the MIDI software now on the market will only operate with a MIDI interface from the same supplier. The suppliers are, in effect, using the interfaces as dongles to deter would-be software pirates.

(continued on page 71)

AMSTRAD 48-95
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(continued from page 69)

This leads to the absurd situation that if you like one supplier's real-time recorder but prefer another's step-time recorder you will have to buy two costly interfaces, performing almost identical functions, to run the two packages.

Some suppliers compound the problem by bundling the interface with an item of software which you may not need and selling separate programs which may interest you but which can only be used with the interface which is not available as a separate item.

A final word of advice if you are thinking of buying MIDI software. If at all possible, you should test the software with the synthesisers or drum machines you are planning to use. Trials with similar machines are not good enough because instrument manufacturers have a nasty habit of revising their MIDI firmware without telling anyone.

MIDI has its critics in the music industry. Some would have preferred a faster, parallel link to the serial format. Others feel that the DIN plug is not up to the job. But the present format was chosen because it offers a relatively simple and cheap way of linking instruments with each other and with micros.

Two recent developments in the micro world could help to spread the MIDI gospel. First, the trend towards 128K as the standard home micro Ram capacity could prove extremely important. It will boost event storage capacities and allow software writers to extend the facilities offered by their packages and to enhance screen displays.

But more significant is the arrival of the first general-purpose micro with a built-in MIDI interface, Atari's ST. Atari boss Jack Tramiel's decision to add \$10 or \$20 to the cost of the ST by including the MIDI interface shows how important he believes MIDI will become.

Next month we will look at the other method for expanding the micro's musical role — sampling.

ADDRESSES

Commodore Business Machines, Corby, Northamptonshire NN17 1BR (0536-205252).

EMR (Electromusic Research), 14 Mount Close, Wickford, Essex SS11 8HG (0702-335747).

Hybrid Technology, Unit 3, Robert Davies Court, Nuffield Road, Cambridge CB4 1TP (0223-316910).

Joreth Music, PO Box 20, Evesham, Worcestershire WR11 5EG (0386-831615).

LVL, Scientific House, Bridge Street, Sandicare, Nottingham NG10 5BA (0602-394000).

London Rock Shop, 26 Chalk Farm Road, London NW1 8AG (01-267 7851).

Micro Musical, 37 Wood Lane, Shilton, Coventry CV7 9LA (0203-616760).

Rittor Music Europe, 24 Broomgrove Gardens, Edgware, Middlesex (01-952 5302).

Rosetti, 138-140 Old Street, London EC1V 9BL (01-253 7294).

Sequential Circuits, PO Box 16, 3640 AA Mijdrecht, The Netherlands (02979-6211).

Siel (UK), Ahed Depot, Reigate Road, Hookwood, Horley, Surrey RH6 0AY (0293-776153/4)

XRI Systems, 10 Sunnybank Road, Wylde Green, Sutton Coldfield, West Midlands B73 5RE (021-382 6048).

MIDI MAGIC

Machine	Supplier	Package	Price	Interface	Comments
Spectrum	EMR	Performer	£39.95	£79.90	8-track polyphonic real-time recorder, 7,960 event capacity (with or without velocity), tracks can be merged.
	Micro Musical	MIDI Musician	£69.00	included	Monophonic step-time recorder, based on Romantic Robot's Music Typewriter (included), microdrive convertor.
	Siel	Live Sequencer Micon	£21.30	£87.95	Simple 1-track polyphonic real-time recorder
	XRI Systems	Real-time Multitracker	£108.00	included	2 programs: 8-track monophonic step-time recorder, helpful staff display, up to 2,900 events/track; and simple 1-track polyphonic real-time recorder, auto-correct.
BBC	EMR	Composer	£44.95	£79.90	6-track step-time recorder, 5,100 events, dynamic memory allocation, joystick option. 8-track polyphonic real-time recorder, capacity up to 7,960 events, track merging, auto correct. Extra editing facilities for Performer, links it with Composer allowing data transfer. Provides graphics display modulated by MIDI data, choice of type of music to be depicted. MIDI hardware module for use with Music 500 system or independently, requires £35 Nucleus ROM.
		Performer	£49.95		
		Editor	£34.95		
		Vu-Music I	£24.95		
	Hybrid Technology	Music 600	—	£129.00	MIDI hardware module for use with Music 500 system or independently, requires £35 Nucleus ROM.
	LVL	—	—	£ 39.95	Interface for use with LVL's keyboard and music ROM.
	London Rock Shop	UMI-2B	£495.00	included	ROM-based 16-track polyphonic real-time and step-time recorder, auto-correct, voice storage for DX7 synth.
Siel	Multitrack Composer	£36.95	£99.00	6-track monophonic step-time recorder.	
CBM-64 /128	Commodore	—	—	£19.95	Simple MIDI interface for use with Commodore packages including Music Studio, Music Expander and Sampler.
	EMR	Performer	£49.95	£79.90	8-track polyphonic real-time recorder, 18,000 event capacity, auto correct, track merge.
	Joreth	Music Composer System	£250.00	included	8-track step-time and real-time recorder, music composition language, auto-correct, score display.
	Rittor	Passport MIDI/4 +	£79.99	£109.99	4-track polyphonic real-time recorder, 12,000 event capacity, dynamic memory assignment, auto-correct.
		Passport MIDI/8 +	£119.99		8-track polyphonic real-time recorder, 12,000 event capacity, dynamic memory assignment, auto-correct, impressive demo pieces.
		Passport MIDI player	£64.99		stores music created on MIDI4+, real-time graphic display during playback.
	Rosetti	Scorewriter	£340.00	£90.00	ROM-based 12-track real-time recorder, produces detailed score print-out of real-time playing.
		12-track recording studio	£99.95		12-track real-time recorder, 7,600 event capacity, auto-correct, track merge.
	Siel	Multitrack Composer	£36.95	£87.95	6-track monophonic step-time recorder.
		16-track sequencer	£67.25		16-track real-time polyphonic recorder, 9,000 event capacity. provides delays of 5-200ms between MIDI In and Out signals, up to 14 "echoes" possible.
Digital Echo Delay		£54.35	6-track polyphonic real-time recorder, 8,000 events, auto-correct.		
Sequential	Sequential 964	£74.95	£99.00		
MSX	JVC	—	—	£TBA	Software similar to EMR's Performer 8-track real-time recorder (see above).
Amstrad	EMR	—	—	£79.90	Interface supplied with Introduction to MIDI program on cassette.

Richard Taylor improves the Spectrum's sound

THIS PROGRAM adds a further four commands designed to enhance its musical and sound capabilities to Spectrum Basic. They start where Beep left off, providing a Play instruction which allows tunes to be played by just specifying the notes rather than having to labouriously convert them into the numerical form required by Beep. Secondly, the program facilitates the use of tone envelopes whereby the pitch of a sound varies with time to produce the laser sounds and zaps that are all too popular in commercial games. Random "noise" can also be produced and, when used in conjunction with envelopes, can be made to create some convincing effects.

The program occupies about the top 2.5K of memory just below the UDG graphics area. When run the program lowers Ramtop and proceeds to poke the machine code into memory. After a couple of minutes the computer should respond with a message informing you that the data was OK. At that point the machine code can be saved to cassette or Microdrive etc. If, however, you are presented with a message informing you of a data error in a certain line then its necessary to go back to that line and check it against the original, correcting any mistakes as you go, and re-run the program. This process should be repeated until you get the data OK message.

The machine code can be saved to tape using:
SAVE "SOUND EXT"CODE 62683,1885
Remember to VERIFY!

To reload use:
CLEAR 62682: LOAD ""CODE

The new commands are used in a similar fashion to those which are standard except that the commands have to be typed out in full — in either upper or lower case — there's no lazy single key entry system. However, before any of the commands will be accepted by the Spectrum the machine code must be initialised with:

RANDOMIZE USR 62683

This instruction completely resets the program and introduces the new commands to the Spectrum so that when Basic comes across them they'll be accepted without any quibbles. Because of the somewhat obscure manner in which it operates, any errors reported by Interface 1 disconnect the sound commands so that they are no longer part of Basic's vocabulary. To reinitialise use:

RANDOMIZE USR 62686

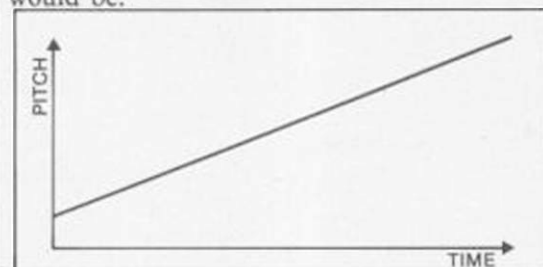
The most mundane of the new instructions

is *Sound. In its simplest form it can be used as a substitute for Beep. In an analogous manner to Beep the command needs two arguments, the first being the length of the sound (in units of 1/100 of a second — so 300 means three seconds) and the next argument is the pitch of the sound. The pitch is described in a completely different way to that expected by Beep — the smaller the number the higher the pitch! The best way to produce a certain tone is by experimentation — there's no easy method of getting a pitch number for a specific frequency. If the pitch of a sound is made negative then noise is produced with a pitch of very approximately what it would have been if it wasn't negative e.g.

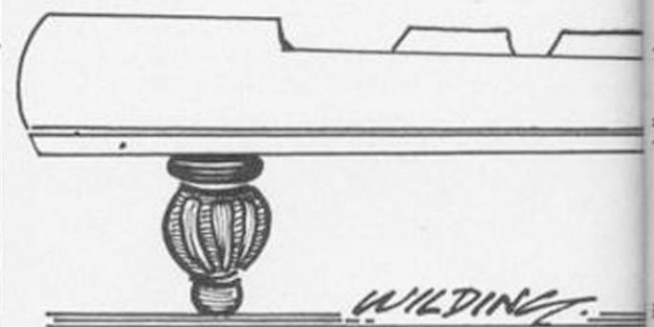
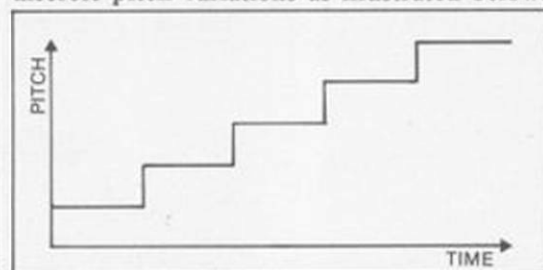
*SOUND 200, - 300

produces noise for two seconds. In fact the sound may not last exactly two seconds, when generating noise the duration you specify is only followed approximately — the sound may last much longer. If this is a problem then you'll have to compensate for it when defining sound lengths.

The *Env command is used to define the envelopes I mentioned. The definition of an envelope describes how the pitch of a sound varies from its initial value as time progresses. These tone changes give rise to the laser/zap effects which were previously unobtainable from Basic without enlisting the help of machine-code routines. A helpful aid in producing envelopes is to illustrate its effect graphically with the aid of a graph. For instance, the graphical form of a steadily increasing note would be:



Notice how the graph shows the pitch undergoing a continuous, smooth change from the initial to the final pitch value. In reality the computer cannot manage this but has to break the change down into a number of small, discrete pitch variations as illustrated below:



You decide how long each individual step will last and by how much the pitch then "jumps" at the culmination of each of the steps.

Say you wanted to create an envelope similar to the one above, we have to specify three quantities, namely the total number of steps, the size of pitch variation after each of them and the length of each step. From these values the following can be calculated:

$$\begin{aligned} \text{Total pitch change} &= \\ &\text{number of steps} \times \text{size of step} \\ \text{Total length of env} &= \\ &\text{number of steps} \times \text{length of step} \end{aligned}$$

Consider that the envelope is to last a total of one second and produce an increase in pitch of 100 units. Because of the weird way in which the pitch is measured an increase is represented by a decreasing pitch number — *Env uses the same method of pitch representation as *Sound. If we wanted to have a total of five steps in the effect then each would have a length of 1/5th second and a step of -20. To define the envelope:

*ENV 0,5, - 20,20

is used. The first expression after the command is the number of the envelope, in this case 0. Up to 16 completely independent envelopes can be stored in the Spectrum's memory at one time, each one being specified by a number between 0 and 15. The second expression is the number of steps, the third the pitch variation per step and, finally, the 20 is the step length in 1/100th's of a second. Since each step lasts a comparatively lengthy 1/5th second its quite easy to hear the individual steps composing the envelope. To hear the envelope type:

*SOUND - 1,250,0

Notice how a third argument has been tagged onto the end of *Sound to specify the envelope to be used. The length of the sound is given as -1. This means that the envelope should be played only once. Similarly if it was -2 then the envelope would be repeated twice. Try

```
110 REM BASIC SOUND EXTENSION
120 REM By Richard Taylor
130 REM 48K Version
140 REM
150 CLEAR 62682: LET a=62683
160 FOR l=0 TO 29
170 LET t=0: READ v,a#
180 FOR c=1 TO LEN a# STEP 2
190 LET x=CODE a#(c)-48-7*(a#(c)
200 >="A")
210 LET y=CODE a#(c+1)-48-7*(a#
220 (c+1)>="A")
230 POKE a.16*x+y
240 LET t=t+PEEK a
250 LET a=a+1: NEXT c
260 IF v<t THEN PRINT "ERROR 1
270 n line":8000+1*10: STOP
280 NEXT l
290 PRINT "Data OK - Now save m
300 achine code to tape."
310 STOP
```

```
8000 DATA 7192,"CDE8F42A3D5C11FD
8001 DATA F4732372C92138FCAF06101121007719
8002 DATA 10FC130608771910FCC93A3A5CFE0BCA
8003 DATA 6CF676FDCB01AEFDCB304EC4CD0E3A3A
8004 DATA 5C3CF5210000FD75"
8005 DATA 8010 DATA 6380,"37FD7526220B5C21
8006 DATA 010022165CCDB016FDCB37AECDE0DFD
8007 DATA CB02EEF147FE0A3002C607CDEF153E20
8008 DATA D778119113CD0A0CAF113615CD0A0CED
8009 DATA 4B455CCD1B1A3E3A"
8010 DATA 8020 DATA 5904,"D7FD4E0D0600CD1B
8011 DATA 1ACD97103A3A5C3C281DFE092004FE15
8012 DATA 2003FD340D01030011705C21445CFDCB
8013 DATA 0A7E200109EDB8FD360AFFDCB019E18
8014 DATA 0AFD363102CD9517"
8015 DATA 8030 DATA 6891,"CDB016AFCD0116CD
8016 DATA 2C0FCD171BFD0B07E20143A3A5CFE0B
8017 DATA CA6CF62A595CCDA711FD3600FF18DC2A
8018 DATA 595C225D5CCDFB1978B12080FD360000
8019 DATA CD5D15FD3600FF18"
8020 DATA 8040 DATA 9115,"C9DFFE0D28B3FDCB
```

```
3046C4AF0DCD6E0D3E19FD964F328C5C
3047 DATA FDCB01FEFD3600FFFD360A01CD8A1BC3
3048 DATA FDF4736F756EE4E2F9706C61F9BEF765
3049 DATA 6EF693F665666665"
3050 DATA 8050 DATA 6655,"63F41DF7001105F6
3051 DATA DF1AE67F4F7E23FE0D2006FE2038F6F6
3052 DATA 20B9200E1A131730E8225D5CEB5E2356
3053 DATA 00E91A131730FB13131AA720D3ED7B3D
3054 DATA 5CE12A5D5C225F5C"
3055 DATA 8060 DATA 7619,"CDC516FD36000BFD
3056 DATA CB017EC205F5C3B6F521FDF4CD302520
3057 DATA 0321A0F5E521761BE5FD3600FFFD3626
3058 DATA 002A5D5C2B7FE2038FAFE2A20BF180D
3059 DATA CD821CCD30252813"
3060 DATA 8070 DATA 8063,"CD941EFE10D29F1E
3061 DATA CD11F71138FC19E5360023AFF5E5DFFE
3062 DATA 2C2057CD791CDFFE2C202CF00CD811C
3063 DATA E1CD30252837E5CD941EE1E5232323A7
3064 DATA CA9F1E77CDA22DDA"
3065 DATA 8080 DATA 6709,"9F1E00CB78C29F1E
3066 DATA 082807792F4F782F4703E1E523712370
```

```
CD941EE1A7CA9F1E7723232323F13CFE
0838A9CD3025C8E177C9E1F118F56F26
005D542929292929"
8090 DATA 8384,"19C9CD821CCD3025
2810CD941EFE08D29F1E0D11F7191148
FE19E5DFFE2CC2BEF6CD811CCD3025E1
280FE53600CD941EE1A7CA9F1E7723E5
23AFF5E5DFFE2CC2"
8100 DATA 7829,"0DF7CD791CDFFE2C
CD2BEF6CD811CE1CD30252846E5CDD52D
DA40F92004FE1038023E5FE1E577CDA2
2DDA9F1E00CB78C29F1E002807792F4F
78294703E1E52323"
8110 DATA 7600,"712370CDD52DDA9F
1EF5CB7FC29F1EF12002ED44E1237723
2323F13CFE08389AC306F7CD8C1CCD30
25C0CDF12B78B12002CF090BED432EFC
ED5330FC21140022"
8120 DATA 7775,"32FC3E033236FCFAF
3237FCCD4CF8211EF8CD8D2C3002F620
4F7EA728D4B9201E235E23562A2EFC25
```




BASIC SOUND EXTENSION

*SOUND - 5,250,0

The pitch value given in *Sound is the initial pitch which is decreased down to 150 by the envelope. If an envelope is being repeated then the pitch commences from its initial value at the start of every recital of the envelope. There is nothing to stop noise being enveloped in a similar fashion, try:

*SOUND - 5, - 250,0

Note that when using enveloped noise the pitch is varied as though the negative sign in front of it didn't exist (although noise is produced), otherwise decreasing -250 by 100 would produce -350 instead of -150 which is what we're after. Enveloped noise is the basis of many of the sound effects to be found in games, especially those of the "space-war" genre. In order to produce a much smoother envelope the step length has to be drastically reduced. Redefine envelope 0 with:

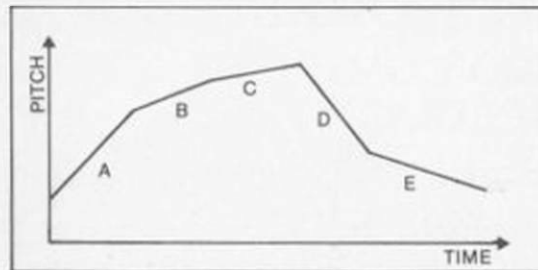
*ENV 0,100, - 2,1

If you try

*SOUND - 8,250,0

a greatly improved effect will be heard.

So far the envelopes that have been utilised are relatively simple in that they consist of only a single type of pitch change. In reality we may wish to use more complex envelopes such as:



The envelopes can be subdivided into five discernable different sections, A-E. We could define a separate envelope for each of A-E and play them together using a string of *Sound commands. This method, as well as being

unelegant and cumbersome, is further complicated because we need to calculate the value envelope A, say, leaves the pitch at when it terminates so that we know what to use as the starting pitch for envelope B. Thankfully the *Env command allows an envelope to be composed of up to eight individual sections. We could define the above envelope as follow:

*ENV 1,20, - 4,2,20, - 1,2,10, - 1,4,20,4,2, 20,2,2

Each of the five sections are 2/5th second in length, making the whole thing two seconds in duration. Try:

*SOUND - 1,300,1

As you can hear such an envelope provides a much more complex sound.

The Beep instruction was designed for playing music rather than making exposition sounds etc. However, life still isn't easy if you're converting music since all the note values have to be converted into the relevant numbers required by the somewhat awkward Beep. The *Play command enables music to be converted without the need for any number crunching. It has a string argument which is used to contain the notes you wish to play and other associated information. Any letter from A to G found is the string played as that particular musical note — so:

*PLAY "abcdefg"

plays all the seven notes available. Of course it would be extremely limiting if you only had seven notes to play with so there is a facility to change octave.

Although the program supports eight octaves

those at the extreme levels of pitch are of little use for musical purposes. In fact the upper few notes in the top octave will produce an error if you try to play them for the simple reason that the computer can't manage to produce such a high pitched sound. To change octave an O is simply put in the string followed by the new octave number — 1 to 8. all subsequent notes in that string are then played in the new octave. At the start of every new *Play the octave is reset to 3. To further increase the quantity of notes available sharps are also supported. A sharp note has a pitch slightly above — one semitone in fact; whatever that is — its ordinary value. To play a sharp note simply suffix the note with a hash character (#)

*PLAY "c#"

gives C sharp.

10 FOR a=1 TO 7

20 *PLAY "o"+STR\$ a+"cc# dd# eff# gg# aa# b"

30 NEXT a

This short program demonstrates the full scope of the notes available in the lower seven octaves. The O "directive" — or any other directive that needs an argument, you'll meet some more in a moment — must be followed by a number, no variables or expressions are allowed. You can, however, circumvent this difficulty by using STR\$ to construct the numerical part of the string — as in the above program — out of an expression, variable or whatever.

You can play noise instead of plain notes by

(continued on page 74)

```
EBDC18F83A2FFC3CE1C87CB5C8CD541F
D27B1B18CEE92323"
8130 DATA 8977."2318D63A54F83B54
F86142F96242F96342F96442F96542F9
6642F96742F9799BAF86EAAF86F9AF86C
D0F87089F8782CFA002A30FC7ECD6BF8
D02A30FC232230FC"
8140 DATA 9056."ED4B2EFC78B1CACC
F70BED432EFC18E4FE21D0FE10D8FE18
3FD823ED4B2EFC78B1CACC70BED432E
FC2230FC37C9CD00F947A7C82142052B
7CB520FB10F6C9CD"
8150 DATA 8578."00F9A7CA6C04FE09
D26C043236FCC9CD00F9FE02D26C0421
37FCC806B677C9CD00F9FE11307FFE10
200230FF322DFC2137FCCBC92A30FC
E52A2EFC85CD54F8"
8160 DATA 6969."C1E1FE2D20072230
FCED432EFC3CD00F9A728516F2600F1
FE2D20057DED446F252232FCC9CD54F8
CD1B2DDACCF7210000CD1B2D30292938
```

```
2C5D542938272938"
8170 DATA 7190."24193821D6305F16
00193819E52A2EFC7CB52006CD54F8E1
18D72B222EFC17CA720027DC9CF0AD6
633002C60787F52A32FC2234FC2A2EFC
7CB5203CCD54F8FE"
8180 DATA 7529."23200DF13CF52A2E
FC7CB52825CD54F8FE2E20242A34FC0CB
7CC2CF75D54CB2CCB1D192234FC2A2E
FC7CB52805CD54F8180621FFFF222EFC
F1076F2600110DFC"
8190 DATA 6722."195E2356EBCDB433
2A655C11FBFF193A36FCD6038677EF34
8043559F8001053435710338CD991EED
5B34FC2137FC3EFCB4E20033A2DFCCB
46280900792F4F78"
8200 DATA 7277."2F470308C365FACD
7A1CDFFE2C2011CD811CCD3025C8CD94
1EFC10D29F1E1806CD3025C83EFFF5CD
A22DDA9F1E08CB78C29F1E082807792F
4F782F4703C5CD55"
```

```
8210 DATA 7314."2D5F1600DA6C0428
04ED445F15C1F118B3CD00F9FE08D240
F9CD11F7191148FE197EA7C84723C5E5
4623C5E54E235ECB039FCB0B5779234E
2346CD65FAE12323"
8220 DATA 7511."2323C110E5E1C110
DDC9DD2137FCDDCB00BDDCB00B66FCB
7A280BDDCB00FE7A2F577B2F5F13CB78
200BDDCB00F6792F4F782F47037DDDA6
00173002CF09CB7D"
8230 DATA 8890."2039D5C57D0CD11F7
1138FC197EA723E5DDE1E1D12025473A
37FC173E0130017BF5C5D5E521000022
2BFCE1E5DDE5CDDAFADDE1E1D1C1F13D
20E6C969601874ED"
8240 DATA 7652."5329FCC5DD4600DD
5E01DD5602DD4E03C5D5E5591600CD4E
FBCD541FD27B1BE1D1D5CB7A20031918
0A7A2F577B2F5F13B7ED52DA40F91130
75ED5219D240F9D1"
8250 DATA 8423."C1D53A37FC17361D
```

```
E52A2BFC78060009473004E1E1E1C9ED
5B29FCB7ED521930F2222BFCED1D110A8
C1D5110400019D11091C97CB5C87A83
C8DDE5CDBEFB3A37"
8260 DATA 7807."FCCB772006CDB503
DDE1C9F33A485CE6380F0FF6084FD5
DDE1C93CC1DCB3CC1DCB3CC1DE5ED
5FCB77CB75F1600200ACB2319300E21
FFFF1809CB23ED52"
8270 DATA 6992."300321000023132B
7CB520FAE179EE104FD3FECB6720CFDD
7CDB5DD2B2007FB0DE1C9E5E5424B21
17110878B1032817EBDD2E102100007C
290FCB11CB103003"
8280 DATA 5837."19CE00DD2D20F14D
44DD2E18E1111E0019EB21000037CB11
CB1017ED6AED52300119DD2D20F0CB11
CB10792F5F782F5E1C96E0473047804
7D04820482048704"
8290 DATA 1108."8C04910496049B04
A004A504A50400000000000000000000
0000000000"
```

(continued from page 73)

utilising the n directive, n0 turns noise off while n1 switches it on. To hear the effect try the above program with n1 preceding the 0 in the string.

The pause (p) directive enables a silent gap, equivalent to a musical "rest" to be placed in a tune. The number following p is the length of the pause measured in 1/100ths of a second. The pause can be up to 2.55 seconds.

It is possible to modify the duration of each note using the L directive. The L is succeeded by a number between 1-255 representing the new length, in 1/100ths of a second, of each note. At the start of each new *Play command the note length is reset to 0.2 seconds. Dotted notes are also supported by the program. A dotted note is played for 1.5 times longer than an ordinary note. To make a dotted note simply put a full stop after the letter in much the same way as you would with a #.

*PLAY "L100c#."

plays c# for 1.5 seconds. If you require a dotted sharp note then the full stop should come after the #.

To add a little more interest to a tune it is possible to use an envelope. So far all the notes have kept the same tone value throughout their duration, like the sound produced by Beep. To turn envelopes on a Y directive is used. The number following the Y is the envelope you wish to use, or 16 to turn envelopes off. All subsequent notes are played using that envelope. By experimenting with a number of different envelope effects it is often possible to enhance the sound of a tune considerably from



its flat, unenveloped beginnings.

To summarise these are the directives available in a *Play string — actually, there is still one to come — I'll mention that one soon.

- A-G = The notes.
- # = If placed after a note will make it a sharp.
- . = If placed after a note will play it 1.5 times longer.
- On = Lets you play subsequent notes in octave n.
- Pn = Pauses for n 1/100ths of a second.
- Nn = If n = 0 then noise is turned off. If n = 1 then its switched on.
- Ln = Makes the duration of subsequent notes n 1/100ths of a second.
- Yn = Makes following notes to be played in envelope n (or normal if n = 16).

If a certain sequence of sound commands are always used together then they can be made into a single unit called an effect. An effect is a

construction of up to eight separate "sounds" strung together. Like envelopes, effects can be defined and stored in the Spectrum's memory for later, and repeated, use. You can have up to eight effects defined at any one time.

*EFFECT 0,1,100,200,16,100,150,16

This effect is equivalent to

*SOUND 100,200:*SOUND 100,150

The first value in an *Effect is the effect (0-7) and the next is the number of times the whole effect is to be repeated when used. Every block of three expressions from there onwards represents one of the maximum eight individual sounds that compose the effect. They are given in the same format as that expected by *Sound, i.e. length, pitch and then envelope number.

In an effect sequence it is mandatory to specify an envelope number, it cannot simply be left off. If no envelope is required then "16" should be specified. The only way to play an effect is by using the *Play command. An X directive, followed by an effect number, will sound the appropriate effect.

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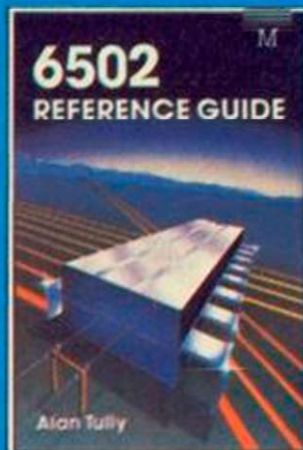
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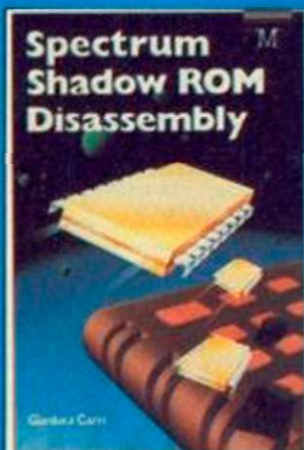
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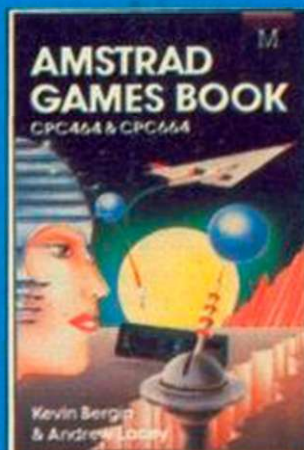
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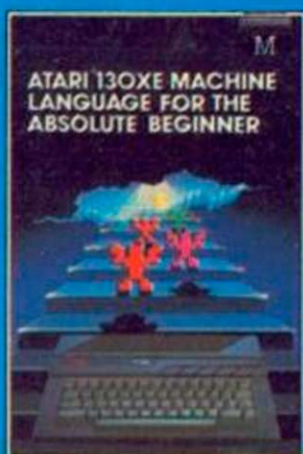
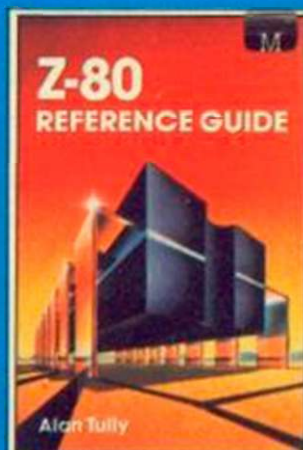
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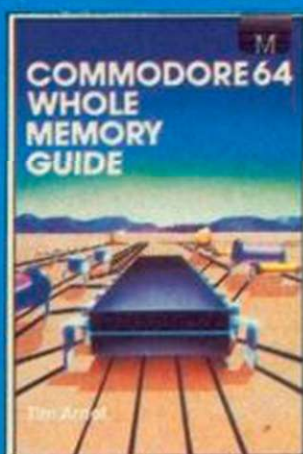
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WIZARDRY
THE MAP
BY SHILL/WELSH

GRAHAM GOOCH'S CRICKET

The following tip will allow owners of Graham Gooch's Test Cricket on the 64 to save teams.

1. Load and run the Select program, and enter the teams as normal.
2. At the end when the program exists to Basic, enter the following . . .
POKE43,0:POKE44,192:POKE45,40:POKE46,194:
POKE56,200:CLR:SAVE"TEAMS" (,8 if using disc)
3. When the teams have been saved, switch the 64 off and then on again to reset the pointers, and load the teams by entering the following . . .
LOAD"TEAMS",1,1 (or ,8,1 if using disc)

4. When the teams have loaded, enter New and then load the main game program.
D A Henry Smithson.

WIZARDRY

Rewind tape to beginning and type: Load (return) — First small bit will load. Poke 1011,248:Poke 1012,252 (return). Run (return). 'Nova' section will now load and '64' will reset. Poke 2969,0 (return).
Sys 2816 (return). The four slow sections will now load.
POKE 3216,255:POKE 50766,255 (return)
POKE 3264,234:POKE 3265,234 (return)
POKE 27214,234:POKE 50151,234 (return)
POKE 50152,234:POKE 50153,234 (return).

The above pokes will give you more energy and will stop most nasties from depleting your energy.
Sys 2970 (return). Start Game.
Jason Hattrell.

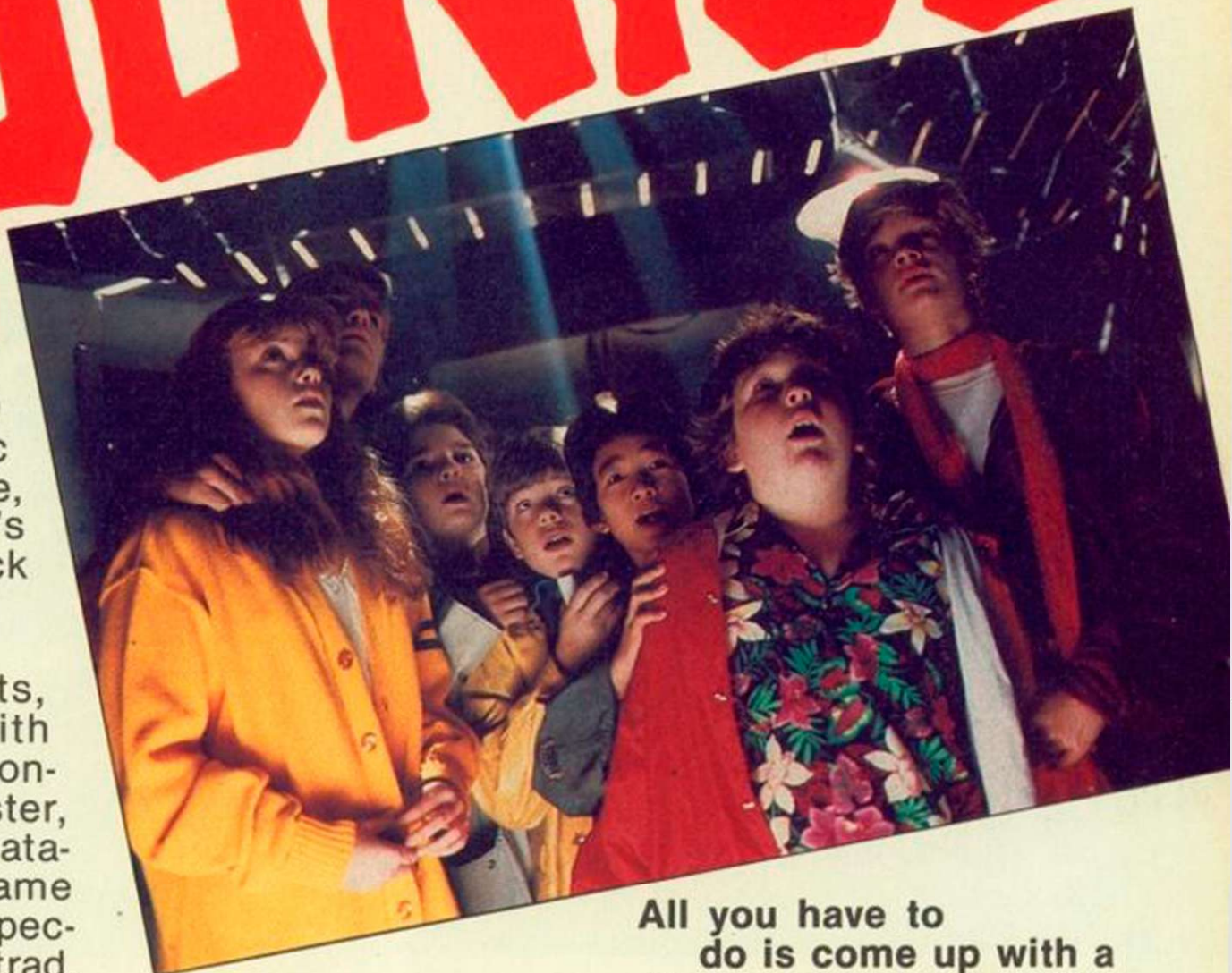
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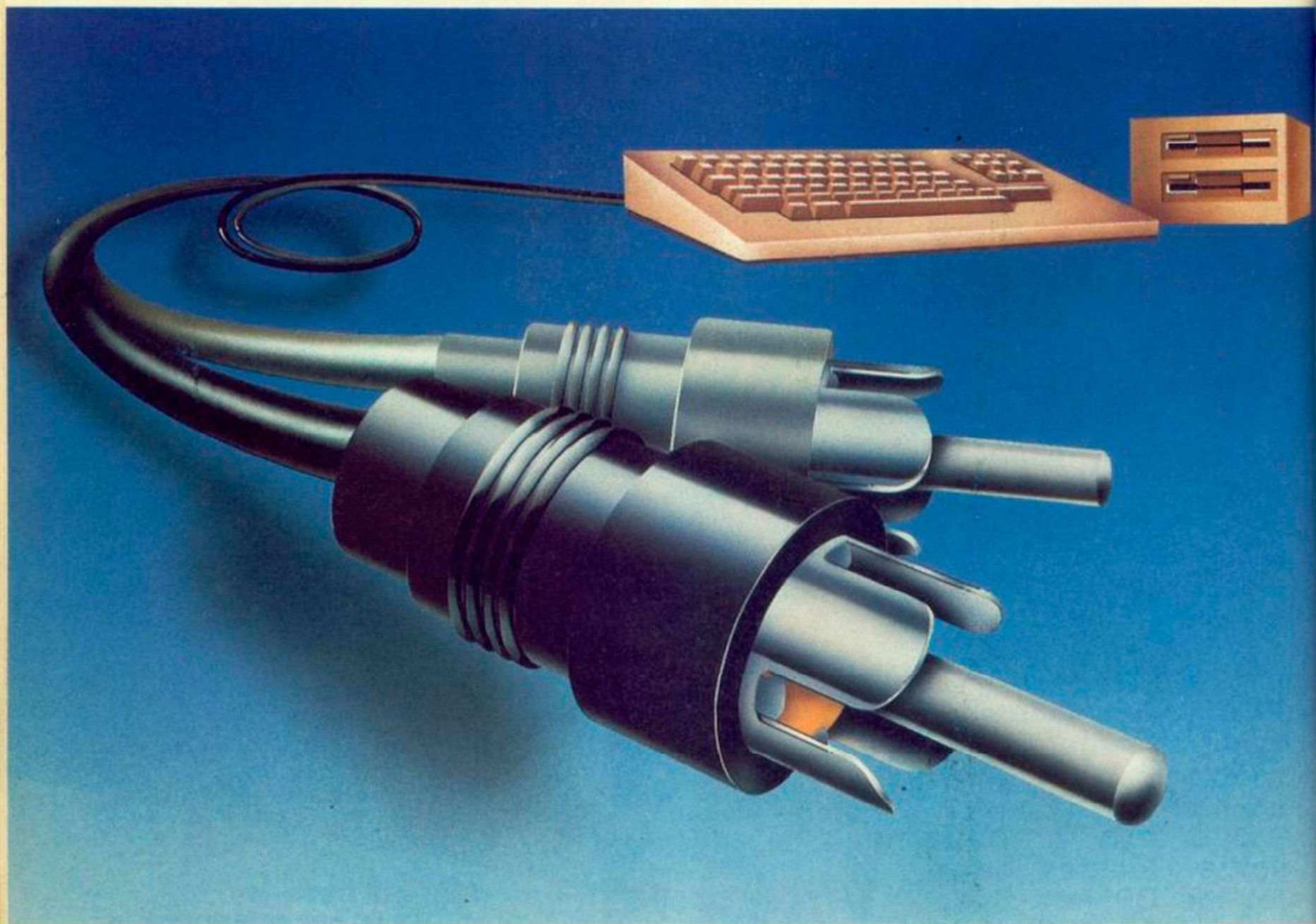
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PHILIPS



Basic Program.

```
1 REM MAIN ASTEROIDS BASIC
2 DIM h(8): DIM h$(8,15): LET
usr=20501: LET redef=30853
10 CLS : PRINT 'TAB 11;"ASTERO
IDS""TAB 5; BY I.M. COLLIER 8/8
5"
20 PRINT "'TAB 5:"Press P to
play game          or K to
redefine keys."
30 POKE 23658,8: PAUSE 150: LE
T 1$=INKEY$
40 IF 1$="K" THEN GO SUB 200:
GO TO 10
50 IF 1$="P" THEN GO TO 300
60 IF NOT h(1) THEN GO TO 30
70 CLS : PRINT "'TAB 10;"HIGH
SCORES""
80 FOR x=1 TO 8: IF h(x) THEN
PRINT TAB 5;"00000"(LEN STR$ h(x
) TO );h(x):" ";h$(x)
90 NEXT x: PAUSE 250: LET 1$=I
NKEY$
100 IF 1$="K" OR 1$="P" THEN GO
TO 40
110 GO TO 10
200 CLS : PRINT "'Press the ke
```

```
ys for:"": RANDOMIZE USR redef:
PAUSE 1: PAUSE 50: RETURN
300 CLS : PAUSE 50: RANDOMIZE U
SR usr: PAUSE 1: PAUSE 50
310 IF PEEK (usr-5) THEN GO TO
10
320 LET sc=PEEK (usr-4)+256*PEE
K (usr-3): IF sc*10>h(1) THEN PO
KE usr-2,PEEK (usr-4): POKE usr-
1,PEEK (usr-3)
330 IF sc*10<h(8) THEN GO TO 10
340 FOR x=1 TO 8: IF sc*10<h(x)
THEN NEXT x
350 FOR y=7 TO x STEP -1: LET h
$(y+1)=h$(y): LET h(y+1)=h(y): N
EXT y
360 CLS : PRINT "'TAB 7;"CONGRA
TULATIONS!"TAB 7;"YOU HAVE TOD
AY'S "'TAB 7;STR$ X AND X>1: ND
" AND X=2:"RD " AND X=3:"TH " A
ND X>3;"HIGHEST SCORE."
370 PRINT 'TAB 4;"PLEASE ENTER
YOUR NAME."
380 PRINT AT 10,7;"< _____
_____"
390 LET N$=""
```

```
400 PRINT AT 10,8;n$;"_" AND LE
N n$<15
410 PAUSE 0: LET 1$=INKEY$
420 IF 1$=CHR$ 12 AND n$<>" TH
EN LET n$=n$( TO LEN n$-1): BEEP
.005,34
430 IF 1$=CHR$ 13 THEN GO TO 46
0
431 LET 1$=(1$ AND CODE 1$<128)
+(" AND 1$=" STOP ")+" AND
1$="NOT ")+" AND 1$=" STEP ")
+(" AND 1$=" TO ")+" AND 1$
" THEN ")+" AND 1$=" AND ")
+(" AND 1$=" OR ")
440 IF 1$>CHR$ 31 AND 1$<CHR$ 1
27 AND LEN n$<15 THEN LET n$=n$+
1$: BEEP .005,34
450 GO TO 400
460 LET h(x)=sc*10: LET h$(x)=n
$
470 GO TO 70
500 BORDER 1: PAPER 0: INK 7: B
RIGHT 1: CLEAR 26920: LOAD "ASCO
DE"CODE : POKE 23675,42: POKE 23
676,108: POKE 23606,42: POKE 236
07,104: RUN
```

ASTEROID ATTACK is a program for the 16 or 48K Spectrum which is probably as close as the Spectrum allows to the arcade version. It has full rotation not limited by the scope of graphics characters; the ship is drawn onto the screen using sines and cosines. Thrusting provides the ship with frictionless motion up to a maximum speed of just less than that of a bullet.

The ship and bullets are moved to an accuracy of 1/128 of a pixel (stored — not on the screen). Obviously the sound cannot reach the high arcade standard, but I have created the best possible effects.

The machine code is created by the two high-speed data loaders. Type in the first Data Program and save a copy. Run the program and if lines 100 and 110 are correct, the machine code high-speed loader will be saved. If they are not correct, check and double check these

lines until they are. If this machine code is correct, the Save and Verify statements can be removed from line 70.

After line 110 has been slow-poked, the other lines will be fast-poked into place (see the difference?). If this does not take place, reload the program and check lines 100 and 110. Don't worry about the mess on the screen as the high-speed loader runs; this is the only place to store the code as yet. When all the errors have been corrected, the code will be saved. Save another copy of the program as well. New the machine and type in program 2. You needn't bother about the lines starting with Rem.

Run the program. If the fast-load code is not in place, it will be loaded before part 2 of the machine code is fast-poked into place. Again, correct all the errors and save the code. Also save the program. New the computer and type: CLEAR 26900:LOAD "ASCODE1"CODE

26922:LOAD "ASCODE2"CODE 29242
Play the tape on which you saved the two parts of code. The machine code is now set up. The graphics pointer can be set up by POKE 23675,42:POKE 23676,108 and the new character pointer by POKE 23606,42:POKE 23607,104
If you like you can test the code by RANDOMIZE USR 28501

Type in the main Basic program. The finished program can now be saved by CLEAR:SAVE "ASTEROIDS" LINE 500: SAVE "ASCODE"CODE 26922,4671
You will notice if you do the Pokes above that I have designed a new character set. The capitals and digits — also all brackets, string and hash — have been made slightly larger and closer to ordinary script. An advantage of this is that capital A looks like a ship and so is used to print the 'lives'. You can shorten the typing by removing this — omit the character pointer

Program 1.

```
1 REM DATA PROGRAM 1
2 DEF FN a(a$)=CODE a$-48-7*(
a$>"9")-32*(a$>"Z"): DEF FN h(a$
)=FN a(a$(1))*16+FN a(a$(2))
10 RESTORE : LET a=23296: FOR
x=100 TO 400 STEP 10
20 READ a$: LET t=VAL a$( TO 5
): LET a=a$(6 TO ): IF LEN a$/2
<>INT (LEN a$/2) THEN PRINT AT 1
6,0;"Length error in line ";x: S
TOP
30 IF x>110 THEN PRINT AT 16,0
;"Line ";x;" ";CHR$ USR 23296,a,
a$,t: LET a=a+LEN a$/2: GO TO 80
40 POKE a,FN h(a$): LET t=t-PE
EK a: LET a=a+1
50 LET a=a$(3 TO ): IF a$<>"
THEN GO TO 40
60 IF t THEN PRINT AT 16,0;"Er
ror in line ";x: STOP
70 PRINT AT 16,0;"Line ";x;" 0
K": IF x=110 THEN SAVE "hex"CODE
23296,144: VERIFY "hex"CODE : L
ET a=16384
80 NEXT x: PRINT AT 16,0;"All
OK - Saving part 1"
90 SAVE "ASCODE1"CODE 16384,23
20: VERIFY "ASCODE1"CODE
100 DATA "08740cd011ccda22ded43
905be7cd8c1ccdf12bed53925bcb38cb
19386578b7c21a37412100022945bc5
2a925b7ecbaf6d10fe0a3802d627fe10
30460707074f237e2322925bcbaf6d
10fe0a3802d627fe"
```

```
110 DATA "0607610302d812a905b77
2322905b5f16002a945b1922945bc110
becd811ccda22d2a945bb7ed427cb520
073e4fd7014b00c911895bafcd0a0ccf
08804552524f528d"
120 DATA "0142200000000000000000
00181818181800180024240000000000
0014161c361c341400081e281c0a3c08
0062640810264600001028102a443a00
00081000000000000008102020201008
0010080404040810"
130 DATA "01618000014083e081400
000008083e08080000000000080810
000000003e00000000000000181800
0000020408102000001824424242418
00182080808083e003c42023c40407e
003c42021c02423c"
140 DATA "0252300040c14247f0404
007e40407c02423c003c40407c42423c
007e020408102020003c42423c42423c
003c42423e02023c0000001000001000
0000100001010200004081020100804
0000003e003e0000"
150 DATA "042900020100804081020
003c420408000800003c4a565e403c00
00081414223e4141007c42427c42427c
003c42404040423c00784442424478
007e40407c40407e007e40407c404040
003c42404e42423c"
160 DATA "04119004242427e424242
003e08080808083e000202020202423c
00444850704844420040404040407e
0041635549414140041615149454341
001c22414141221c007c42427c404040
001c22414145221d"
170 DATA "03457007c42427c484442
```

```
003c42403c02423c00fe1010101010
004141414141221c0041412222141408
00414141495563410041221408142241
004122140808080007f02040810207f
003c20202020203c"
180 DATA "02379000402010080400
003c04040404043c0010385410101000
00000000000000ff001c227820207e00
000038043c443c000020203c22223c00
00001c2020201c00004043c44443c00
0000384478403c00"
190 DATA "02580000c101810101000
00003c44443c0438040407844444400
0010003010103800004000404042418
002028303028240000101010100c00
000068545454540000078444444400
0000384444443800"
200 DATA "02798000784444784040
00003c44443c040600001c2020202000
00003840380478000010381010100c00
0000444444443800000444428281000
0000445454542800000442810284400
0000444442040"
210 DATA "024460007c0810207c00
000c10102010100c000808080808000
003008080408083000324c0000000000
3c4299a1a199423c000000003600c90
101010082004200420042004200120c1
11220e1400080000"
220 DATA "06917000000003600ff0
1ff01ff83ffc3ffc3ffc3ffe7fff3fff
3f3e0e1c000800003800440820081c
10022002400280018001800180018201
8502488c3070000038007c00fe00ffc
1ffe3ffe7ffeffff"
230 DATA "08434fffffffffffffffff
```


(continued from previous page)

one hits you — and all crashes are screen-checked, so no gyms — you explode and, providing you have a life left, you will appear back on the screen when a box 100 by 80 pixels is clear of asteroids. If you think this box is too large or too small, you can alter its size (see Pokes Table). In a desperate situation, hyperspace takes you away from the path of converging asteroids and plants you in a random position on the screen. However, this may move you into the path of another asteroid — so use with caution.

Levels vary in difficulty, partly because more asteroids appear. There are also alien ships which career across the screen firing at you. It can split asteroids — you get the points — but this can be a hazard as more small asteroids are

created. If it crashes into an asteroid, it has a chance of being blown up — you don't get the points. There are two sizes of alien: slow large ones — these usually blow up on contact with anything — and faster small ones — these may not blow up on contact with an asteroid. The

The following pokes are available — normal contents are in brackets.

- 28510 Number of lives. (do not use more than 32. However if you use more than 6, the score will be printed on top of them.) (3)
- 28515 One less than the starting number of asteroids. If you poke this with an odd number, you will not be able to be killed. (2)
- 31099 Controls the generation of aliens. A higher number gives increased probability (11).

31116 Controls the type of aliens. A higher number means a greater proportion of large aliens. (15)

The following locations hold the parameters for the box which must be clear of asteroids before your ship is printed:

- 30773 Left x coordinate (78)
30777 Right x coordinate (178)
30784 Bottom y coordinate (48)
30788 Top y coordinate (128)

If you abort a game with a high score, your achievement will not be recognised. To change this, remove line 310 from the Basic program. If the program seems too daunting, I will supply a cassette of the completed game for £2.00 to: Ian Collier, 57 Wyndham Avenue, Bolton, BL3 4LG.

Program 2.

```
1 REM DATA PROGRAM 2
2 DEF FN a(a$)=CODE a$-48-7*(
a$>"9")-32*(a$>"Z"): DEF FN h(a$
)=FN a(a$(1))*16+FN a(a$(2))
3 IF PEEK 23296<>205 THEN PRI
NT "Loading hex code": LOAD "hex
CODE":CLS
10 RESTORE:LET a=16384:FOR
x=100 TO 390 STEP 10
20 READ a$:LET t=VAL a$( TO 5
):LET a=a$(6 TO ):IF LEN a$/2
<>INT (LEN a$/2) THEN PRINT AT 1
6,0;"Length error in line ";x: S
TOP
30 PRINT AT 16,0;"Line ";x;" "
;CHR$USR 23296,a,a$,t:LET a=a+
LEN a$/2
40 REM POKE a, FN h(a$):LET t=
t-PEEK a:LET a=a+1
50 REM LET a$=a$(3 TO ):IF a$
<>" " THEN GO TO 40
60 REM IF t THEN PRINT AT 16,0
;"Error in line ";x:STOP
70 REM PRINT AT 16,0;"Line ";x
;" OK"
80 NEXT x:PRINT AT 16,0;"All
OK - Saving part 2"
90 SAVE "ASCOD2"CODE 16384,23
51:VERIFY "ASCOD2"CODE
100 DATA "08052cb28cd3a6dc1dd7e
00a7203b3a41713d3241713c47878787
804f0600dde5d121090019edb0dde5d1
2a1a74a7ed52da0073280b1911f7ff19
221a74c30073210000221a74c30073dd
3500dd6606dd6e05"
110 DATA "08119788447feb0380afe
d83eb030023e50804779854fdd6608dd
6e07dd5e03dd5604cd9a070ccb7c200a
fe19380ed619046f1808fee73004c619
05677dcb7d200afe19380ed6190c6f18
08fee73004c6190d"
120 DATA "101726fdd7101dd7002dd
7503dd7404fdbc5796cd8d6ddd4e05dd
4606cb29cb28cd3a6d110900dd19c105
c22372cd1c74d9d1cd9f108f132915c
e1227d5cflcd1dled1fbc9321674d9
e50f0f3d28053cfe"
130 DATA "06598c03802d6306f2600
ed5b7b5c19eb2120003a1674fe022003
21080019eb4d44d921000022c973cdaa
22321774e5d9e1d906103a1674fe0220
020608c5d9e50a03083a1674d6022802
0a03d94f08471600"
140 DATA "101056ad91a13083a1674
d60228021a13d967085f3a1774a7280f
cb38cb19cb1acb3bcblccb1d3d20f1d9
7ed9a3a8c4c373d9cdcb737ed9a4a9c4
c373d9cdcb737ed9a5aac4c373d9c3d5
733e0132c973c900"
150 DATA "08779002c7de61fc07dd6
206fc9e1247ce60720187dc6206f3812
7cd60867fe50200a7dfec038052640d6
c06fd9c105c265733aca73a7280ffe10
280bfe08200b3a1674fe0220043ac973
a7e1d9c90004feca"
160 DATA "1040844713ad876a7cced
6e3ad876473a1874a7cc7779dd21697b
dd3500c5dd7e01dd4e02dd4603203fdd
360004fdbc57d6c5cdc275fdbc5796c1
```

```
dd7e01fe03d2cf79dd7e04814fdd7e05
8047feb0380afed8"
170 DATA "083333eb030023e508047
dd7102dd7003dd7e01c5cdc275c13a41
71a7282b2145715f7e913cfe10301878
23962b3cfe10daf7745778fe0f30087a
d650fe10daf7747b110900193d20d83a
4e6f1f38352ae56e"
180 DATA "098367d91c604fe163022
7894c604fe16380d5f78fe0f30147bd6
50fe16300ddd7e01fdcb5796cdle73c2
9076dd7e01fe03d45479c1110600dd19
05c23274c92b7e23a7caa974dd7e01e5
c5fdbc5796f5d5cd"
190 DATA "101131e73d12006f1c1e1
c3a974f1fdcb57d6c1c5cdc275cd8d77
21d77635060fcd7176c1e1dd7e012b36
00fe02382e21d87635dd7e01fe033804
af3218742ad976dde5d1a7ed52444d21
060019edb011faff"
200 DATA "07846dd192ad9761922d9
761887110500197ecfb2fcb2fdd86045f
3cdd7704237ecb2fcb2fdd860557cd60
76e60182dd7705dd7e013d28023e02dd
770121d876342ad9763604237723dd7e
0277dd7e03237723"
210 DATA "07787cd6076e6012f8377
cd6076e6012f8223772322d976c3e474
321674d9e50f0f3d28053cfe03802d6
306f2600ed5b7b5c19d9cdaa22321774
06103a1674fe0220020608c5e5d97e23
083a1674d6022802"
220 DATA "093557e23d94f085f1600
3a1774a7280947cb3bcbl9cblal0f8fd
cb575620127bae77cdcb7379ae77cdcb
737aae77c33b767b2fa677cdcb73792f
a677cdcb737a2fa677e1247ce6072018
7dc6206f38127cd6"
230 DATA "096560867fe50200a7dfe
c038052640d6c06fcl1090e1d9c9e5d5
ed5f6f260011697a197edleled4fc9e5
21697a7e230e085fe618f601d3fe1614
f5f11520fb7b0f0d20ed10e7e1c93eff
32d676324e6f2118"
240 DATA "08874747ea72002360221
1974cbfeed7bd476215827d921506f35
cdf677fbc0a773a506fa7280ecd1178
3e0a32d676324e6fc3796fed563e3eed
47c9116907360cb17be50605c53ae46e
864f234623e5cdf2"
250 DATA "105616d2ae56e78844779
854fcd8d6d13ae46e864f230634e5cd
206ee1c110d61c9fdbc57962e00cd67
6e0650cd7176fdbc57d62e01cd676e06
05214277c5fdbc5796cdcb760650cd71
76fdbc57d6cdcb76"
260 DATA "09837110f0019c110e5c9
3c32cc4432b4f650d48a50ace03c843a
2fc8462fb8fd4ad68c4aaadc3286382d
c4482dbcf144d88f44ad829883626c0
4a26c0ee3adc924aa4d7268a3420bc4c
20c4ec30e09450a0"
270 DATA "06575d6238cdd7e01110a
00a728151105003d280f110f003d2809
1119003d28031132002a516f1922516f
0606fdbc57962a516fcdce7706142a53
6fed5b516fa7ed52193001eb3e16d7af
d778d71e3001f0d8"
280 DATA "09865cd2a190118fccd2a
19019cfcdd2a1901f6fcd2a197dcdef
```

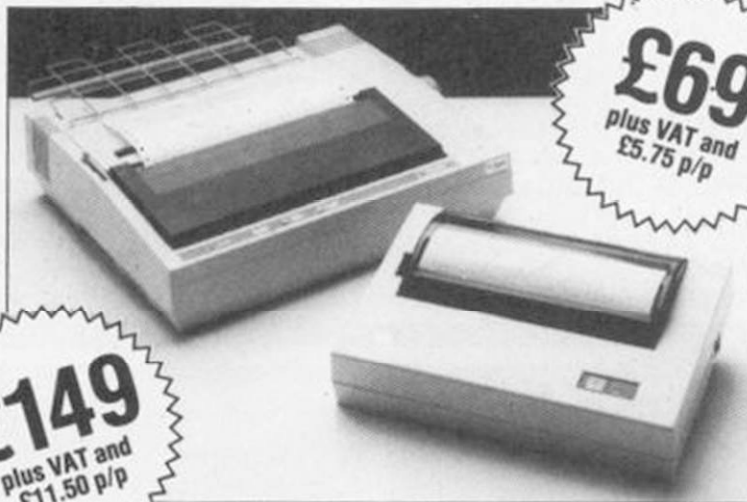
```
157bd7c93e16d7afd7afd7fdcb57963a
506fa72806473e41d710fb3e20d7c93a
d876a7c8fb473eff32d6762118747ea7
2002360223cbfecdd"
290 DATA "103807e78c8dd21697bdd
7e02fe4e380ffeb2300bdd7e03fe3038
04fe8038ca110600dd1910e33e1032d6
76211974cbbe2b7efe04d03600c93efe
dbfecb5737c0a7c93efedbfecb5f37c0
a7c93edfdbc5796c47"
300 DATA "0866537c0a7c93e7fdbfe
cb47c921df780606c5e511eb78783dcd
0a0caf32085c763a085ca728f9d706fe
78dbfe0e051f30120d20facb0038f13e
08d73e20d73e08d718d8e15e235623e5
eb70110400193e05"
310 DATA "0754591878787c6477721
6400116400c0b503e1c110acc961786b
7875780870e46f7f78800d41626f7274
2020202020ba0d487970657273706163
65ba0d46697265202020202020ba0d54
6872757374202020"
320 DATA "0880820ba0d5269676874
2020202020ba4c656674202020202020
bac5cd1e73c1c8dd7e01fdcb57d6cdc2
75060acd7176fdbc5796e1af321874c3
37752a1a747cb5e83a4e6f1fd8235e23
562ae56e7c92c603"
330 DATA "09150fe06d07b95c603fe
06d0c390763a4f6fc60b57cd6076bad0
4fcd6076bad081bad0fe0f3e04de0021
d876342ad9763601237723360123cd60
76e67fc6147723360323cd6076e60187
3d478780772322d9"
340 DATA "08931763ad87647210000
221a743eff321874af321974c92a1a74
7cb5202ec5c5cd607632687ac604f06
1ccdf26de17cd60880677dc608816f22
667adde5cdc770f3dde12a42712b221a
74c13a1974cb7f20"
350 DATA "077602f6717179f873c84
fe402001aff0e520023e4a321974e61f
87878787c6966f2600cb14c5dde51104
00c0db503f3dde1c121657a35200a361e
3a1874ee013218743e06dd9601dd7700
79c6034f3a18741f"
360 DATA "09662300578dd86054778
c363741de57bb9394152ab1025a913d
bec1db0cad863776553c79b6c9a9d09
acef66ad101c205e3452e9276bcff2b
388b6d14c4f173a5df93c24d050f3a0
4058218f6aaacbe8"
370 DATA "09641ae4beab2bce45942
3a4d9222bbd18e5c0008c5e2e0579829
caa6dfe253e76437b7ca8a244c3a747
511b18falff0831907b7b5017ba1fb3b
b99e23ab32e6e5c68c138505ec122e36
26315faf280dd717"
380 DATA "10634f5e34c72ffed7a86
99f7cccd960403cd6ee8879117e64a4
7f3f378482c9872f55d3544e5dd948d5
8db660fc95f849bd0e8946f24590b4bf
62061681679f8a331a30dc0f3561ebb0
6f7097f95bc81e6e"
390 DATA "043770b692dbae7dd809c
d27d6856f4c239742ca3e1751df6b841
4f4aced4de71b3"
```

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Creating Arcade Games on the Commodore 64 by Robert Woolford (ISBN 0 907563 75 9) is £7.95, and is available at most book and computer stores, or directly from the publishers, post free: *

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Interface

Listing 1.

```

100 P=52992:T=18680
110 FORX=PTOP+153:READB:T=T-B:PO
KEX,B:NEXT
120 IFTHEMPRINT"CHECKSUM ERROR:
"-T:STOP
130 R1=INT((P+128)/256):R0=P+128
-R1*256
140 POKEP+1,R0:POKEP+2,R1:POKEP+
6,R0:POKEP+7,R1
150 R1=INT((P+138)/256):R0=P+138
-R1*256
160 POKEP+72,R0:POKEP+73,R1:POKE
P+123,R0:POKEP+124,R1
200 DATA 32,128,207,132, 2, 32,
128,207
210 DATA192, 50,176,125,169, 79,

```

```

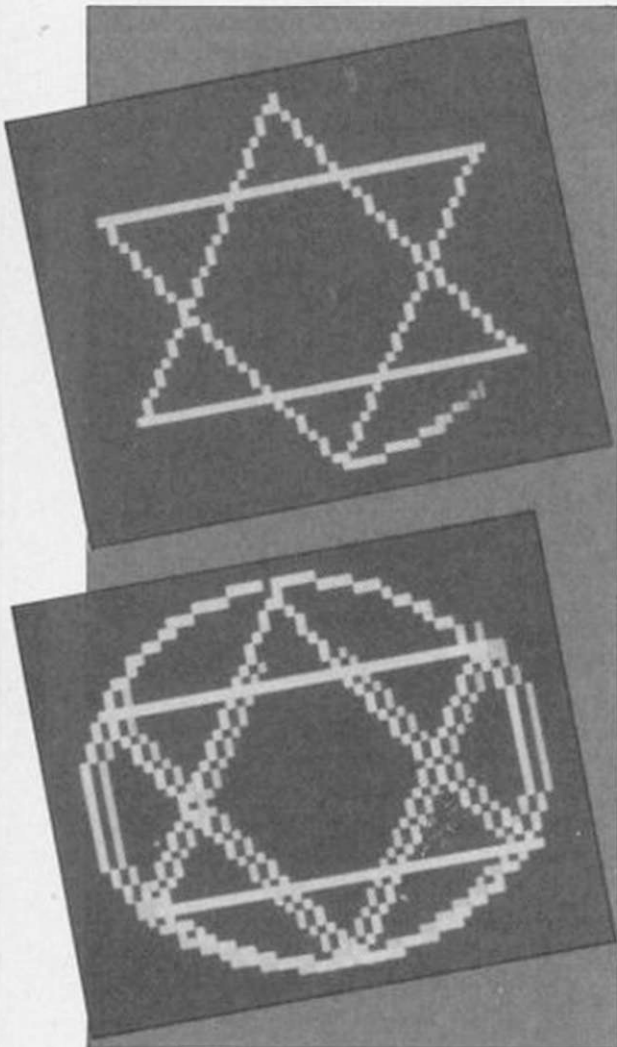
197, 2
220 DATA144,119,152,162, 0,134,
252, 74
230 DATA 8, 10, 10, 10,133,251,
10, 38
240 DATA252, 10, 38,252, 24,101,
251,144
250 DATA 2,230,252, 70, 2, 8,
164, 2
260 DATA133,251,133,253,165,252,
72, 24
270 DATA109,136, 2,133,252,104,
24,105
280 DATA216,133,254,177,251,162,
0,221
290 DATA138,207,240, 7,232,224,
16,144
300 DATA246,162, 0,169, 1, 40,

```

```

144, 1
310 DATA 10, 40,144, 2, 10, 10,
134, 2
320 DATA174, 52, 3,240, 11,202,
240, 4
330 DATA 69, 2,144, 8, 5, 2,
144, 4
340 DATA 73,255, 37, 2,170,173,
134, 2
350 DATA145,253,189,138,207,145,
251, 96,
360 DATA 32,253,174, 32,138,173,
32,247
370 DATA183, 96, 32,126,124,226,
123, 97
380 DATA255,236,108,127,225,251,
98,252
390 DATA254,160

```



ALTHOUGH THERE are many clever and complicated graphics utilities available for the 64 I have not come across one that allows the use of a simple "plot" facility without the bother of going into bit-map mode. Double density plotting is a method that can be used to do this and Blocks is a short and simple machine code routine that will allow double density plotting.

It utilises the fact that within the Commodore 64's built in character set are a range of block characters — quarter squares and a half squares, so that in conjunction with reverse video it is possible to display all the 16 variations of quarter squares within one character position. To put it another way, these characters can effectively double the resolution of the screen from 40 by 25 to 80 by 50.

Usual restrictions apply

Of course they are only blocks and the usual colour restrictions of the 64's display apply, but they can be very useful and because they do not need bit-map mode to be used, they can mixed freely with text on a normal screen from Basic.

The machine code routine is quite short — just over 150 bytes — and is intended to be located at 52992 (hex CF00) which is the top page of the much used 4K block of Ram from 49152 upwards. However, by changing just eight bytes you could relocate it anywhere in Ram, in the cassette buffer, for example. Listing 1 does this for you.

Listing 1 is a Basic loader program which will install the machine code routine in memory, in addition should you wish to relocate the routine then the Basic program will do this for you — simply change the value of P in the first line. The loader can very easily be made part of another program.

Once the routine is in memory it can be called from Basic by a Sys command in the following format:

```
SYS P,X,Y
```

Where P is the start address of the routine — 52992 as listed — X is the x co-ordinate (0-79) and Y is the y co-ordinate (0-49). X and Y may be any valid Basic expressions, any values out of the ranges shown will be ignored.

The only other information required by the routine is the type of plot that you want it do. This is controlled by the contents of location 820 in the following way: a zero will cause unplotting, a one — plotting and anything else will cause Exclusive-or plotting — to change whatever is there already. Any plotting will be done in the current cursor colour so changing the cursor colour will change plot colour.

Listing 2 is a demonstration program which will plot a few things using the Blocks routine and listing 3 is a version of biorhythms which uses Blocks to plot the charts. The biorhythms program accepts date in the format 1.1.85, any reasonable character may be used to separate the numbers and an asterisk will end the program.

Listing 3.

```

1 POKE53280,0:POKE53281,0:GOSUB2
000
10 PRINT"WHAT DATE WOULD YOU
20 PRINT"LIKE TO HAVE YOUR -
"1 2 3 4 5 6 7 8 9 10 11 12"SPC(26)
30 PRINT"WHAT IS YOUR NAME "
40 PRINT"WHAT IS YOUR DATE OF
BIRTH "
50 GOSUB1000:DS=LS:IFDS=""THEN11
55 IFLS=""THEN10
60 D=INT(VAL(LS)):LS=MIDS(LS,LEN
(STRS(D))+1)
70 M=INT(VAL(LS)):LS=MIDS(LS,LEN
(STRS(M))+1)
80 Y=INT(VAL(LS)):IFY<100THENY=Y
+1900
100 IFM>13THENIFD>12ANDD<=(
L(M)-FNL(Y))THEN120
110 PRINTTAB(27)
120 SX=ASC(MIDS(ES,D))-65
130 PRINT"NAME:"NS:PRINT"OR
N ON "D"SS(SX)" MS(M)" IN"Y
140 Z=FNM(M-D)Z(M):ZS=ZS(Z):I
FD=Z(M)THENZS=ZS+ZS(FNM(M+1)

```

```

)" CUSP"
150 PRINT"ODIAC SIGN: "ZS:GOT
0200
200 PRINT"WHAT DATE WOULD YOU
LIKE TO HAVE YOUR -
210 PRINT"BIORHYTHMS CALCULATED
FOR "MX=10
220 GOSUB1000:DDS=LS:IFLS=""THEN
310
225 IFLS=""THEN10
230 DD=INT(VAL(LS)):LS=MIDS(LS,L
EN(STRS(DD))+1)
240 MM=INT(VAL(LS)):LS=MIDS(LS,L
EN(STRS(MM))+1)
250 YY=INT(VAL(LS)):IFY<100THEN
YY=YY+1900
300 IFMM>13THENIFDD>12ANDD<=(
L(MM)-FNL(YY))THEN320
310 PRINTSPC(27)
320 IFYY<YTHEN310
330 IFYY=YANDMM<MTHEN310
340 IFYY=YANDMM=MANDD<DTHEN310
400 PRINT"THE MOMENT PLEASE...
410 N=(YY-Y)*365-D+DD+(M*2)ANDF
NL(Y)+(MM*3)ANDFNL(YY)
420 FORX=YTOYY:N=N-FNL(X):NEXT
430 IFM>1THENFORX=1TOM-1:N=N-L(X
):NEXT
440 IFMM>1THENFORX=1TOMM-1:N=N+L
(X):NEXT

```

```

450 IFM<36500THEN500
460 PRINT"DDS", THAT"S"MM"
DAYS OLD ???
470 PRINT"WHO DO YOU THINK YO
U ARE - "ETER JAN ?
480 PRINTTAB(14)"TRY AGAIN
490 GOTO200
500 SX=ASC(MIDS(ES,DD))-65
510 PRINT"NAME:"NS:PRINT"IN
"DD"SS(SX)" MS(MM)" IN"YY
520 PRINT"YOU WILL BE"MM"DAYS OL
D."
530 PRINT"YOUR BIORYTHMS WILL
BE SHOWN AS FOLLOWS-
540 PRINT"RED ::SHOWING Y
OUR PHYSICAL CYCLE,
550 PRINT"GREEN ::FOR YOUR
EMOTIONAL CYCLE AND
560 PRINT"BLUE ::YOUR INTE
LLECTUAL CYCLE.
570 PRINT"HE CHARTS SHOW 2 WE
EKS BOTH BEFORE ANDAFTER THE DA
TE SHOWN.
580 PRINT"RESS "
WHEN YOU ARE READY...
590 GETKS:IFKS<>CHRS(13)THEN590
600 PRINT"NSTAB(19)+"TAB(22)
M"DAYS OLD
610 PRINT"BORN ON "DSTAB(23)ON
"DDS
620 PRINT"FORX=1T023:PRINTTAB

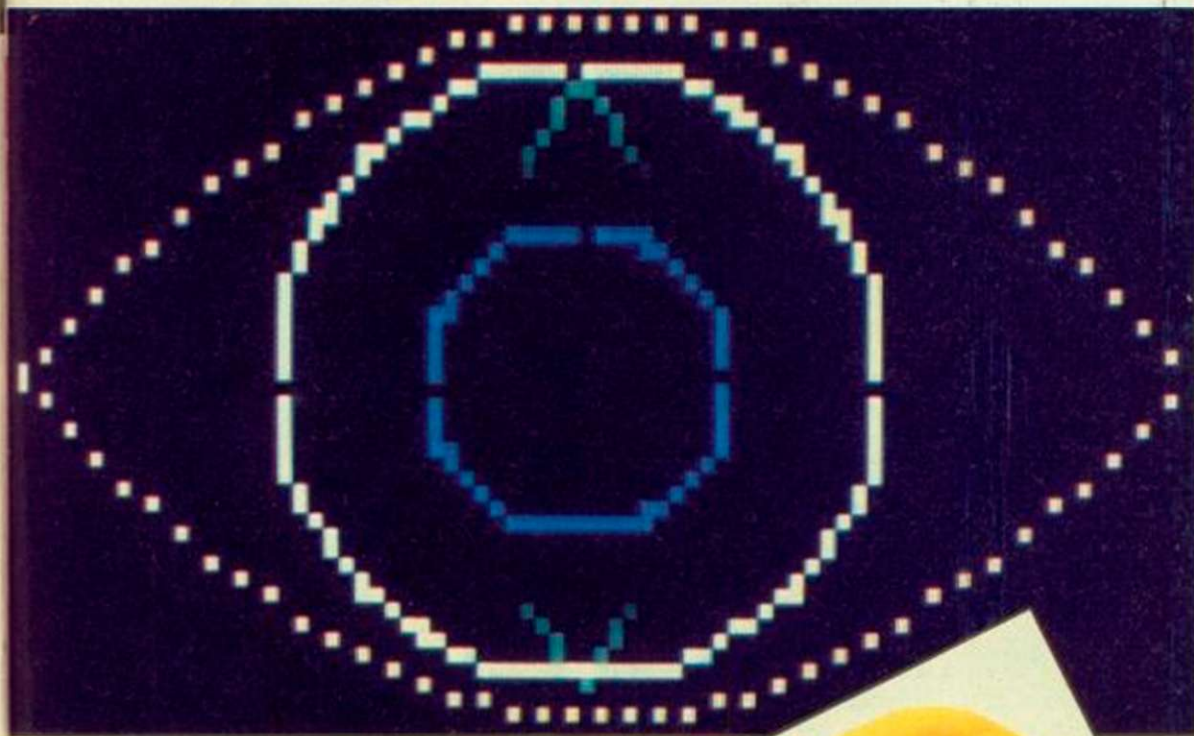
```

```

(19)"I":NEXT
630 PRINT" (1 DAY/DIVISION)
640 PRINT"
650 PRINT"
700 PRINT"POKE820,1
710 FORG=0T02:PRINT" MIDS("
",G+1,1)" MIDS(" ",G+1,1)"
720 M=M(G):FORX=0T077:MM=N+X/2-1
9.5
730 SYSPLOTT,X,25-20*SIN(MM/4*2*
):NEXT:NEXT
740 PRINTTAB(24)"RESS "
750 PRINTTAB(27)"TO EXIT...
780 POKE198,
790 GETKS:IFKS<>CHRS(13)THEN790
850 PRINT" -0 Y0
U WANT ANOTHER GO ? "MX=3:GOS
UB1000
860 IFLS<(LS,1)="N"THENPRINT"
":END
870 IFLS<(LS,1)="Y"ORLS="OK"OR
LS=""THEN10
880 GOTO850
1000 PRINT" :LS=""
1010 GETKS:IFKS=""ORKS=CHRS(34)T
HEN1010
1020 IFKS=CHRS(13)THENPRINT" "

```

DOUBLE DENSITY BLOCKS



Keith Suddick simplifies the extensive but complex graphics facilities of the CBM-64 using block characters with a short and simple machine-code routine.



Listing 2:

```

10 REM DOUBLE DENSITY EXAMPLES
15 REM FOR % READ PI
20 PRINT "L":POKE53280,0:POKE5328
  1,0
30 P=52992:XX=80:YY=50:MX=79:MY=
  49:X2=40:Y2=25
40 POKE820,1:REM PLOT
100 C$="":FORZ=0T020STEP4
110 PRINTLEFT$(C$,1);:C$=MID$(C$
  ,2)
120 FORX=ZTOMX-Z:SYSP,X,Z:SYSP,M
  X-X,MY-Z:NEXT
130 FORY=ZTOMY-Z:SYSP,Z,Y:SYSP,M
  X-Z,MY-Y:NEXT
140 NEXT
150 FORX=0T0100:POKE199,XAND1
160 PRINT"#####"TAB(13)
  "DOUBLE DENSITY"
170 NEXT
180 FORD=1T0500:NEXT
200 PRINT"#####";:A=23:D$="S"
210 FORX=1T024:D$=D$+"J"+CHR$(20
  )+CHR$(13):NEXT:D$=D$+"J"+CHR$(2
  0)+"S"
220 FORX=0T0159
230 SYSP,X/2,Y2+A*SIN(X*A/X2)
240 SYSP,X/2,Y2-A*SIN(X*A/X2)
250 NEXT:PRINT"#####";
260 FORX=0T079:PRINTD$
270 SYSP,79,Y2+A*SIN(X*A/X2)
280 SYSP,79,Y2-A*SIN(X*A/X2)
290 NEXT
300 PRINT"#####";:FORA=20T010STEP-10
310 FORX=0T02*A*STEP*/(A*3)
320 SYSP,X2+A*SIN(X),Y2+A*COS(X)
330 NEXT:PRINT"#####";:NEXT
340 FORD=1T0700:NEXT
400 PRINT"#####";:A=1.5
410 FORY=0T031
420 SYSP,40-Y/A,Y+5:SYSP,40+Y/A,
  Y+5
430 SYSP,40-Y/A,45-Y:SYSP,40+Y/A
  ,45-Y
440 NEXT
450 FORX=19T061
460 SYSP,X,36:SYSP,X,14
470 NEXT
500 A=24
510 FORX=0T02*A*STEP*/72
520 SYSP,X2+A*SIN(X),Y2+A*COS(X)
  *.85
530 NEXT
600 FORX=1T040:PRINTD$:FORD=1T05
  0:NEXT:NEXT
  
```

```

RETURN
1030 IFK$="S"ORR$="L"THEN1090
1040 IFK$=CHR$(20)ORR$="J"THEN10
  70
1050 IFLEN(L$)=MXOR(ASC(K$)AND12
  7)<32THEN1010
1055 IFK$=" "THENR$=" "
1060 L$=L$+K$:PRINTK$;" ";:GOT
  01010
1070 IFL$=""THEN1010
1080 L$=LEFT$(L$,LEN(L$)-1):PRIN
  TCHR$(20);:GOTO1010
1090 K$=CHR$(20):IFL$=""THEN1010

1100 FORDL=1TOLEN(L$):PRINTK$;:M
  EXT:L$="":GOTO1010
2000 DIMM$(12),L(12),Z(12),Z$(12
  ),B(15)
2020 FORX=1T012:READM$,L(X),Z$,Z
  (X)
2030 M$(X)=CHR$(ASC(M$)+128)+MID
  $(M$,2):Z$(X)=CHR$(ASC(Z$)+128)+
  MID$(Z$,2)
2040 NEXT
2050 DEFFNM(X)=X+12*(X/12)
2060 S$(0)="ST":S$(1)="ND":S$(2)
  ="RD":S$(3)="TH"
2070 DEFFNL(X)=((X-1900)AND3)=.
  2080 DEFFNM(X)=X+12*(X/12)
2090 W(0)=23:W(1)=28:W(2)=33:T=2
  :FT=40:U=1:SS=1024:CS=55296:CC=6
  
```

```

46:PLOT=52992
2200 FORX=0T07:READC(X):V(C(X))=
  X:NEXT
2300 FORX=0T0153:READB:POKEPLOT+
  X,B:NEXT
2400 E$="ABCDEFGHIJKLMNPOQRSTUVWXYZ
  ABC
  DDDDDDDA"
3000 PRINT"#####"TAB(13)
3010 PRINT"#####";:SPC(2
  6)"#####";:SPC(26)#####

3020 PRINT"#####";:WITHIN THE HUM
  AN BODY, VARIOUS
3030 PRINT"#####";:CHARACTERISTICS
  ARE KNOWN TO
3040 PRINT"#####";:VARY IN A REGUL
  AR MANNER OVER
3050 PRINT"#####";:PERIODS OF TIME.

3060 PRINT"#####";:THESE CHARACTE
  RISTICS CAN BE
3070 PRINT"#####";:THOUGHT OF AS RE
  PRESENTING THE
3080 PRINT"#####";:LEVELS OF PHYSIC
  AL, EMOTIONAL
3090 PRINT"#####";:AND INTELLECTUAL
  ACTIVITY AND
3100 PRINT"#####";:ALTHOUGH NEVER
  EXACTLY RIGHT,
3110 PRINT"#####";:THEY CAN BE CALC
  ULATED FOR ANY
  
```

```

3120 PRINT"#####";:PERSON AT ANY TI
  ME.
3130 PRINT"#####";:THIS PROGRAM WI
  LL CALCULATE A
3140 PRINT"#####";:SET OF THESE "L
  _ _ _ _ _" GIVEN
3150 PRINT"#####";:YOUR DATE OF BIR
  TH.
3230 PRINT"#####";:PRESS [ ] _ _ _ /
  _ _ _ TO BEGIN...
3900 GETK$:IFK$(C)CHR$(13)THEN390
  0
3999 RETURN
9000 DATAJANUARY,31,CAPRICORN,20
  ,FEBRUARY,28,AQUARIUS,19
9010 DATAMARCH,31,PISCES,20,APRI
  L,30,ARIES,20
9020 DATAMAY,31,TAURUS,20,JUNE,3
  0,GEMINI,21
9030 DATAJULY,31,CANCER,23,AUGUS
  T,31,LEO,23
9040 DATASEPTEMBER,30,VIRGO,23,0
  CTOBER,31,LIBRA,23
9050 DATANOVEMBER,30,SCORPIO,22,
  DECEMBER,31,SAGITTARIUS,21
9100 DATA0,6,2,4,5,3,7,1
9200 DATA32,128,207,132,2,32,128
  ,207
9210 DATA192,50,176,125,169,79,1
  97,2
9220 DATA144,119,152,162,0,134,2
  
```

```

52,74
9230 DATA8,10,10,10,133,251,10,3
  8
9240 DATA252,10,38,252,24,101,25
  1,144
9250 DATA2,230,252,70,2,8,164,2
  2
9260 DATA133,251,133,253,165,252
  ,72,24
9270 DATA109,136,2,133,252,104,2
  4,105
9280 DATA216,133,254,177,251,162
  ,0,221
9290 DATA138,207,240,7,232,224,1
  6,144
9300 DATA246,162,0,169,1,40,144,
  1
9310 DATA10,40,144,2,10,10,134,2
  2
9320 DATA174,52,3,240,11,202,240
  ,4
9330 DATA69,2,144,0,5,2,144,4
  2
9340 DATA73,255,37,2,170,173,134
  ,2
9350 DATA145,253,189,138,207,145
  ,251,96
9360 DATA32,253,174,32,138,173,3
  2,247
9370 DATA183,96,32,126,124,226,1
  23,97
9380 DATA255,236,100,127,225,251
  ,90,252,254,160
  
```

SPECTRUM



THIS IS A complex draw program for the ZX Spectrum with many advanced facilities usually found only on expensive commercial packages. These include a fill routine that can handle even the most complicated shapes, patterned fill, filled-in and empty circles, solid and dotted lines, variable cursor speed, screen magnify — magnifications — and two screen stores.

To enter the program, you should first type in the control program — listing 1 — and save it to tape or Microdrive with auto-run Line 500. You should make no changes to the program, except to the Load command in line 500 if you wish to use the program on Microdrive, as memory is tight and line numbers are important. If you do not have Microdrives, then you will be unable to enter the Microdrive Save/Load lines, so type in lines 200 and 201 again in place of lines 202 and 203.

Next:

```
CLEAR 24999
```

and type in the hexloader. If you are going to use your own hexloader, then you will have to enter the Pokes and Save command at the end of the program — line 80 — yourself after you have typed the hex in. Enter the hex from the listing, eight bytes at a time with no separating spaces, entering the checksums when prompted.

When you have finished the program will automatically save the code to tape. If you want to save it to Microdrive, you must New the hexloader first, as otherwise there will not be enough memory for the "m" channel. It is best to start off by saving everything to tape, then

transfer to Microdrive later.

```
To test the program, first type:
PRINT USR 0
```

to clear the computer, then Load the control program. This will automatically Load the code and print up a menu on screen. If this does not happen, press 0 then r. If you get a menu now, then you must have forgotten to enter the Pokes at the end of the hexloader. If you do not, then you have made an error in typing in the code.

The menu has six options, numbered 0-5. Option 0 allows you to use the drawing program, option 5 will quit the program and return to Basic, and the others will bring up a sub-menu asking what you want to save or load.

When you press 0 you should be presented with a blank screen, except for a small information window in one corner. Assuming that there was nothing in memory before you loaded the program, the screen attributes will be set to 0, so you will be unable to see your cursor. Press Caps Shift V, then select option 3 from the Clear Screen menu.

How to use the program

I will now explain how to use the program. The first thing you will need to know is how to move the cursor. The keys Q, W, E, A, D, Z, X and C are the cursor control keys — these will be familiar to users of Melbourne Draw. When used in conjunction with Symbol Shift, these keys will scroll the screen, and with Caps Shift they can be used to move the magnification window — more of which later.

The cursor can be used in any one of the four plot modes, Set — plots point, Res — resets point-equivalent to Inverse 1, XOR — inverts pixels-equivalent to Over 1 and Skip — allows you to move the cursor without plotting. These modes are selected by the keys P, O, I and U respectively.

To change the colours on the screen you must change from the pixel cursor — indicated by SCRN in the information window — to the attributes cursor — ATTR. The L key will switch between the two cursors. The attribute cursor behaves exactly like the pixel cursor, except that it is character-sized. In Set mode,



it will draw with the ink, paper, bright and flash values indicated at the bottom of the information window. These can be altered using the number keys. Keys 0-7 will change the ink — unshifted — or paper — with Caps Shift — colour, keys 8 and 9 will change the bright — unshifted — and flash — with Caps Shift — values.

Note also that, when using the attribute cursor, Symbol Shift with the movement keys will scroll the attributes. It is important to remember, with both pixel and attribute cursors, that the point underneath the cursor is not plotted until you move the cursor from it. If you wish to plot/change the attributes at the cursor position, press Enter — this will plot in the current mode, so obviously will have no effect in Skip mode. Finally, on this subject, if you wish to speed up or slow down the cursor, you can use Symbol Shift together with the number keys to select a speed. There are nine speeds (1-9) and also a special "no repeat" mode (0).

For the line and circle drawing routines, you have to specify two points — these will be the two ends of the line, or of a radius of the circle. To set one end of the line, or the centre of the circle, press Caps Shift and Enter. This defines the cursor position as the "last point". Next, move the cursor to the other end of the line, or a point on the circumference of the circle.

See "last point" flashing

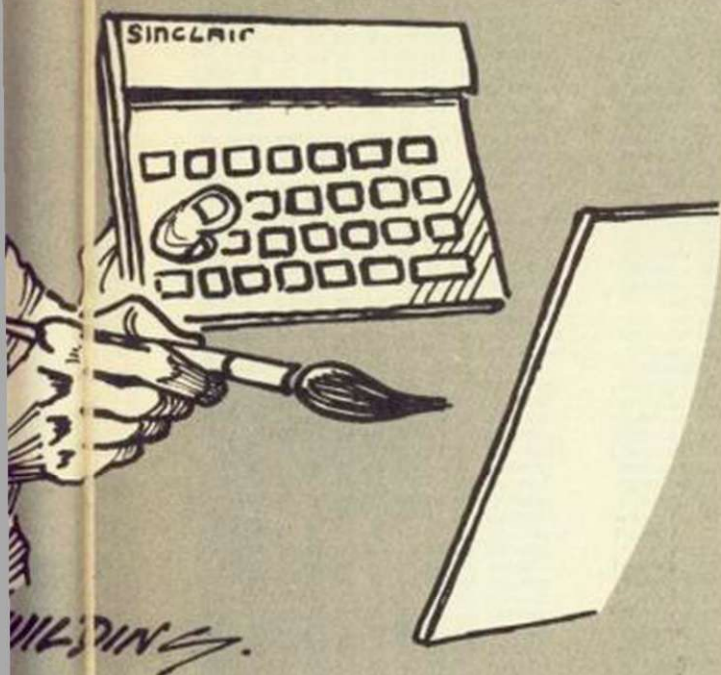
If you press Symbol Shift and Enter together, and hold them down, you will see the "last point" flashing. This can be useful when you wish to remind yourself of its position. To draw a line — select the appropriate mode first — it is pointless drawing a line in Skip mode! — press Caps Shift and J. To draw a circle, press Caps Shift and H. Symbol Shift and H will draw a filled circle, Symbol Shift and J gives a dotted line. To change the mask for the dotted line, press Caps Shift and K — the mask is initially set to 10101010.

It is important when drawing a picture in colour to be able to see the positions of the edges of character squares, so as to avoid "attribute clashes". To help you do so, the program can superimpose one of two grids over the screen. Press G for a black-on-white grid, or Caps Shift

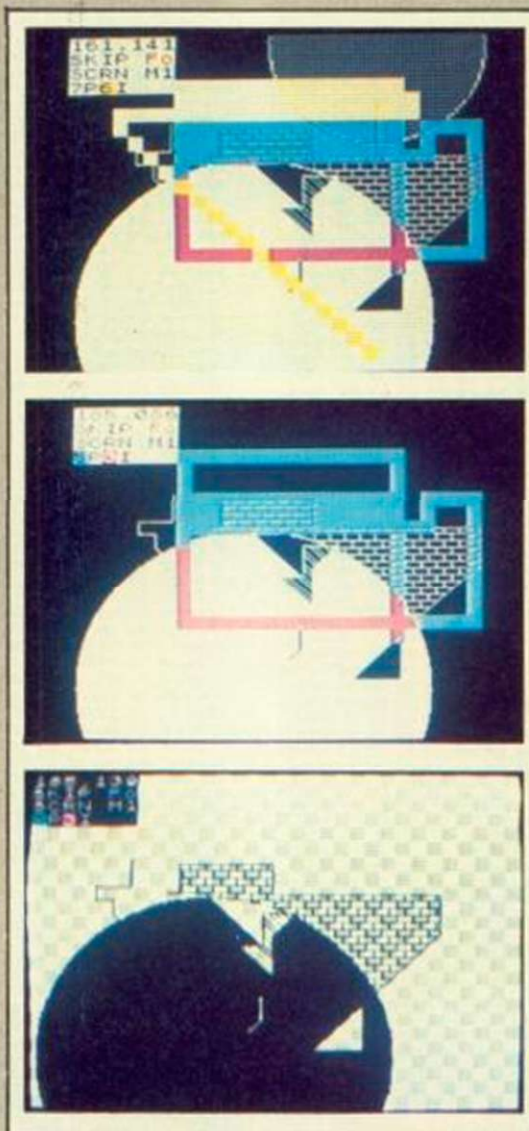
DRAWER

Hex loader.

```
1 DEF FN b(a$)=CODE a$-48-7*(a$>"9")
2 DEF FN h(a$)=FN b(a$(1))*16+FN b(a$(2))
3 DEF FN b$(a)=CHR$(a+48+7*(a>"9"))
4 DEF FN h$(a)=FN b$(INT(a/16))+FN b$(a-16*INT(a/16))
5 POKE 23658,B
10 FOR a=25000 TO 30448 STEP 8
20 PRINT a;" "; LET c=0: LET a$=""
30 FOR g=0 TO 7: IF a$(1)="" THEN INPUT LINE a$: LET a$=a$+" "
60 LET z=FN h(a$): LET a$=a$(3 TO ): POKE a+g,z: PRINT " ";FN h$(z):LET c=c+z
70 NEXT g: INPUT "Checksum:";k: IF c<>k THEN PRINT "Error": BEEP .5,50: GO TO 20
80 PRINT : NEXT a: POKE 30456,128: POKE 30457,96: SAVE "DRAWCODE"CODE 25000,55
12
```

Paul Rhodes and an advanced draw program.



G for a grid which retains the ink and paper colours already on the screen. As the grid is a pattern of Bright and normal squares, it will not show up on an RGB monitor.

Now on to the Fill routine. This will fill in any shape bounded by a solid line or the edge of the screen. Move the cursor within the shape and press Caps Shift F. To fill a shape in with one of the 20 fill patterns, proceed as for a normal fill but press Symbol Shift F. You will be prompted for a pattern number. Select the pattern using keys 0-9 for the first 10 patterns or Caps Shift plus 0-9 for the other 10.

If you want to make up your own pattern, any of the 20 can be redefined. The patterns consist of an 8 by 8 character square, like a UDG. Draw your pattern in a character square — use the grid — and, with the cursor still in the square containing the pattern, press Caps Shift P. Select the pattern as for Fill. Pressing Symbol Shift with the number will abort the fill or pattern define command if you have selected it by mistake.

Similar to the "define pattern" command is "define UDG" — selected with Caps Shift and O. In answer to the "UDG?" prompt you should press the key corresponding to the graphic you want to define, which must be in the range A-U. Any other letter key or Break will abort the command.

There are two memory-stores for pictures, so that you can save a picture at any stage in development, then recall it if you have messed something up. To save a screen, press Caps Shift and I. To recall it later, press Caps Shift and U. The long-term store will retain the picture until you store something else over it, but Fill, Line and Circle all copy the screen into the temporary store so that you can undo their operation if needs be.

This can be especially important with Fill as you might find that you have left a gap in the shape to be filled, and fill in more than you want to; or you may decide you have chosen the wrong pattern.

There is a text mode

For putting text and UDGs on the screen, there is a Text mode, selected by pressing T. Type in text as normal, except that capital letters are unshifted and lower case shifted, using Caps Shift with the keys 5-8 to move the cursor around the screen. Graphics mode is selected with Caps Shift 9, which will change the appearance of the cursor and display "GRPH" under "Text" in the information window.

The information window now needs some explanation. The two numbers at the top are, of course, the cursor coordinates. They follow the normal practice of defining (0,0) as the bottom left corner of the part of the screen normally available to Basic. The bottom two lines are assigned negative y-coordinates. The second line of the window will display the mode — Set, Res, XOR, Skip or Text — and "Fo" which signifies that "Follow mode" is in operation — this will be explained later.

(continued on next page)

Listing 1.

```

10 LET a=USR VAL "25383"
20 LET o=INT (a/VAL "256"): LET b=a-VAL "256"*o
30 IF NOT o THEN CLS : PRINT "RUN to restart": STOP
40 INPUT n$: IF LEN n$>VAL "10" OR NOT LEN n$ THEN GO TO VAL "30"
50 RESTORE VAL "100"+b: READ c,l: GO SUB VAL "199"+o
60 RUN
100 DATA USR "a",VAL "168"
101 DATA VAL "30285",VAL "160"
102 DATA VAL "57344",VAL "6912"
200 SAVE n$CODE c,l: VERIFY n$CODE : RETURN
201 LOAD n$CODE c,l: RETURN
202 INPUT "Drive:";d: SAVE "*"m";d;n$CODE c,l: VERIFY "*"m";d;n$CODE : RETURN
203 INPUT "Drive:";d: LOAD "*"m";d;n$CODE c,l: RETURN
500 CLEAR 24999: LOAD "DRAWCODE"CODE : RANDOMIZE USR VAL "25360": RUN
  
```

Listing 2.

25000: 20 00 4D 4E 42 0D 4C 4B =417	25272: 75 64 7A 64 7F 64 69 6A =877	25552: 54 55 52 45 27 53 41 56 =593	25840: C9 22 2A 77 24 7C E6 07 =793
25008: 4A 48 50 4F 49 55 59 50 =600	25280: 00 00 00 00 E6 66 B2 75 =627	25560: 45 20 54 4F 20 54 41 50 =525	25848: C0 7D C6 20 6F 38 05 7C =843
25016: 39 38 37 36 31 32 33 34 =424	25288: 51 67 70 65 D3 66 00 00 =710	25568: 45 27 4C 4F 41 44 20 46 =498	25856: D6 08 67 C9 7C 2F E6 18 =951
25024: 35 51 57 45 52 54 41 53 =604	25296: 87 73 E4 72 BA 66 C2 66 =1176	25576: 52 4F 4D 20 54 41 50 45 =568	25864: C0 2A 2A 77 C9 22 2A 77 =791
25032: 44 46 47 01 5A 58 43 56 =541	25304: BE 66 C6 66 00 00 AB 66 =865	25584: 27 53 41 56 45 20 54 4F =537	25872: 25 7C 2F E6 07 C0 7D D6 =976
25040: FF 00 6D 6E 62 0D 6C 6B =800	25312: AB 66 AB 66 AB 66 AB 66 =1092	25592: 20 4D 49 43 52 4F 44 52 =560	25880: 20 6F 38 E8 7C C6 08 67 =864
25048: 6A 68 70 6F 69 75 79 00 =776	25320: AB 66 AB 66 AB 66 AB 66 =1092	25600: 49 56 45 27 4C 4F 41 44 =555	25888: C9 7D 07 07 07 AC E6 07 =756
25056: 09 08 07 06 00 00 00 00 =30	25328: AB 66 9D 6D A2 6D A7 6D =1086	25608: 20 46 52 4F 4D 20 4D 49 =522	25896: AC 07 07 07 AC E6 FB AC =1015
25064: 05 71 77 65 72 74 61 73 =780	25336: 00 00 00 00 AC 6D DA 66 =601	25616: 43 52 4F 44 52 49 56 45 =606	25904: 57 C9 0C CB 08 D0 7D 3C =904
25072: 64 66 67 00 7A 7B 63 76 =764	25344: 81 6D 15 6F C0 67 00 00 =713	25624: 27 45 58 49 54 20 50 52 =547	25912: E6 1F 28 02 2C C9 0D CB =764
25080: 20 00 2E 2C 2A 0D 3D 2B =281	25352: 86 6D BB 6D C0 6D A5 6A =1159	25632: 4F 47 52 41 4D 27 21 20 =478	25920: 00 37 C9 0D CB 00 D0 7D =805
25088: 2D 5E 22 3B 7F 5D 5B 5F =638	25360: 11 00 E0 ED 53 2E 77 CD =931	25640: 62 3A 2B 77 A7 2B 09 21 =564	25928: 3D 2F E6 1F 28 02 2D C9 =657
25096: 29 2B 27 26 21 40 23 24 =326	25368: 08 70 AF 32 3B 76 32 F6 =821	25648: 70 62 3D 2B 03 21 C0 62 =637	25936: 0C CB 08 37 C9 7D E6 E0 =1058
25104: 25 20 20 20 3C 3E 7E 7C =505	25376: 76 3E 18 32 20 77 C9 ED =856	25656: DD 21 20 77 0E 08 DD 7E =774	25944: 6F 7D C6 20 6F D0 7C C6 =1107
25112: 5C 7B 7D 00 3A 60 3F 2F =604	25384: 73 FE 76 31 00 E0 CD 5A =1055	25664: 00 06 05 1F 38 0A 23 23 =178	25952: 08 67 2F E6 18 C0 26 40 =706
25120: 00 00 00 00 0E 66 99 75 =594	25392: 63 ED 7E 76 C9 3A F7 =1337	25672: 10 F9 DD 23 00 20 EF C9 =1006	25960: C9 2A 7B 22 FA 76 C9 =1212
25128: 51 67 88 A5 D3 66 00 00 =734	25400: 76 D3 FE CD 0D 68 CD 2E =1159	25680: 5E 23 56 7A B3 CB 21 2E =795	25968: CD FA 66 ED AB FA 76 CD =1436
25136: 00 00 00 00 BA 66 C2 66 =584	25408: 67 CD 3D 67 CD 26 64 CD =1020	25688: 67 E5 EB E9 11 FF FF 1E =1351	25976: 97 69 CD 93 69 CD 16 67 =1043
25144: BE 66 C6 66 00 00 7E 66 =820	25416: 04 74 3A 25 77 E6 08 20 =604	25696: 21 11 00 E0 18 1C 11 01 =375	25984: 20 F1 CD 0A 67 C3 0D 6B =906
25152: 7E 66 7E 66 7E 66 7E 66 =912	25424: 09 3A 2D 77 A7 CC 2E 67 =751	25704: FF 18 17 11 FF 00 18 12 =616	25992: 11 00 00 18 26 11 FF FF =606
25160: 7E 66 7E 66 7E 66 7E 66 =912	25432: 18 E7 CD A6 67 DD 21 BE =1173	25712: 11 01 00 18 00 11 FF 01 =328	26000: 1B 21 11 00 FF 18 1C 11 =398
25168: 7E 66 8D 65 92 65 97 65 =969	25440: 63 CD 56 68 A7 2B CF FE =1162	25720: 18 08 11 00 01 18 03 11 =94	26008: 01 FF 18 17 11 FF 00 18 =599
25176: 00 00 80 71 9C 65 63 6D =706	25448: 05 01 FF 00 CB F5 CD 0D =924	25728: 01 01 21 94 68 E3 ED 4B =829	26016: 12 11 01 00 18 00 11 FF =345
25184: A1 65 00 00 8C 67 00 00 =553	25456: 68 DD 21 94 63 CD 56 68 =1003	25736: 2E 77 79 E6 1F 83 FE 20 =964	26024: 01 18 08 11 00 01 18 03 =78
25192: A6 65 AB 65 80 65 00 00 =816	25464: C1 4F CD 0D 68 DD 21 =1048	25744: D0 7B 81 4F 7A A7 2B 11 =885	26032: 11 01 01 C1 ED 4B FB 76 =890
25200: 00 00 00 00 E2 66 B2 75 =625	25472: 8C 63 CD B6 68 CD 62 68 =1137	25752: FE 01 28 12 79 D6 20 4F =759	26040: 3A 3B 76 E6 40 2B 0E 7B =706
25208: 51 67 69 65 D3 66 E6 75 =1050	25480: C1 C9 4F C9 07 03 4E 41 =827	25760: 30 07 7B D6 08 47 FE E0 =946	26048: E6 1F 07 07 07 5F 7A E6 =729
25216: BC 73 EB 72 57 70 75 70 =1029	25488: 4D 45 3F 27 11 07 53 41 =420	25768: D8 ED 43 2E 77 C9 08 79 =1015	26056: 1F 07 07 07 57 7B B2 FE =643
25224: FB 6F FE 6F 00 00 7A 66 =948	25496: 56 45 2F 4C 4F 41 44 27 =529	25776: C6 20 4F 30 F4 7B C6 08 =927	26064: C0 D0 47 7B 07 CB 12 0F =837
25232: 7A 66 7A 66 7A 66 7A 66 =896	25504: 55 44 47 20 41 52 45 41 =537	25784: 47 E6 1F FE 18 20 EA C9 =1070	26072: 81 CB 12 08 CB 1A 17 AA =780
25240: 7A 66 7A 66 7A 66 7A 66 =896	25512: 27 46 49 4C 4C 20 50 41 =511	25792: 7B 07 07 07 AA E6 07 AA =721	26080: E6 01 C0 08 4F 2A FB 76 =918
25248: 7A 66 5C 64 61 64 66 64 =815	25520: 54 54 43 52 4E 53 27 53 =602	25800: 07 07 07 AA E6 FB AA C9 =1040	26088: ED 43 FB 76 40 44 CD E6 =1250
25256: 00 00 00 00 6B 64 39 6D =373	25528: 43 52 45 4E 27 1B 0A =438	25808: 57 07 07 AA E6 08 5F =992	26096: 69 C3 00 69 79 07 07 07 =547
25264: 70 64 FE 6E C0 67 00 00 =871	25536: 4F 80 54 49 4F 4E 53 27 =595	25816: 7A 37 1F 37 1F 37 1F AA =550	26104: AB E6 C7 AB 07 07 6F 3A =948
	25544: 45 44 49 54 20 50 49 43 =546	25824: E6 FB AA E6 FB 57 C9 7C =1538	26112: 3B 76 E6 40 20 16 7B A7 =812
		25832: 0F 0F 0F E6 03 C6 5B 67 =667	

(continued on next page)

(listing 2 from previous page)

Table of alphanumeric codes and numbers, organized in columns. Includes codes like 26120: 1F 37 1F A7 1F AB E6 FB +961 and 27208: 7D E6 9C AF CD FA 69 01 -1177.

(continued from previous page)

The third line displays the cursor mode - SCRN or ATTR for the normal cursor, GRPH or nothing for the text cursor - and the magnification - so far, always 1. Along the bottom are the paper and ink colours and bright and flash settings - a bright B appears for Bright 1, a flashing F for Flash 1. The window can be turned off and on with Caps Shift N, and it can be moved by pressing N. This is normally unnecessary as it moves automatically if you move the cursor over it. So as to be noticeable at all times when switched on, the window selects black or white paper to contrast with the paper colour underneath it.

One of the most important and useful features of the program is the magnifier. This allows you to magnify part of the screen by a factor of either two or four in each direction - i.e., magnifying the area by four or -16. The area to be magnified is called the "magnification window" and can be seen by pressing Caps Shift and M - press them again to turn it off. It can be moved around the screen by pressing Caps Shift along with the cursor movement keys. Symbol Shift M will select the magnification and hence the size of the window - with a greater magnification, the area to be magnified is smaller.

To magnify the area in the window, press M. There is a special feature of the magnifier which causes the window to automatically centre itself on the cursor if it is not within the magnification window. This means that when drawing in magnified mode, the window will automatically follow the cursor when it goes off the edge of the screen and is therefore called "Follow mode".



You can turn it off - and back on again - by pressing Symbol Shift and S. To centre the window press S, and to move the cursor to the centre of the window, press Caps Shift and S. You can still change the magnification and move the window around when in magnified mode, but remember that in follow mode you cannot move the window away from the cursor.

To clear the screen, press Caps Shift and V, then select either screen which will leave the attributes alone, attributes which will clear the colour details only or both - a normal CLS.

Symbol Shift and V will select the Invert command, which has the same options available. This can be useful for many things. For example, for inverted text you should invert the screen, then put the text on the screen normally, then invert the screen again.

You can also clear parts of the window

inverting the screen, drawing round them and filling them in, and then inverting the screen again. Note that the option to invert both screen and attributes will have no visible effect, unless you turn the grid on. One other command which can be used in conjunction with Clear is Border - press B - which can be used to set the border colour. This does not affect the picture itself, it is purely for the convenience of the user.

The only other key which you will need to use is R. Regardless of any shifts, this will return you to the main Save/Load menu.

I think you will find that it is worth the time and effort to type it in. Alternatively, as usual, I can supply it on tape for £3 - with instructions for transference to Microdrive. Orders to P. Rhodes at 104 Venter Gardens, Luton LU3 3SW.

28296:	E1	5D	54	CD	0D	65	20	F2	=995
28304:	21	1F	77	01	20	00	ED	88	=637
28312:	D1	78	A7	CB	F2	89	6E	21	=1269
28320:	1F	E0	06	00	C5	E5	06	20	=917
28328:	CB	16	28	10	FB	E1	CB	1E	=993
28336:	CB	06	CD	F1	64	C1	10	EC	=1200
28344:	C9	21	00	E0	06	00	C5	E5	=1082
28352:	04	20	CB	1E	23	10	FB	E1	=798
28360:	CB	16	CB	0E	CD	F1	64	C1	=1181
28368:	10	EC	C9	78	B6	77	7C	F6	=1244
28376:	E0	67	78	A3	B6	77	7C	F6	=1265
28384:	5F	67	C9	78	A6	C9	3A	FF	=1199
28392:	BF	FE	FF	00	79	0F	0F	0F	=1058
28400:	AC	E6	E0	AC	08	7D	D9	6F	=1259
28408:	08	67	E3	05	D9	C9	21	00	=1018
28416:	3C	18	18	11	03	50	41	54	=357
28424:	54	45	52	4E	20	4E	35	40	=585
28432:	42	45	52	3F	27	CD	32	70	=686
28440:	DA	00	68	22	FC	76	D9	E5	=1188
28448:	CD	F4	66	21	FF	FF	22	FE	=1382
28456:	BF	E5	AF	32	38	76	CD	08	=1038
28464:	70	ED	4B	F8	76	CD	F4	65	=1340
28472:	48	0D	3E	01	0F	10	FD	47	=503
28480:	7C	E6	07	ED	5B	FC	76	83	=1190
28488:	5F	7A	CE	00	57	1A	5F	16	=653
28496:	00	CD	F3	65	38	08	CD	E3	=869
28504:	6E	28	F6	CD	32	65	CD	03	=1168
28512:	6E	CD	F1	64	28	10	CD	E3	=1144
28520:	6E	28	F6	CD	32	65	CD	03	=729
28528:	4A	CC	E6	AE	CB	CA	2A	2A	=1107
28536:	77	CD	0D	65	2B	10	CD	E3	=926
28544:	6E	28	F6	CD	32	65	CD	03	=721
28552:	42	CC	E6	AE	CB	CA	2A	2A	=1091
28560:	77	CD	0D	65	2B	10	CD	E3	=968
28568:	6E	28	F6	CD	32	65	CD	03	=1155
28576:	07	07	AF	3C	47	7C	E6	1F	=609
28584:	F6	40	67	FE	58	38	88	CD	=1155
28592:	0A	67	E1	D9	C3	0D	68	13	=889
28600:	06	53	54	4F	52	45	2F	52	=532
28608:	45	54	52	49	45	54	45	27	=571
28616:	54	45	40	50	4F	52	41	52	=618
28624:	59	20	53	54	4F	52	45	27	=557
28632:	4C	4F	4E	47	20	54	45	27	=571
28640:	4D	20	53	54	4F	52	45	27	=545
28648:	DD	21	87	4F	CD	56	68	2E	=989
28656:	00	0F	0F	0F	0F	0F	0F	0F	=675
28664:	CD	EB	6F	EB	18	10	CD	EB	=1260
28672:	6F	3A	F6	76	E6	FE	32	F6	=1313
28680:	76	1B	1C	11	00	80	21	00	=348
28688:	E0	01	00	18	ED	80	3A	F6	=966
28696:	76	E6	01	01	00	03	28	0D	=406
28704:	26	FB	18	09	21	00	40	11	=436
28712:	00	E0	01	00	18	ED	80	C3	=860
28720:	00	68	00	21	03	6F	CD	B6	=875
28728:	68	CD	62	68	CD	74	67	87	=1070
28736:	87	87	6F	26	00	3A	28	77	=636
28744:	FE	02	3F	D8	47	11	40	76	=914
28752:	28	03	11	90	76	19	C9	CD	=766
28760:	32	70	DA	00	68	E5	ED	48	=1041
28768:	F8	76	CD	20	66	7C	E6	F8	=1320
28776:	67	D1	06	08	7E	12	13	24	=525
28784:	10	FA	C3	00	68	DD	21	60	=995
28792:	70	CD	86	68	CD	62	68	CD	=1215
28800:	2E	67	CD	3D	67	CD	A7	70	=1002
28808:	E6	DF	D6	41	38	F4	FE	15	=1307
28816:	D2	0D	68	26	00	87	87	87	=773
28824:	6F	ED	58	78	5C	19	18	8D	=892
28832:	06	03	55	44	47	3F	27	11	=352
28840:	AB	61	3A	28	77	A7	28	09	=698
28848:	11	DD	61	3D	28	03	11	F8	=691
28856:	61	21	20	77	06	05	0E	08	=314
28864:	CB	1E	38	08	13	10	F9	23	=619
28872:	00	06	05	20	F3	AF	C9	1A	=701
28880:	C9	3A	F6	76	E6	F8	32	F6	=1400
28888:	76	3A	38	76	E6	20	CB	3A	=873
28896:	38	76	EE	20	32	38	76	E6	=904
28904:	20	DD	21	00	A0	28	0F	3A	=559
28912:	F6	76	E6	02	DD	21	3D	76	=1029
28920:	28	04	DD	21	45	76	3A	38	=602
28928:	76	ED	4B	F8	76	E6	04	20	=1062
28936:	09	CD	F4	65	DD	E5	D1	C3	=1413
28944:	8F	68	CD	23	69	D8	28	3A	=902
28952:	CD	F4	65	06	08	C5	DD	5E	=1076
28960:	00	06	04	C5	CD	03	9F	4F	=651
28968:	CB	03	9F	AF	E6	0F	AF	06	=954
28976:	04	77	24	10	FC	7C	D6	04	=769
28984:	67	C1	2C	10	E6	C1	DD	23	=1035
28992:	7D	D6	04	6F	7C	C6	04	67	=883
28996:	CD	F4	64	10	DD	C9	CD	F4	=1425
29000:	65	06	08	C5	DD	4E	00	DD	=832
29008:	23	06	04	AF	CB	11	17	17	=486
29016:	10	FA	47	0F	80	77	0A	47	=657
29024:	AF	CB	11	17	10	FA	47	77	=778
29032:	0F	80	4E	2C	77	24	77	20	=632
29040:	71	CD	F1	64	C1	10	DA	C9	=1281
29048:	3A	38	76	07	0F	08	07	DC	=692
29056:	93	69	3A	F6	76	F6	04	32	=974
29064:	F6	76	ED	4B	F8	76	E6	=1392	
29072:	F8	47	79	E6	76	76	ED	=1301	
29080:	F8	76	CD	20	72	CD	2E	=1071	
29088:	3E	10	32	2C	77	CD	CF	=810	
29096:	CD	A7	70	FE	FF	CA	D1	70	=1516
29104:	A7	28	ED	CD	D1	71	3A	2C	=1073
29112:	77	D6	18	38	08	FE	20	30	=755
29120:	E1	3E	20	18	DD	3E	50	18	=730
29128:	D9	F5	CD	D9	70	F1	FE	20	=1523
29136:	38	56	6F	26	00	3A	F6	76	=713
29144:	E6	02	ED	58	36	5C	28	12	=764
29152:	7D	FE	20	28	0D	FE	41	D8	=999
29160:	FE	56	0D	D6	41	6F	ED	58	=1266
29168:	78	5C	29	29	29	19	E5	ED	=829
29176:	4B	F8	76	CD	2D	66	D1	D5	=1215
29184:	CD	BF	68	DD	E1	ED	4B	F8	=1458
29192:	76	79	C6	08	4F	78	47	C5	=912
29200:	CD	FE	70	C1	ED	43	F8	76	=1434
29208:	CD	2D	66	11	00	A0	01	08	=538
29216:	00	7E	12	24	13	10	FA	C9	=666
29224:	DD	21	00	A0	FE	09	20	08	=720
29232:	3A	F6	76	EE	02	32	F6	76	=1076
29240:	F8	76	CD	2E	67	05	DD	ED	=1131
29248:	F8	76	20	05	79	D6	08	18	=770
29256:	C3	FE	08	28	8C	FE	07	78	=1066
29264:	20	08	06	08	30	88	D6	40	=772
29272:	18	84	C6	08	FE	0C	38	AE	=1086
29280:	D6	C0	18	AA	C5	3A	08	77	=982
29288:	90	ED	43	07	77	32	07	77	=750
29296:	CD	B4	72	C1	79	48	47	91	=1053
29304:	CB	32	07	77	11	00	00	C5	=590
29312:	CD	95	72	C1	78	A7	CB	11	=1165
29320:	00	FF	ED	44	47	3A	29	77	=849
29328:	A7	20	C1	79	A7	C5	CD	A9	=1139
29336:	01	C1	79	A7	C5	CD	A9	=1139	
29344:	01	C1	79	A7	C5	CD	A9	=1139	
29352:	1D	2A	F6	76	7C	80	47	9F	=921
29360:	AA	C0	78	FE	C0	DD	7D	81	=1390
29368:	4F	9F	AB	C0	C5	CD	08	69	=1116
29376:	C1	CD	E6	69	C9	3A	07	77	=1118
29384:	A7	CB	79	A7	28	DB	C5	D5	=1324
29392:	CD	A9	72	D1	C1	C5	D5	D5	=1329
29400:	79	ED	44	4F	CD	A9	72	D1	=1202
29408:	C1	0D	18	E1	3E	FF	18	01	=797
29416:	AF	32	29	77	CD	08	70	CD	=918
29424:	F4	66	ED	4B	F8	76	2A	FA	=1316
29432:	76	78	94	30	02	ED	44	F5	=986
29440:	79	95	30	02	ED	44	CD	60	=926
29448:	73	F1	E5	CD	60	73	D1	19	=1235
29456:	CD	74	73	7C	A7	20	46	7A	=951
29464:	83	28	01	2C	DD	21	00	77	=637
29472:	7D	DD	77	00	A7	20	08	01	=673
29480:	00	00	CD	A9	72	18	2E	11	=575
29488:	85	00	CD	63	73	7C	DD	77	=1064
29496:	01	DD	7E	01	CD	60	73	E5	=994
29504:	DD	7E	00	CD	60	73	C1	A7	=1123
29512:	ED	42	CD	74	73	45	DD	4E	=1107
29520:	01	CD	6C	72	DD	7E	01	DD	=997
29528:	35	01	A7	20	DC	C3	0A	67	=781
29536:	5F	16	00	21	00	00	06	08	=164
29544:	CB	3F	30	01	19	CB	23	CB	=781
29552:	12	10	F5	C9	11	01	00	A7	=665
29560:	ED	52	38	04	13	13	18	F7	=688
29568:	19	CB	3A	CB	18	EB	C9	3A	=1010
29576:	3A	76	18	02	3E	FF			

THIS PROGRAM gives you 13 extra graphics commands. The Inverse and Copychar commands are text-orientated and the others are graphics orientated. The Stipple command affects both graphics and text. After the Ston command has been used all text is stippled as well as all points plotted, all lines drawn and all shapes filled. When using stippled text no text will be printed when the graphics pen and paper are equal since the graphics Tag mode is used to print the text.

Any stippled text may be fully edited provided that the background colour does not appear within the stipple parameters. The Stoff command will return the text and graphics to their original pen and paper colours. If the Paint command is used while the stipple effect is on unpredictable patterns will occur due to the order in which points are plotted. To fill a shape with stipple I would advise the use of the Box, Ellipse and Circle commands with the Fill command on.

Any colour parameters used refer to the pen and paper colours currently selected and will respond to mode changes in the same manner as does Amstrad Basic. For example, if the stipple colours are selected by:

STIPPLE,1,2,3,4,5,6,7,8

then in mode 0 all eight colours will be used, however in mode 1 these colours will appear Mod 4 and the stipple will be equivalent to:

STIPPLE,1,2,3,4,0,1,2,3,0

If the incorrect number of parameters for a command have been entered the routine will return to Basic and display an error message.

Type in the data from program 3 followed by program 1. Once program 1 has been run the code can be saved by:

SAVE"CALL 38155",B,37985,2220

To load this data type:

MEMORY 37985:LOAD"CALL 38155"

and to use the new commands type:

CALL 38155

Remember that if you wish to use the Symbol

GRAPHICS

Program 1.

```
10 DEG:FOR F=0 TO 255:POKE (156*256)+F,SIN(F/255*180)*
255:NEXT
```

Program 3.

```
10 REM Hex loader
20 REM use this program to enter
30 REM the hex dump code
40 REM Type in each line of 20
50 REM hex digits as a single string
60 REM and then the checksum. E.g.
70 REM for the first line enter the
80 REM digits from F to 1
90 MEMORY 37985
100 FOR n = 37986 TO 39906 STEP 10
110 LET t=0:PRINT n:":":
120 INPUT a$
130 FOR c = 0 TO 9
140 n = VAL("a"+MID$(a$,c+1,2)):POKE (c+n),n
150 t = t + n
160 NEXT
170 PRINT " = ";INPUT ch
180 IF ch<> t THEN PRINT "input error
- try again": GOTO 110
190 NEXT
```

Andrew Ware with a suite of 13 new graphics commands for the CPC-464.

AMSTRAD

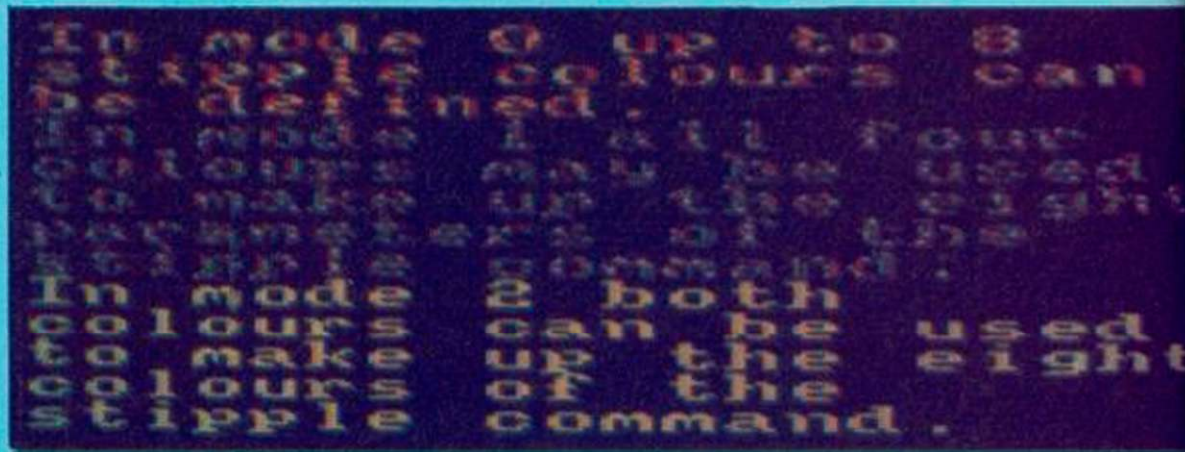
After command it must be used before the Memory command.

BOX,x co-ordinate,y co-ordinate,width,height [,ink]. This command responds to FILL. With FILL,0 an outline of the box is drawn and with FILL,1 the box is filled.

CIRCLE,x co-ordinate,y co-ordinate,radius [,ink]. Circle responds to FILL. With FILL,0 the circumference only is drawn and with FILL,1 the circle is filled.

COPYCHAR,column,row,@variable%. Returns the CHR\$ value of the character at the given row and column position into the integer variable following the "@" character.

ELLIPSE,x co-ordinate,y co-ordinate,width,height [,ink]. Ellipse responds to FILL in the



Hex dump.

37986	F5D5C54D06085C160021	= 893	38466	D5CDEABDD1E13EFFAC67	= 1865	38946	03DD6E04CB85DD660522	= 1036	39426	3EC3320EBC3E01322A9B	= 819
37996	0000C839300119CB23CB	= 775	38476	3EFFAD6FC9FE01C22C9B	= 1450	38956	7A95DD6E06D66072278	= 1092	39436	214A9B22D4BDC9DD6602	= 1223
38006	120520FAC1D1F1C9F5D5	= 1601	38486	DD7E00326D9FE012804	= 955	38966	95C5D5ED5B78952A7A95	= 1469	39446	DD6E04CD75BBD60BDD	= 1553
38016	C5571E000608AFED5223	= 857	38496	3EEA18023EF6322C9632	= 924	38976	CD8395D1C13A6D96FE06	= 1458	39456	6E00D660177C9060DD	= 989
38026	P28F94192B2910F4C1D1	= 1304	38506	4496C900CD1596ED5B76	= 1241	38986	2827210000CD5F902323	= 634	39466	7E00E60FC5060421589A	= 853
38036	F1C9BF94C32E95C3AC95	= 1687	38516	95ED4B74952A7695ED42	= 1338	38996	7DB920F77CB820F3C3E8	= 1599	39476	0FCBBE3002CFECC0E23	= 1167
38046	C30B96C3D599C35196C3	= 1538	38526	3002C5D17AFE0020107B	= 1003	39006	97C5D5E5110000C0C0BB	= 1391	39486	10F4C1DD23DD2310E221	= 1240
38056	F397C30298C39F98C3B4	= 1624	38536	FE3F300B218000CD7E94	= 1016	39016	E1D1D5E5CDF6BBE1D1C1	= 2141	39496	589A0604CB0E62310FBC	= 968
38066	98C3E599C3F699C3279A	= 1711	38546	7DFE0020023E01FE0F30	= 801	39026	C921000005C5110000CD	= 866	39506	11BCCDC99AC955FF0000	= 1306
38076	C3139A434952434CC545	= 999	38556	023E0F32C096F52A7495	= 1023	39036	C0BBE1110000E5CDF6BB	= 1488	39516	E5F5D5C53A039BF0E028	= 1394
38086	4C4C495053C5475045CE	= 1011	38566	232322C19621000022C3	= 709	39046	E1D1D5CDF6BBE1210000	= 1527	39526	0678FE00CA919AAF0604	= 1066
38096	4750415045D246494CCC	= 998	38576	96F132C596673AA79584	= 1397	39056	CD6BB210000110000CD	= 893	39536	ED5B589A2A5A9ACB0130	= 1108
38106	4D4153CB424FD8494E56	= 1026	38586	32C696C3C79602220022	= 1012	39066	F6BBE3E897FE01C22C9B	= 1659	39546	0BCB03CB02CB04CB05C3	= 1032
38116	455253C55041494ED453	= 1022	38596	0040413AC5962600FED	= 920	39076	DD7E00E60121B398BEC8	= 1332	39556	B39A0710E00FED53589A	= 1171
38126	544F46C653544FCE5354	= 1050	38606	5B7495E5CD049B227895	= 1252	39086	77CD9CBBC900FE04D22C	= 1380	39566	225A9AC147D1F1E1C368	= 1516
38136	4950504CC5434F505943	= 888	38616	EBE1D5ED5B7695CD0A9B	= 1638	39096	98FE032007CD7C95DD23	= 1185	39576	0CCB442802CB7CB4228	= 1036
38146	4841D200000795969401	= 802	38626	227A95E53A7395FE0128	= 1151	39106	DD23DD6E00DD6601DD5E	= 1226	39586	02CBD7CB452802CBE7CB	= 1371
38156	9694210795CD18C21FD	= 1375	38636	1F2A7A95E05BC3961131	= 1055	39116	02DD5603ED537895227A	= 1057	39596	4328D7CBF718D3CB4228	= 1316
38166	9A2264BB3EC32638BCD	= 1273	38646	AFED523811192B2B05ED	= 1128	39126	95AF32D39932D4993253	= 1286	39606	02CBC7CB4328C9CB718	= 1373
38176	F6993E01CD0EBCD889B	= 1413	38656	5B7895227A95CD2F96D1	= 1276	39136	99325499325599326B99	= 1038	39616	C5CB4328C1CB718BDFE	= 1569
38186	CDE599C9FE05D22C9BFE	= 1710	38666	18EA3A6D96FE0120073A	= 927	39146	326C99326D99CD11BCFE	= 1287	39626	002810FE01201821C19A	= 755
38196	842007C07C95DD23DD23	= 1033	38676	7395FE002829ED5B7895	= 1196	39156	022820F53E233253993E	= 764	39636	22849A216F9A3608C921	= 914
38206	DD4E00D4601ED431396	= 1064	38686	ZAC1962B2B3E80BC381B	= 932	39166	2B326B99F1FE0128103E	= 967	39646	999A22049A216F9A3602	= 981
38216	DD6E02DD6603DD5E04DD	= 1199	38696	AFED5238161913E5D52A	= 1100	39176	2332549932559932E2B32	= 765	39656	C921B39A22649A216F9A	= 1185
38226	5605CD83953E02327395	= 954	38706	7A953A7395FE002801EB	= 1123	39186	6D99326C99CDE78B325F	= 1341	39666	3604C9E5C9C99A01CFC4	= 1602
38236	ED437495ED4376953E3F	= 1265	38716	CD2F96D1E118E5E1D122	= 1557	39196	993277993269932A199	= 1182	39676	8A32039BCFA7930E0511	= 1097
38246	32A795ED537895227A95	= 1260	38726	7A95ED5378953A6D96FE	= 1431	39206	2A7A95ED5B7895CDBE99	= 1452	39686	800019D1F5C5E5D5E2B1	= 1514
38256	C36E9602320032002200	= 591	38736	0120403A7395FE012817	= 737	39216	3AD4993C3C32D4996F26	= 1107	39696	009C1600197EE1CDD997	= 1127
38266	2300DD7E00CDD8B8C9C5	= 1394	38746	2A7A95ED5BC39613E052	= 1324	39226	905B23562B244E2346ED	= 971	39706	D1CB4228003EFFAD6F3E	= 1189
38276	ED5CDDCBBED53A89522	= 1709	38756	300B19ED5B7895CD2F96	= 1091	39236	537895ED437A952A7895	= 1238	39716	FFAC67C1FC9000060E11	= 1188
38286	AA95D1E1D5E5ED4AA95	= 1826	38766	Z2C3963A7395FE00284A	= 1069	39246	ED5B7A9523000000B05	= 1082	39726	21399B7E0C5ABB2310F9	= 1153
38296	09EBED4BA89509EBCCD9	= 1523	38776	ED5B78952AC19613E052	= 1320	39256	E5DF00BE1D1FE00C0BB	= 1937	39736	C90A504152414D454445	= 802
38306	BBE1D1C1C93F00000000	= 1078	38786	383EED5B7A952A7895CD	= 1233	39266	992A7895ED5B7A952B00	= 1106	39746	52204552524F520AF53E	= 825
38316	FE06D22C9BFE052007CD	= 1172	38796	2F9622C196182F3A7395	= 967	39276	0000EBD5E5CDF0BBE1D1	= 1743	39756	0132039BE5CDDCBB053	= 1354
38326	7C95DD23DD23DD6E00DD	= 1337	38806	FE012B112A7A95ED5B78	= 1073	39286	FE00CBB99ED5B78952A	= 1434	39766	000DC98BCDC688ED53B4	= 1603
38336	6601227695DD6E02DD66	= 1060	38816	95CD2F9622C396ED53C1	= 1443	39296	7A952323E5D5C0F00B01	= 1624	39776	9B22B69BE15C16006229	= 1004
38346	03227495221396DD6E04	= 840	38826	963A7395FE0028102A78	= 944	39306	E1FE00CBB99ED5B7895	= 1617	39786	292929EB2929292911BC	= 891
38356	DD6605DD5E06DD5607CD	= 1160	38836	95ED5B7A95CD2F9622C1	= 1377	39316	2A7A952B2BE5D5CDF0BB	= 1403	39796	FE02280629FE01280129	= 680
38366	8395ED537895227A953E	= 1236	38846	9622C3963AC596673AC0	= 1287	39326	D1E1FE00CBB993AD499	= 1652	39806	EBE5C1218F01ED420C0C	= 1534
38376	7F32A795AF3273952A74	= 1140	38856	9684673AC696BCDAE897	= 1580	39336	21D3993C3CBCE0C09BB	= 1308	39816	BBF1CDFBB2AB69BED5B	= 1779
38386	95ED5B7695ED52D26E96	= 1533	38866	732C5960C3796E567CD	= 1602	39346	DADC99C3309905E5CDEA	= 1888	39826	B49BCDC0BB2AB29BED5B	= 1622
38396	3C19327395EB227495ED	= 1170	38876	62945C1600E16PCD6294	= 1147	39356	BBC1D13AD3993C3C32D3	= 1392	39836	B09BCDC0BB2AB29BED5B	= 1508
38406	5376951863FE01C22C9B	= 1121	38886	19C9ED5BA8952AAA95CD	= 1437	39366	99269D0F7323722B471	= 915	39846	000000000000000000635	= 59
38416	C37C953200210000ED5B	= 879	38896	C9B8C9FE01C22C9BDD2C	= 1584	39376	2378900000DD7E00CDE	= 1120	39856	21C59B7E23CD5ABB10F9	= 1293
38426	1396E5D5CDEABDD1E13E	= 1733	38906	00322B9BCD59BCC9FE06	= 1191	39386	BBC9FE03C23099CD4BB	= 1507	39866	C90A2852535820455854	= 769
38436	FFAA573EFFA85FCD8ABD	= 1721	38916	D22C9BFE05200AD7E00	= 1057	39396	C921680C22E9BDAF322A	= 1073	39876	454E4445442047524150	= 682
38446	C9CD3296E5D5CDEABDD1	= 1883	38926	CDEBDD23DD23DD4E00	= 1425	39406	9B21A41322D4BDC9215C	= 1042	39886	4849435320524F555449	= 730
38456	E1E53EFFAA573EFFA85F	= 1611	38936	CB81DD4601DD5E02DD56	= 1248	39416	9A22E9BD21F59A220FBC	= 1279	39896	4E45530A0A0D20412E50	= 486

S EXTENSIONS

same manner as circle.

|FILL,integer. |FILL,0 turns fill off. |FILL,1 turns fill on. FILL responds to the stipple command.

|GPAPER,graphics paper colour. The background graphics paper is set to the colour specified.

|GPEN,graphics pen colour. The foreground graphics pen is set to the colour specified.

|INVERSE,integer. |INVERSE,0 turns the inverse mode off and text is printed in the current pen colour on the current paper colour.

|INVERSE,1 turns the inverse mode on and text is printed in current paper colour on the current pen colour.

Paint responds to stipple

|MASK,integer. Sets ink mask: |MASK,0 Force mode. Pixel plotted over background. |MASK,1 XOR mode. Pixel XORed with background pixel. |MASK,2 AND mode. Pixel ANDed with background pixel. |MASK,3 OR mode. Pixel ORed with background pixel.

|PAINT,x co-ordinate,y co-ordinate[,ink]. Paints an enclosed area of the graphics window around the point x,y. This command can be terminated by pressing Ctrl and C keys together. Paint responds to stipple, however the results are unpredictable.

|STIPPLE,pen 1,pen 2,pen 3,pen 4,pen 5,pen 6,pen 7,pen 8. Sets the order of pixel colour While stipple is activated the current graphics pen colour is ignored. Text will be printed in current stipple colours.

|STOFF. Turns stipple off.

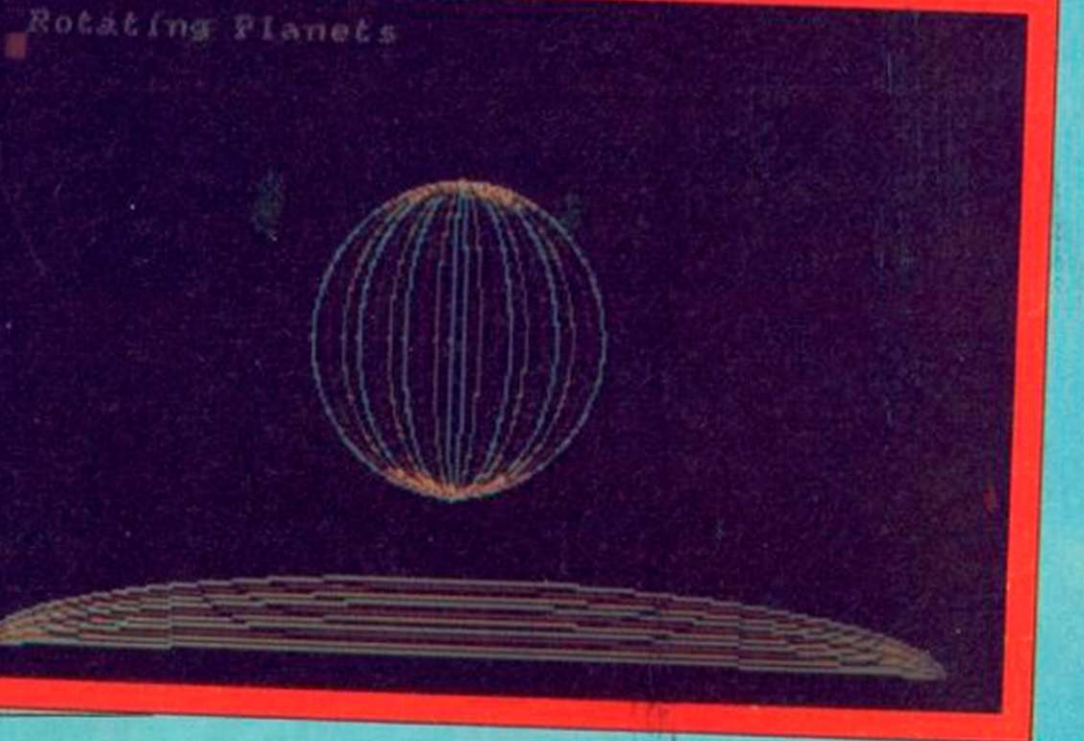
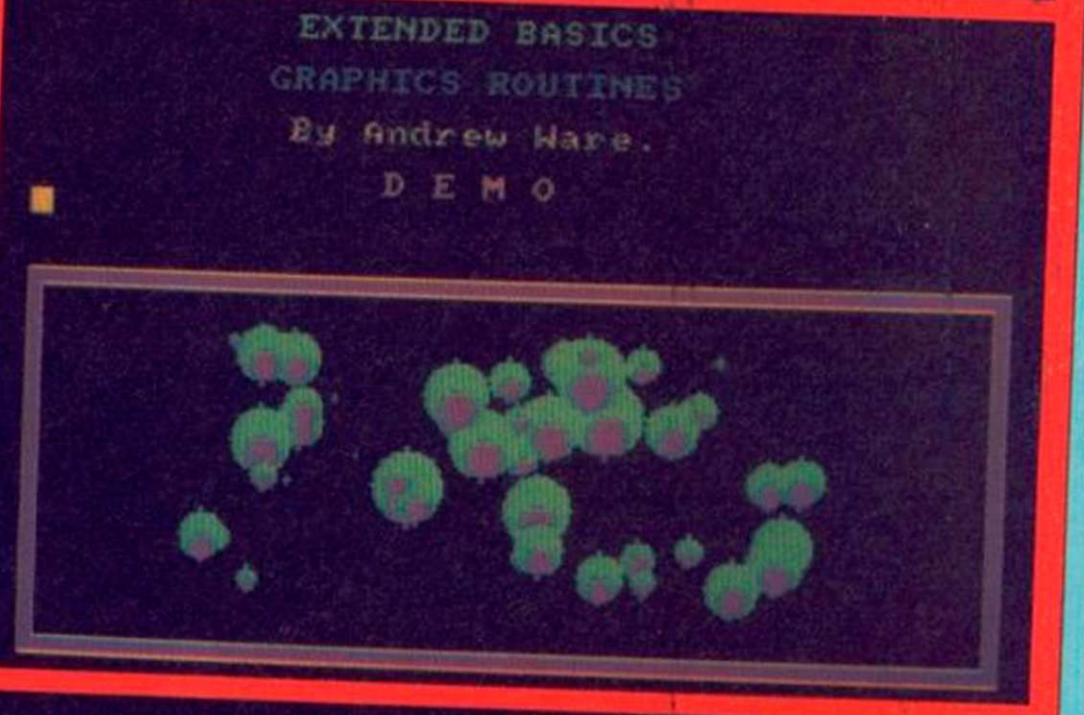
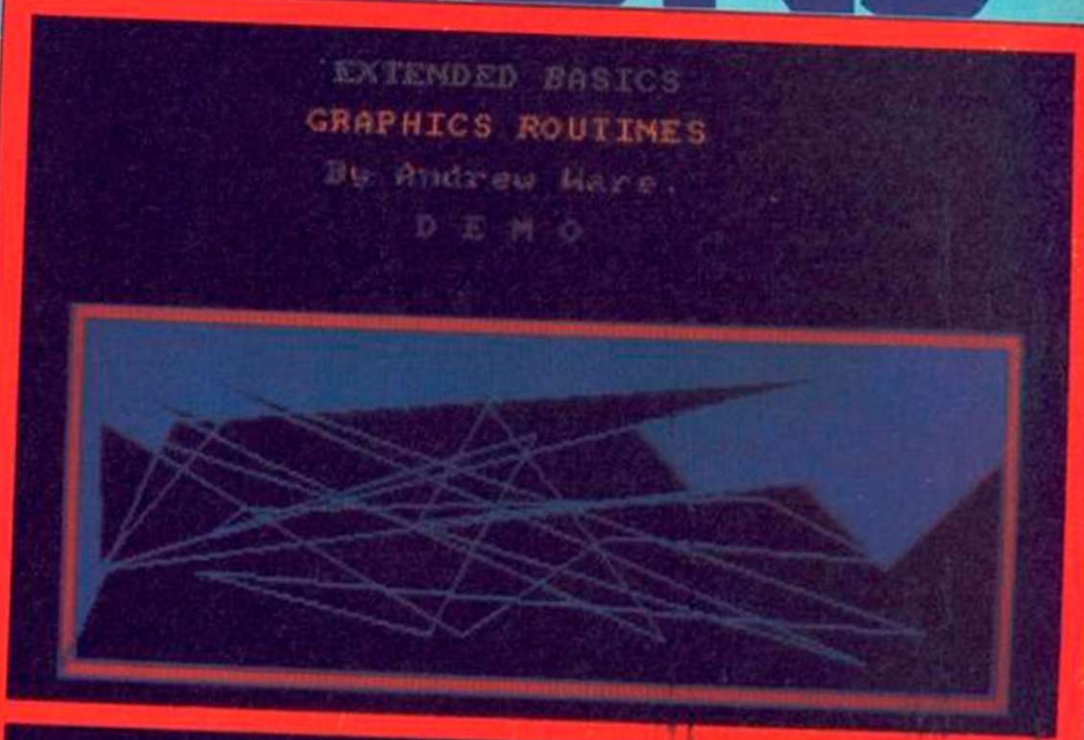
|STON. Turns stipple on.

Terms in brackets are optional and all co-ordinates are relative to the current graphics origin.

Program 2.

```

10 |MASK,0:INK,0:|BORDER,0:INK,1,24:INK,2,6:INK,3,5:|
20 |STON:INK,4,15:INK,5,18:MODE,1:|STIPPLE,1,2,3,1,2,1,2,1,2:|STON
30 LOCATE,12,1:PRINT,EXTENDED BASICS:|STIPPLE,2,3,2,3
40 LOCATE,11,3:PRINT,GRAPHICS ROUTINES:|STIPPLE
50 |STIPPLE,1,2,3,1,1,2,3,1:LOCATE,12,5:PRINT,By Andrew Ware
60 |STIPPLE,1,2,3,1,1,2,3,1:LOCATE,16,7:PRINT,D E M O
70 |STIPPLE,1,3,1,3,1,3,1,3:LOCATE,10,10,619,219:|PAINT
80 |STOFF
90 |FILL,0:|BOX,0,0,639,239,1:|BOX,10,10,619,219:|PAINT
100 |FILL,1:FOR f=0 TO 50:|CIRCLE,x,y,r/2,r/2,3:|NEXT
110 |CIRCLE,x,y,r/2:|CIRCLE,x,y,r/2,r/2,3:|NEXT
120 |FILL,0:INK,2,24:INK,3,6:INK,1,5:|FILL,1:FOR g=1 TO 3:|MASK
130 |NEXT:|NEXT
140 |FILL,1:FOR f=0 TO 4:|BOX,12,12,615,216,0
150 |MASK,0:|BOX,12,12,615,216,0
160 |DRAW,RND*600+20,RND*200+10:|NEXT
170 |FOR f=0 TO 28:|DRAW,RND*600+20,RND*200+10:IF TEST(x
180 |RND*100 MOD 3)=1:|PAINT,x,y,0
190 |THEN OFF MOD 3)+1:|PAINT,x,y,0
200 |NEXT
210 |MODE,0:MODE,1:|STON:|STIPPLE,1,2,1,2,1,2,1,2:|PRIN
220 |T Rotating Planets:|STIPPLE,1,1,1,1,1,1,1,1:|FOR f=0
230 |TO 100:|PLOT,RND*640,RND*400,1:|NEXT:|STOFF
240 |FILL,1:|CIRCLE,320,200,100,0:|ELLIPSE,320,0,320,
250 |FILL,0:FOR f=5 TO 100 STEP 10:|ELLIPSE,320,200,f,1
260 |(f/10) MOD 3+1:|NEXT
270 |FOR f=5 TO 50 STEP 5:|ELLIPSE,320,0,320,f,(f/5)MOD
280 |3+1:|NEXT
290 |INK,1,6:INK,2,26:INK,3,24:GOSUB,190
300 |INK,1,24:INK,2,6:INK,3,26:GOSUB,190
310 |INK,1,26:INK,2,24:INK,3,6:GOSUB,190
320 |NEXT:GOTO,200
330 |FOR g=0 TO 100:|NEXT:RETURN
340 |CLS:|STON:PRINT,EXAMPLE OF STIPPLE
350 |FOR f=0 TO 3:FOR g=0 TO 3:FOR h=0 TO 3:FOR l=0 TO 3:
360 |STIPPLE,f,g,h,l,f,g,h,l:PRINT,STIPPLE
370 |NEXT:|NEXT:|NEXT:|NEXT
380 |MODE,0:|STIPPLE,1,2,3,4,1,2,3,4:PRINT,In mode 0 up
390 |to 8 stipple colours can be defined
400 |STIPPLE,1,3,9,7,9,11,13,15:PRINT,In mode 1 all fo
410 |ur colours may be used to make up the eight parameters
420 |of the stipple command
430 |STIPPLE,1,2,1,2,1,2,1,2:PRINT,In mode 2 both
440 |colours can be used to make up the eight colours of th
450 |e stipple command
460 |FOR f=0 TO 1000:|NEXT:INK,0,26:INK,1,5:|BORDER,26,1
470 |INK,2,6:INK,3,18:MODE,0:|STIPPLE,1,2,3,4,5,6,7,8:|PRIN
480 |TIPPLE,1,2,3,4,5,6,7,8:PRINT,In mode 0:|FOR
490 |f=0 TO 2000:|NEXT
500 |MODE,1:PRINT,In mode 1:|FOR f=0 TO 2000:|
510 |EXT,MODE,2:PRINT,In mode 2:|FOR f=0 TO 2000:|
520 |NEXT:RUN
  
```



ATARI 128

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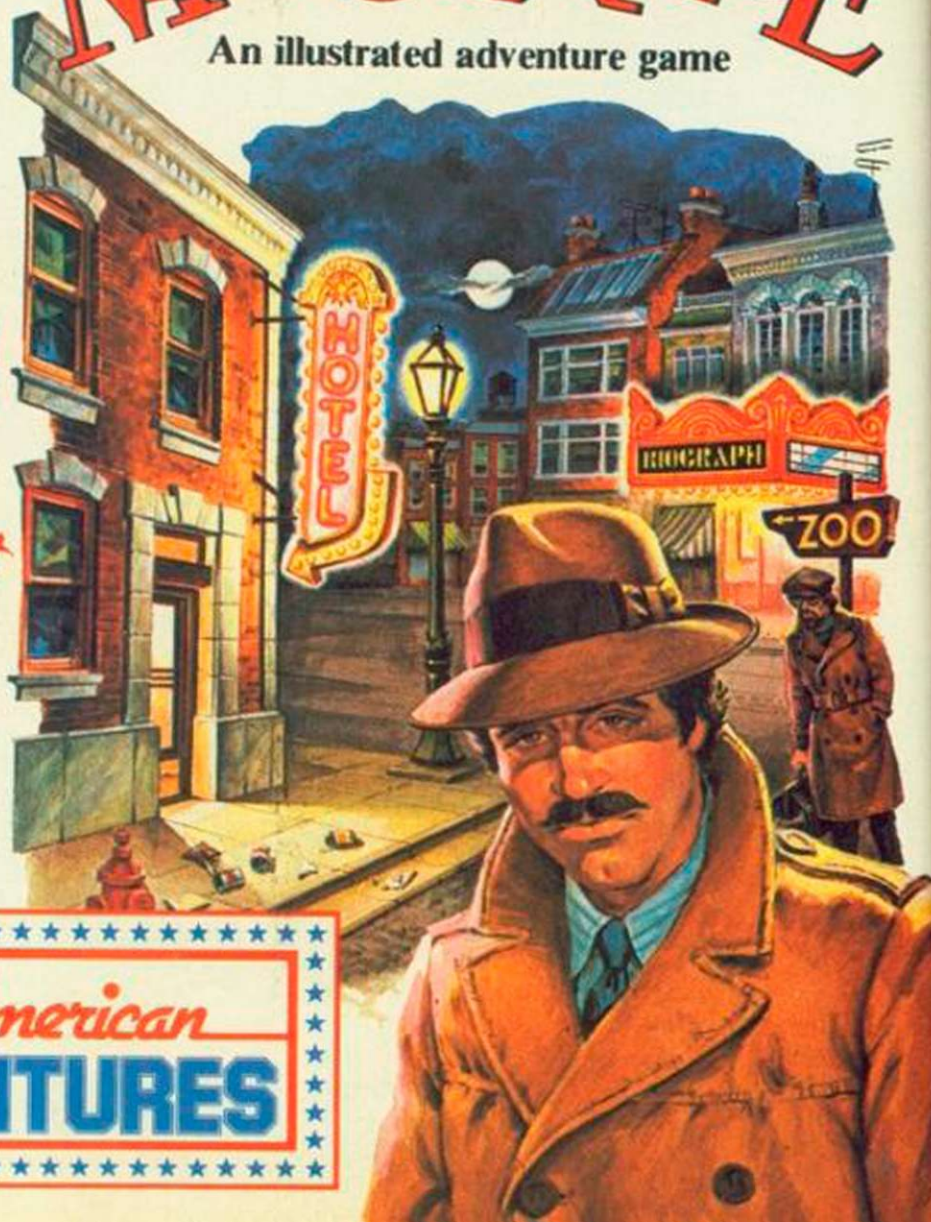
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CHANGER

WHEN LECTURING I often include informal definitions of computing terms to make them more memorable to students. My informal definition of a utility is a program which makes life easier for an operator or a programmer. The utility presented here falls into the latter category. This machine-code program does nothing that cannot be done from Basic; but it does it much faster and with much less bother to the programmer.

The utility is designed to manipulate the colour attributes of a BBC's mode 7 screen. A simple call is included to invert the colours — excluding black and white; a more involved series of calls will select an area of the screen to be affected, and allow a more precise exchange of attributes. All of this could be done

from Basic; but would involve the program keeping track of the position and nature of teletext control codes. The memory involved for this may be greater than the memory occupied by this utility; and it would certainly execute more slowly.

Teletext — mode 7 — screens have colour and other attributes set and controlled by character codes in the range 129 to 159 Ascii. A control code on a line will control the manner in which succeeding characters on that line are presented by the hardware. Such codes only affect the current line up to either the end of the line or an overriding code on the same line.

An example may make this clearer; suppose the message "HELLO!" is required to be presented in red text. The red text control code is given in the user guide as Ascii 129 (page

486). This can be incorporated into a string by the command

```
string$ = CHR$(129) + "HELLO!"
```

When this string is printed onto a mode 7 screen the control code will occupy one character position and the text will follow it in red. The colour will be changed by a following colour code or by the end of that line. If it is wanted to change the colour from red to blue; it is only necessary to change the control code from red text — 129 — to blue text — 132. It is not necessary to rewrite the text itself.

The utility presented here, if called without any parameters will cause a predefined change in text and graphic colour attributes. These predefined changes are red to green and vice versa, yellow to blue and cyan to magenta and vice versa. White codes are not affected.

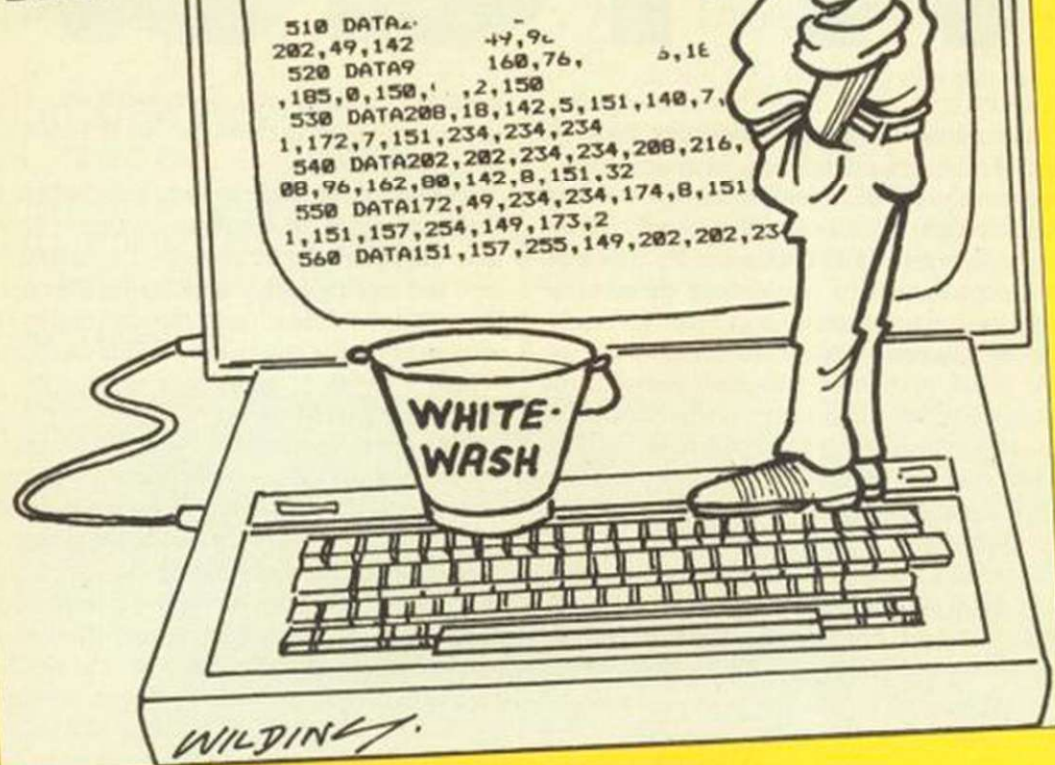
```

100 MODE 7
110 REM MODE 7 CHANGER
120 REM FINIAN CULWIN
130 REM VERSION 1.0
140 ORIGIN = ADDR
150 FOR opt = 1 TO 3 STEP 2
155 PA = ADDR
160 PROC prepare
170 PROC checkit
180 PROC doit
190 NEXT opt
200 PROC test
210 PROC save
220 END

1000 DEF PROC prepare
1010 zerop = &70
1020 table = &72
1030 table% = &B5
1040 table%1 = &C3 : REM address of *40 table
1100 I OPT opt
1110 .yhi : NOP
1120 .ylo : NOP
1130 .xleft : NOP
1140 .xright : NOP
1150 .flag : NOP
1160 .address : NOP : NOP
1170 .temp : NOP : NOP
1180 .from : NOP
1190 .to : NOP
1200
1210 ENDPROC
2000 DEF PROC checkit
2010 I OPT opt : .invert
2020 LDA &B55
2030 CMP #7
2040 BNE wally
2050 LDA #0
2060 STA flag
2070 LDA &600
2080 BEO default
2090 BEO default
2100 BEO default
2110 BEO default
2120 BEO default
2130 BEO default
2140
2150 PA = &17
2160 (PA+1) = "wally"
2170 PA% = #0
2180 PA% = PA + 11 : REM ERROR MESSAGE
2200 I OPT opt
2210 default : default parameters
2220 JSR setdefaults
2230 JMP main
2300 four : get four parameters
2310 JSR getfour
2320 JMP main
2400 six : get six parameters
2410 JSR getfour
2420 LDA &600
2430 STA zerop
2440 LDA &60E
2450 STA zerop+1
2460 LDA (zerop).Y
2470 STA from
2480 LDA &61E
2490 STA zerop
2500 LDA &611
2510 STA zerop+1
2520 LDA (zerop).Y
2530 STA to
2540 INY
2550 STY flag : set flag for change
2560 JMP main
2590 two : get two parameters
2600 JSR setdefaults
2610 LDA #0
2620 LDA &601
2630 STA zerop
2640 LDA &602
2650 STA zerop+1
2660 LDA (zerop).Y
2670 STA from
2680 LDA &604
2690 STA zerop
2700 LDA &605
2710 STA zerop+1
2720 LDA (zerop).Y
2730 STA to
2735 INY
2738 STY flag : set flag for change
2740 JMP main
2800 setdefaults : set default parameters
2810 LDA #0
2820 STA ylo
2830 LDA #39 : yleft
2840 LDA #24 : yright
2850 LDA #24 : xright
2860 LDA #24 : xleft
2870 STA yhi
2880 RTS
2910 .getfour : STORE FIRST FOUR PARAMETERS
2920 LDY #0
2930 LDA &601
2940 STA zerop
2950 LDA &602
2960 STA zerop+1
2970 LDA (zerop).Y
2980 STA xleft
2990 LDA &604
3000 STA zerop
3010 LDA &605
3020 STA zerop+1
3030 LDA (zerop).Y
3040 STA xright
3050 LDA &607
3060 STA zerop
3070 LDA &606
3080 STA zerop+1
3090 LDA (zerop).Y
3100 STA ylo
3110 STA zerop
3120 LDA &608
3130 STA zerop+1
3140 LDA (zerop).Y
3150 STA yhi
3160 RTS
3160 ENDPROC
4000 DEF PROC doit
4010 I OPT opt
4020 .main
4022 INC xright
4024 INC yhi : correct max values
4030 .lineop
4040 LDA ylo
4050 ASL A : offset for table (2*Y)
4060 STY
4070 LDA (table).Y
4080 STA zerop+1
4090 INY
4100 LDA (table).Y
4110 STA zerop : offset from HIMEM
4120 CLC
4130 LDA #&7C
4140 ADC zerop+1
4150 STA zerop+1 : add HIMEM to offset
4160 JSR oneline
4170 INC ylo
4180 LDA ylo
4190 CMP yhi
4200 BCC lineop : do each line
4210 RTS : from routine
4220 .oneline
4230 LDY xleft : offset into Y index
4240 .nextchar LDA (zerop).Y : get screen char into
4250 JSR onechar
4260 STA (zerop).Y : return to screen
4270 INY
4280 TYA
4290 CMP xright
4300 BCC nextchar : do each character
4310 RTS : from oneline
4320 .onechar
4330 LDY flag
4340 BNE switch : branch for change
4350 CMP #&81
4360 BCC noaud : byte too low
4370 CMP #&97
4380 BCC noaud : byte too high
4390 PHA : preserve byte
4400 AND #&0F : strip high nibble
4410 CMP #&7
4420 BCS noaud : low nibble > 7
4430 AND #1
4440 BNE up : increase byte
4450 PLA : TAX
4460 DEX
4470 TXA
4480 RTS : decrease byte
4490 UP : from onchar down
4500 .up
4510 PLA : TAX
4520 INX
4530 TXA : increase byte
4540 RTS : from onchar up
4550 .noaud PLA
4710 .noaud RTS : from onechar no aud
4720 .switch
4730 CMP from
4740 BNE noaud : not to be switched
4750 LDA to : change it!
4760 RTS : from onechar switch
4770
4780 ENDPROC
6000 DEF PROC test
6010 CLS
6020 screen$ = CHR$(132)+CHR$(157)+CHR$(147)+CHR$(234)+CHR$(131)+STRING$(32,"")+CHR$(147)+CHR$(101)+CHR$(32)
6030 FOR vtab = 0 TO 21
6040 PRINT screen$
6050 NEXT
6060 PRINTTAB(3,0);CHR$(232)+STRING$(34,CHR$(252))+CHR$(100)
6070 PRINTTAB(3,21);CHR$(170)+STRING$(34,CHR$(175))+CHR$(165)
6080 FOR char = 0 TO 6
6090 PRINTTAB(15,3;char);CHR$(156);CHR$(129+char);"TE
STRING -CHR$(133)+CHR$(132)+""
6099 PRINTTAB(0,15);
6100 NEXTchar
6110 star$ = CHR$(157)+CHR$(152)+""+CHR$(129)+""
6120 stripe$ = CHR$(157)+CHR$(133)+CHR$(157)
6130 FOR star = 11 TO 14 : PRINTTAB(7,star);star$ : NEX
T star
6140 FOR stripe = 15 TO 19 : PRINTTAB(7,stripe);stripe$
NEXTstripe
6150 FOR demo = 1 TO 6
6160 PROC message("INVERT WHOLE SCREEN")
6170 CALL invert
6180 NEXT demo
6190 left% = 0 : right% = 39 : top% = 0
6200 FOR demo% = 1 TO 21
6210 PROC message("INVERT PART SCREEN")
6220 CALL invert:left:right:top%:demo%
6230 NEXT demo%
6240 PROC message("CHANGE CYAN TO MAGENTA")
6250 cyan% = 134 : magenta% = 133
6260 CALL invert:cyan%:magenta%
6270 PROC message("CHANGE STARS TO STRIPES")
6280 star% = 42 : stripe% = 61 : string% = 36
6290 PROC message("FIRST STARS TO STRING")
6310 CALL invert:star%:string%
6320 PROC message("NOW STRIPE TO STAR")
6330 CALL invert:stripe%:star%
6340 PROC message("AND STRING TO STRIPE")
6350 CALL invert:star%:stripe%
6360 left% = 7 : right% = 36 : top% = 11
6370 PROC message("ONE LINE AT A TIME")
6380 FOR bottom% = 11 TO 19
6390 top% = bottom%
6390 CALL invert:left:right:top%:bottom%:star%:stri
pe%
6400 CALL invert:left:right:top%:bottom%:stripe%:st
ar%
6410 CALL invert:left:right:top%:bottom%:string%:st
ar%
6420 TIME = 0 : REPEAT UNTIL TIME = 50
6430 NEXT bottom%
6440 PROC message("THAT'S ALL FOLKS")
6450 ENDPROC
6460 DEF PROC message(string$)
6470 DEF PROC message(string$)
6480 VDU20,0,24,39,22,12,26
6490 xtab% = (LEN(string$))/2
6500 FOR ytab = 22 TO 23
6510 PRINTTAB(xtab,ytab);CHR$(141);string$
6520 NEXT ytab
6530 PRINTTAB(14) "PRESS";CHR$(136);"SPACE";CHR$(137)
:"BAR"
6540 REM TIME = 0 : REPEAT UNTIL TIME > 100
6550 REPEAT
6560 UNTIL INKEY(-99)
6570 ENDPROC
6580 DEF PROC save
6590 VDU7
6600 VDU20,4,19,36,2,12,26
6610 PRINTTAB(0,0);
6620 PRINTTAB(11,24);STRING$(15,"");
6630 yellow% = 131 : blue% = 132 : green% = 130
6640 CALL invert:yellow%:green%
6650 CALL invert:blue%:green%
6660 PRINTTAB(10,5);CHR$(129);"CODE ASSEMBLED"
6670 PRINTTAB(5,7);CHR$(129);"START ADDRESS" "origin"
6680 PRINTTAB(5,9);CHR$(129);"END ADDRESS" "PA"
6690 PRINTTAB(5,11);CHR$(129);"ACTION ADDRESS" "main"
6700 PRINTTAB(5,24);
6710 ENDPROC

```


Fintan Culwin
with a quick
change on the
BBC.



The default of the whole screen can be modified by adding four integer parameters to the call. These parameters define an area of the screen in the order leftX, rightX, topY and bottomY. Only the codes in this area will be changed; but the effects of the codes may extend

to the right of the area.

More selective control of the changes can be made by specifying two or six integer parameters. Two parameters indicate a code to be found and a code to replace it. These codes are not limited to teletext control codes; any



This program is
available on Telsoft.

Ascii characters can be exchanged. Two integer parameters will effect the whole screen; six will select an area of the screen. The first four define the area as before; the last two specify the codes to be found and replaced respectively.

Only a limited error checking is provided. A check is made that the machine is in mode 7; and a check is made that the correct nns only. The left/right and up/down should be in the correct order and within the confines of the screen. If these conditions are not adhered to unexpected and possibly disastrous results will be obtained.

For the non technical all that is necessary is to copy out the listing. It is configured for tape based systems to occupy memory from &D00 onwards; it extends beyond the normal start of user memory &E00; so it will have to be protected or assembled for a different area. When run the code is first assembled and then tested with all four possible types of command. Once tested the start, end and execution addresses are displayed allowing a working copy to be saved.

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Figure 1.

```

10 REM WYCHWOOD Plotter control program for the ORIC-1
20
30 GOTO 70
40 GOTO 2810: REM Indirection to program error routine
50 GOTO 3720: REM Indirection to PROCPL0T error routine
60
70 Drive# = "1": F# = "Default"
80 #V0,1
90 MODE 3
100 CLOSE0
110 ARRAYSIZE = 150
120 DIM A$(ARRAYSIZE)
130 CLS
140 PRINT SPC(15); "WYCHWOOD - Plotter Control Program"
150 PRINT: PRINT SPC(15); "(c) John Dawson 1985"
160 PRINT: PRINT SPC(15); "Version 1.10"
170 PRINT: PRINT SPC(15); "for the ORIC-1 plotter"
180 FOR delay% = 0 TO 700: NEXT delay%
190 CLS
200
210 REPEAT
220 ON ERROR GOTO 40
230 #DRIVE 0
240 PROCINSTRUCTS("COMMAND")
250 Z# = GET#
260 IF Z# = "M" THEN DL = 0: PROCWRITE
270 IF Z# = "E" THEN PROCEDIT_PLOT
280 IF Z# = "S" THEN PROCSAVE
290 IF Z# = "R" THEN PROCLOAD
300 IF Z# = "D" THEN PROCCHANGE_DRIVE
310 IF Z# = "P" THEN PROCSTART_UP: PROCPL0T: VDUI
320 IF Z# = "L" THEN PROCPL0T_PLOT
330 IF Z# = "C" THEN PROCATALOGUE
340 IF Z# = "I" THEN PROCPOOL_TEXT
350 UNTIL Z# = "X"
360 VDUI2
370 VDUI2
380 END
390
400 DEF PROCATALOGUE
410 PROCN_WINDOW
420 CLS
430 PRINT "CATALOGUE of the current data disc"
440 PRINT STRING$(40, "-")
450 PRINT: PRINT
460 IF Drive# = "0" THEN #,0
470 IF Drive# = "1" THEN #,1
480 IF Drive# = "2" THEN #,2
490 IF Drive# = "3" THEN #,3
500 PRINT
510 ENDPROC
520
530 DEF PROCCHANGE_DRIVE
540 PROCN_WINDOW
550 CLS
560 PRINT "DATA - alter the drive number for data storage"
570 PRINT STRING$(40, "-")
580 PRINT TAB(0,5); "Current drive number is "; Drive#
590 PRINT TAB(0,7); "ENTER new drive number or"
600 PRINT "press <Return> to leave unchanged ";
610 Z# = GET#
620 IF Z# = CHR$(13) THEN #,0
630 IF Z# = "0" THEN Drive# = 0: GOTO 640
640 IF VAL(Z#) < 1 OR VAL(Z#) > 3 THEN VDUI: GOTO 590
650 Drive# = Z#
660 CLS
670 ENDPROC
680
690 DEF PROCSTART_UP
700 PROCN_WINDOW
710 PRINT SPC(17);
720 ENDPROC
730
740 DEF PROCRETURN
750 PRINT "Press <Return> to continue ";
760 # = GET#; IF # < > CHR$(13) THEN #,0
770 ENDPROC
780
790 DEF PROCEDIT_PLOT
800 PROCN_WINDOW
810 CLS
820 PRINT "EDIT current array"
830 PRINT STRING$(40, "-")
840 PROCN_W2
850 #FX,1
860 #FX,10
870 VDUI 2
880 VDUI 1,12,1,10,1,12
890 PRINT "I"
900 ENDPROC
910
920 DEF PROCPL0T_WINDOW
930 VDUI 29,0,24,30,0
940 ENDPROC
950
960 DEF PROCN_W2
970 VDUI 29,21,24,79,3
980 ENDPROC
990
1000 DEF PROCN_WINDOW
1010 VDUI 29,21,24,79,0
1020 ENDPROC
1030
1040 DEF PROCWRITE
1050 PROCINSTRUCTS("ELEMENT")
1060 PROCN_WINDOW
1070 CLS
1080 CL=0
1090 REPEAT
1100 PRINT STRING$(1, "I")
1110 INPUT LINE " " Z#
1120 IF Z# = "0" THEN #,0
1130 A$(CL) = Z#
1140 CL = CL+1
1150 UNTIL CL = ARRAYSIZE OR Z# = "0"
1160 CL = CL-1
1170 ENDPROC
1180
1190 DEF PROCINSTRUCTS(X#)
1200 PROCN_WINDOW
1210 CLS
1220 X = OPENUP X#
1230 REPEAT
1240 INPUTEV, Y#
1250 PRINT Y#
1260 IF NOT EDFEX THEN PRINT
1270 UNTIL EDFEX
1280 CLOSEX
1290 ENDPROC
1300
1310 DEF PROCPL0T
1320 ON ERROR GOTO 50
1330 CLS: Err# = F#
1340 FOR DL = 0 TO CL
1350 Err% = DL: Err# = Err%
1360 IF LEFT$(A$(DL),1) = "I" THEN NEXT DL
1370 IF LEFT$(A$(DL),1) = "." THEN PROCNACRO ELSE
PRINT A$(DL)
1380 NEXT DL
1390 VDUI2
1400 CLS
1410 ENDPROC
1420
1430 DEF PROCSAVE
1440 CLOSE0
1450 PROCN_WINDOW
1460 CLS
1470 PRINT "SAVE plot array to disc"
1480 PRINT STRING$(40, "-")
1490 PRINT TAB(0,3); "CHECK data disc is in drive "; Drive#
1500 PRINT TAB(0,5); "ENTER file name";
1510 INPUT " " N#
1520 IF LEN(N#) > 7 THEN VDUI: GOTO 1500
1530 F# = "1" + Drive# + ".X." + N#
1540 X = OPENUP(F#)
1550 PRINTEV, N#, CL
1560 FOR DL=0 TO CL
1570 PRINTEV, A$(DL)
1580 NEXT DL
1590 CLOSEX
1600 CLS
1610 ENDPROC
1620

```

WYCHWOOD

SOME PEOPLE make a fetish out of "good" programming. Computer academics run riot with the idea that any Goto instruction in a program should be erased as though it were a manifestation of the Devil himself. Other people have more laid back attitudes which do not necessarily help to produce tight, error proof, well documented programs that can be used by someone other than the author.

As usual, a sensible mid-point between the poles of opposing arguments seems to produce a good outcome; there are solid advantages in structuring a program so that the logic of the steps that the computer needs to follow is set out clearly and simply; while an occasional Goto, with a local destination and not crossing any exits from the segment of the program in which it is used, produces no confusion and can save space and effort.

I tend to write programs out of my head and the tidying up gets done later on when I have some idea that I can achieve what I want to do. That's the opposite of what you might be taught about "proper" computing but it's human and the end result may not be so bad. What you do need is a sense of the good structure at which you are aiming finally.

Figure 1 is a listing of Wychwood; a plotter control language for the BBC micro. I wrote the program originally because I wanted to control the sophisticated features of an Epson HI-80 plotter and that's quite difficult to do using Basic, spreadsheet programs or a word processor. The version listed here is adapted for the Oric-1/Tandy four colour plotter.

All computer languages allow you to construct a series of steps, or program instructions, that the computer will follow when the program is run. If you are writing a

language in Basic you need some way of inputting and storing the steps that the computer is to carry out.

It would be possible to enter each step at the keyboard, store the sequence on tape or floppy disc and then run the program by starting the tape and reading each instruction as it occurred. One obvious difficulty of this method is that all programming languages provide facilities to repeat a series of operations until a desired result is achieved.

With the program steps stored on tape you'll have to rewind the tape each time the program went round the loop. That seems a bit slow and perhaps boring — but it could be done.

Another method of holding the instructions that your language must follow is to place the program steps into a Basic array. Finding the start of the program is easy, to find the next instruction you need only increment a counter by one, and loops are easy to establish and run as you can alter the value of the counter to point to the instruction after the label that marks the start of the loop.

For example, Wychwood uses the array A\$ to hold the series of instructions that form a Wychwood program.

The idea of using an array to store the instructions that are to be carried out by Wychwood is fine so far as it goes. But first of all the program you have written to control a plotter will be lost when the power to the computer is turned off, and second, the BBC computer is comparatively short of space for very large arrays.

In fact, the second objection is a good thing because it leads to a neat solution which removes all practical limitations on the size of plotter control program you can write and gives

Figure 2.

```

WRITE      a new plot sequence
EDIT      the current plot array
STORE     the plot array to disc
READ      a plot array from disc

PLOT      the current array
LIST      the current plot array

CATALOGUE the current disc
DRIVE     alter the data drive

TEXT      spool array to text file

EXIT <X> to BASIC
Which C D E L P R S T W X

```

WYCHWOOD - Plot array editor

APPEND instructions to array

DELETE instruction

INSERT instructions into the array. Enter <Q> to exit the insert mode

MODIFY an instruction

EXIT <X> the editor to return to the MCL

```

1630 DEF PROCLOAD
1640 CLOSE0
1650 PROCN_WINDOW
1660 CLS
1670 PRINT "READ plot array from disc"
1680 PRINT STRING$(40, "-")
1690 PRINT TAB(0,3); "CHECK data disc is in drive "; Drive#
1700 PRINT TAB(0,5); "ENTER file name";
1710 INPUT " " N#
1720 IF N# = "" THEN PROCATALOGUE: PROCRETURN: GOTO 1640
1730 IF LEN(N#) > 7 THEN VDUI: GOTO 1700
1740 F# = "1" + Drive# + ".X." + N#
1750 FOR DL = 0 TO CL: A$(DL) = "" : NEXT DL
1760 Y = OPENUP(F#)
1770 INPUTEV, N#, CL
1780 PROCN_WINDOW
1790 CLS
1800 PRINT "Loading "; F#
1810 CL=0
1820 REPEAT
1830 INPUTEV, A$(DL)

```

```

1840 PRINT A$(DL)
1850 CL=CL+1
1860 UNTIL EDFEX
1870 CLOSEY
1880 CL = CL-1
1890 CLS
1900 ENDPROC
1910
1920 DEF PROCNACRO
1930 K = INSTR("1234567890ABCDEFGHIJKLMN", TITLE, SIZE0,
SIZE40% A$(DL))
1940 IF K = 0 THEN GOTO 2000
1950 IF K = 1 THEN RESTORE 4000: PROCX
1960 IF K = 8 THEN PRINT "C3"
1970 IF K = 14 THEN PRINT "C2"
1980 IF K = 18 THEN PRINT "C0"
1990 IF K = 23 THEN PRINT "D0"
2000 IF K = 29 THEN RESTORE 4000: PROCX
2010 IF K = 35 THEN PRINT "B0"
2020 IF K = 42 THEN PRINT "B1"
2030 ENDPROC

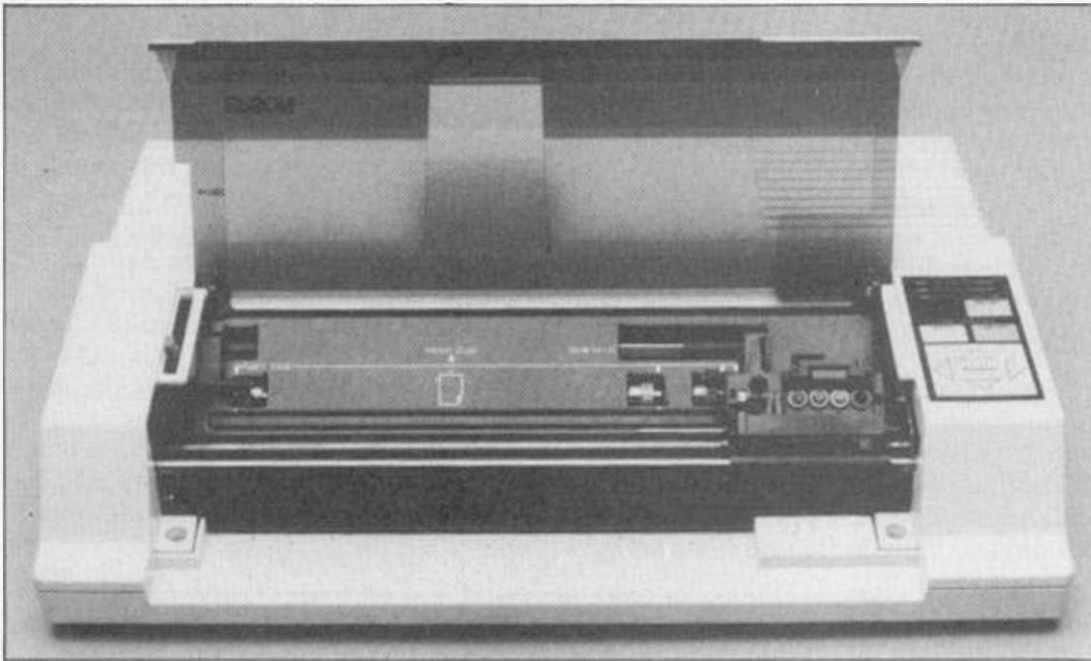
```

WOOD

John Dawson with Wychwood, a plotter control language for the BBC micro to control the features of the Oric-1/Tandy.

- array
- D Change the current data disc — default '1'
- P Send the contents of A\$ to the plotter
- L List the A\$ program array to a parallel printer
- C Display a catalogue of the current data disc
- T Produce a text file from the current A\$ array
- X Exit the Wychwood program to Basic

For my own education, I decided that I wanted to show different prompt messages and instructions on screen at various places in the program. It is inefficient to try to store these as part of the Basic program because the relatively large amounts of textual information seriously detracted from the data you can hold

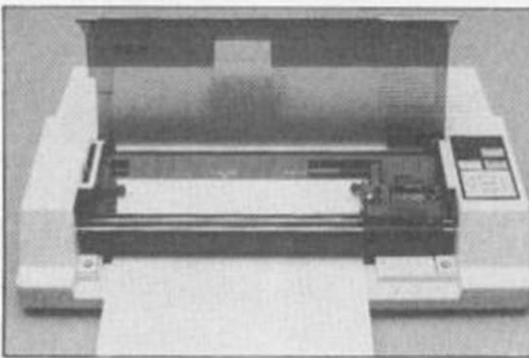


your programs a tidy, easy to understand structure. The solution does depend, however, on the use of a floppy disc drive.

In theory, you could use the program with one or two cassette decks but you lose the ability to find one out of a collection of files in a few milliseconds and that will make the program very frustrating to use.

Before you can "run" a Wychwood program, you need to be able to enter the instructions into the program array, save the program on a floppy disc and read it back into the computer. Nobody writes correct programs in one go and Wychwood has an editing facility that allows you to Modify, Delete, Insert and Append instructions to those already in the array. The functions available from the Main Command Level (lines 210-350) are:

- W Write a new program
- E Edit the contents of the A\$ program array
- S Store the A\$ array on disc
- R Read a program from disc into the A\$



in the machine at any one time.

This is a key difference between a program written for the BBC using cassette tape as its mass storage facility and the same machine fitted with disc drives. A cassette tape based program must hold the whole program in Ram at once unless you intend to Chain one section of the program after another. With floppy discs you can ready one file or another from disc just as often as you want.

(continued on next page)

```

2490 CLS
2490 FOR HL = PSTARTS TO PSTARTS+PDL
2500 PRINT STRING$(HL); " " ; A$(HL)
2510 NEXT HL
2520 ENDPROC
2530
2540 DEF PROCEDIT_COMMAND
2550 #FFA,1
2560 #MUD9,31,26,29,14
2570 CLS
2580 PRINT STRING$(40," ")
2590 PRINT "Select (A D I R E) "
2600 IF DL < PSTARTS THEN DL = PSTARTS
2610 IF DL > PSTARTS+PDL THEN DL = PSTARTS+PDL
2620 PRINT TAB(10,2); SPC(18)
2630 PRINT TAB(10,3); STRING$(DL); " " ; A$(DL)
2640 PRINT TAB(13,4);
2650 ZL = GET
2660 IF ZL = 136 THEN DL = DL-1; GOTO 2600
2670 IF ZL = 137 THEN DL = DL+1; GOTO 2600
2680 Z# = CHR$(ZL)
2690 #FFA,0
2700 ENDPROC
2710
2720 DEF PROCDELETE
2730 FOR EL = DL TO ARRAYSIZE-1
2740 A$(EL) = A$(EL+1)
2750 NEXT EL
2760 #ARRAYSIZE) = ""
2770 CL = CL-1
2780 ENDPROC
2790
2800 DEF PROCINSERT
2810 FOR EL = ARRAYSIZE TO DL STEP -1
2820 IF EL < 1 THEN GOTO 2840
2830 A$(EL) = A$(EL-1)
2840 NEXT EL
2850 CL = CL+1
2860 A$(DL) = ""
2870 CLS
2880 PRINT STRING$(40," ")
2890 PRINT "ENTER new instruction"
2900 IF DL < 1 THEN GOTO 2920
2910 PRINT TAB(10,2); STRING$(DL); " " ; A$(DL-1)
2920 PRINT TAB(10,4); STRING$(DL); " " ; A$(DL+1)
2930 PRINT TAB(10,3); STRING$(DL); INPUT LINE " " A$(DL)
2940 IF A$(DL) = "D" OR A$(DL) = "E" THEN PROCDELETE;
ENDPROC
2950 DL = DL+1
2960 GOTO 2810
2970
2980 DEF PROCMODIFY
2990 CLS
3000 PRINT STRING$(40," ")
3010 PRINT "COPY or MODIFY the current instruction"
3020 PRINT TAB(10,2); STRING$(DL); " " ; A$(DL)
3030 PRINT TAB(10,4); STRING$(DL); " " ; A$(DL+1)
3040 INPUT LINE " " E#
3050 IF E# = "" THEN ENDPROC ELSE A$(DL) = E#
3060 ENDPROC
3070
3080 DEF PROCPLIST_PLOT
3090 PROCPLN_WINDOW
3100 CLS
3110 IF A$(0) = "" THEN GOTO 3190
3120 PRINT TAB(10,6); "Enter page header (40 chars max)";
"";
3130 INPUT LINE " " T#
3140 IF LEN(T#) > 40 THEN VDU(7); GOTO 3100
3150 #FXS,1
3160 #FXA,0
3170 VDU 2
3180 PLS = 50; PPS = 1
3190 FOR EX = 0 TO DL STEP PLS
3200 PRINT SPC(10); T#;
3210 PRINT TAB(60); "Page "; PPS
3220 PRINT; PRINT
3230 FOR JL = 0 TO PLS-1
3240 PRINT SPC(10); STRING$(DL+JL);
3250 PRINT TAB(16); A$(DL+JL);
3260 IF A$(DL+JL) = "" THEN GOTO 3270
3270 NEXT JL
3280 VDU 1,12
3290 VDU 3
3300 CLS
3310 PPS = PPS+1
3320 PRINT TAB(10,6); "Press (RETURN) to continue"
3330 Y# = GET#; IF Y# < CHR$(13) THEN GOTO 3350
3340 CLS
3350 VDU 2
3360 NEXT EX
3370 VDU 3
3380 GOTO 3420
3390 CLS
3400 VDU(7); PRINT "PLOT ARRAY EMPTY "
3410 FOR DELAYS = 0 TO 1000; NEXT DELAYS
3420 PROCPLN_WINDOW
3430 ENDPROC
3440
3450 DEF PROCPOOL_TEXT
3460 #DELETE T,DEFAULT
3470 PROCPLN_WINDOW
3480 #SPOOL T,DEFAULT
3490 PROCPLN_PLOT
3500 #SPOOL
3510 ENDPROC
3520
3530 DEF PROC_ELEMENT
3540 CLOSE#0
3550 F# = "1:Drive#"; T# = A$(DL)
3560 E# = OPEN$(F#); S# = F#; ERR# = 0
3570 REPEAT
3580 Char# = GET$(E#)
3590 Char# = CHR$(Char#)
3600 PRINT Char#;
3610 ERR# = ERR#+1
3620 UNTIL EOF$(E#)
3630 CLOSE# E#
3640 ENDPROC
3650
3660 DEF PROCXX
3670 READ J#
3680 FOR HL = 1 TO J#
3690 READ COM#
3700 PRINT COM#
3710 NEXT HL
3720 ENDPROC
3730
3740 DEF PROC_UNTIL
3750 Loop# = Loop#-1
3760 IF Loop# > 0 THEN DL = Repeat# ELSE ENDPROC
3780 ENDPROC
3790
3800 VDU 3
3810 VDU 26
3820 VDU 12
3830 PRINT TAB(10,1); "PROGRAM FAULT " ; VDU 7
3840 PRINT TAB(10,4); "Fault in line number " ; E#
3850 PRINT TAB(10,6); "Fault number " ; E#
3860 PRINT; PRINT; PRINT
3870 PROCRETURN
3880 CLOSE#0
3890 CLS
3900 GOTO 210
3910
3920 VDU 3
3930 VDU 26
3940 VDU 12
3950 PRINT "A fault has occurred while
interpreting a file"
3960 PRINT; PRINT "The filename is: " ; IERR#
3970 PRINT; PRINT "The fault occurred in line number:
" ; IERR#
3980 PRINT; PRINT; PRINT
3990 PROCRETURN
4000 CLOSE#0
4010 CLS
4020 GOTO 210
4030
4040 REM Commands for Oric-1 plotter
4050 DATA 5,1,"R10,0","X1,15,20","R10,0","X0,-20,20"
4060 DATA 4,C1,S2,"R800,0",01

```

```

2040
2050 K = INSTR("INCL,INCV,SETV,SETV,LOOP", LEFT$(A$(DL),5))
2060 IF K = 0 THEN 2170
2070 V# = LEN(A$(DL))-5
2080 X# = RIGHT$(A$(DL),V#)
2090 Y# = VAL(X#)
2090 IF K = 1 THEN X# = X#+Y#
2100 IF K = 8 THEN Y# = Y#+X#
2110 IF K = 11 THEN X# = X#Y#
2120 IF K = 16 THEN Y# = X#Y#
2130 IF K = 21 THEN Loop# = X#Y#
2140 ENDPROC
2150
2160 K = INSTR("REPEAT,UNTIL", A$(DL))
2180 IF K = 0 THEN PROC_ELEMENT
2190 IF K = 1 THEN Repeat# = DL
2200 IF K = 8 THEN PROC_UNTIL
2210 ENDPROC
2220
2230 DEF PROCEDIT_PLOT
2240 PROCINSTRUCT("EDITOR")
2250 PDL = 15

```

```

2260 PSTARTS = 0
2270
2280 REPEAT
2290 PROCDISPLAY_PAGE
2300 PROCEDIT_COMMAND
2310 IF ZL = 136 THEN PSTARTS = PSTARTS+10; DL = DL+10
2320 IF ZL = 137 THEN PSTARTS = PSTARTS-10; DL = DL-10
2330 IF PSTARTS > ARRAYSIZE THEN PSTARTS = ARRAYSIZE-10; DL = PSTARTS
2340 IF PSTARTS < 0 THEN PSTARTS = 0; DL = PSTARTS
2350 IF Z# = "A" THEN DL = DL+1; PROCWRITE; PROCINSTRUCT("EDITOR")
2360 IF Z# = "D" THEN PROCDELETE
2370 IF Z# = "E" THEN PROCINSERT
2380 IF Z# = "R" THEN PROCMODIFY
2390 UNTIL Z# = "X" OR Z# = "A"
2400 Z# = ""
2410 PROCPLN_WINDOW
2420 CLS
2430 ENDPROC
2440
2450
2460 DEF PROCDISPLAY_PAGE
2470 PROCPLN_WINDOW

```

(continued from previous page)

ProcInstructs (lines 1190-1290) sets up a text window on the left hand side of the VDU, clears the screen and then reads a sequential text file, printing it to the screen until the End of File marker is reached.

Having loaded the instruction file, the remainder of the procedure to write a new Wychwood program is pretty straightforward. The program line number is printed by line 1100 and line 1110 accept into Z\$ any alphanumeric characters that you type on to the keyboard. This is important because many plotter commands contain commas which will terminate the normal Basic Input instruction — pages 277 and 278 in the BBC User Guide.

Wychwood has the facility to turn the contents of the A\$ Basic array into a text file. The Wychwood Main Command Level loop will go (if you press T — line 340) to Procspool_Text. Procspool_Text deletes the old file 'T.DEFAULT' on the program disc and then prints the program instructions currently held in memory to a new text file 'T.Default' in lines 3480 and 3490.

The plotter is not turned on because Procstart_Up is not called before Procplot. The next stage has to be done manually when you copy the default file from the program disc to the data disc, if you are using two disc drives, and then rename the file to the name of whatever element it will form in the final program.

Because Procspool_Text calls Procplot, which will read existing element text files in the course of printing out a plotter program, it is possible to repeat this process more than



once, increasing the size of the text file each time.

My BBC micro is fitted with version 2 of the Basic interpreter and that means that the Openup instruction should be replaced by Openin for those people working with Basic 1.

Wychwood has changed since last month and the interpreter procedure — Procplot — has grown as I have added new commands to the Wychwood repertoire. In order to make the program easier to adapt to different plotters I have written a new procedure — Proccx — which reads the low level commands that are to be sent to the plotter when a high level program instruction is encountered.

AXIS-1

for example, restores the data pointer to line 4050 and then reads five commands from the data in the line. This method concentrates the data that will need changing when the program is adapted to a different plotter, in one place.

The program is incomplete and must be structured to some extent to suit the particular needs of an individual. Nevertheless, the procedures for writing and editing the contents of a single dimension array, and storing and retrieving the array on floppy discs are complete and working well. Additionally, the program

can display large quantities of information to guide the user when Wychwood is operating.

An interpreter of this sort can be used for many purposes, not just for controlling a plotter, and, because it is written in Basic, it is very easy to extend or modify the actions that will be carried out when a particular instruction is executed. The speed of execution should be entirely adequate for many domestic tasks as well as some applications in school laboratories.

Extracting parameters from the text strings in a single element array is not impossible but tends to be a clumsy business using Basic. If the machine you wish to control, an astronomical telescope or an automatic heating and watering system in a greenhouse, for example, requires a fixed number of parameters associated with each instruction, you may find life far easier if you use a multi-dimension array to store the program.

You could use a single dimension string array to store the instruction name and a two or three dimension integer or real array to hold the parameters. The program pointer will identify the current elements in each array, linking the instruction name to its associated parameters or values.

If, to save typing and additional work to create the Command, Element and Editor files, you would like a copy of Wychwood as it is listed in this article with the additional files, write to me at *Your Computer* enclosing your return address in block capitals, a note of whether you want the program on a 40 or 80 track disc and a cheque for £5.75 to cover the cost of the disc, post, packing and copying.

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**Galaset Ltd, 30 Bayford Road,
Littlehampton, West Sussex.**

COMMODORE 64, BBC AND SPECTRUM

```

5 REM  HEX LOADER FOR CBM 64  FIG.1
6 REM
10 FOR I=680 TO 727:READA:POKEI,A:T=T+A
20 NEXT I:IF T=6716 THEN GOTO 100
30 PRINT"ERROR IN DATA":T=6716:END
40 DATA 169,1,133,186,169,1,133,184
50 DATA 133,185,169,8,133,183,169,208
60 DATA 133,187,169,2,133,188,169,56
70 DATA 133,251,169,199,133,252,169,251
80 DATA 162,231,160,206,32,216,255,96
90 DATA 68,79,87,78,76,79,65,68
100 SA=51000:LA=52855
110 INPUT"START ADDRESS";A
120 IF (A<SA) OR (A>LA) THEN GOTO 140
130 IF A/8=INT(A/8) THEN GOTO 150
140 PRINT"PRINT ADDRESS ERROR":GOTO 110
150 T=(A-32768)AND255:PRINTA:INPUTD#
160 IF D#="END" THEN GOTO 900
170 IF LEN(D#)=20 THEN GOTO 190
180 PRINT"WRONG LENGTH":GOTO 150
190 FOR B=0 TO 7:BF=MID$(D#,2*B+1,2)
200 GOSUB 300:IF E=1 THEN GOTO 280

```

```

210 POKE A+B,D:T=T+D:NEXT
220 BF=MID$(D#,10,3):GOSUB 300
230 IF E=1 THEN GOTO 280
240 IF T=D THEN GOTO 260
250 PRINT"CHECKSUM ERROR":GOTO 150
260 A=A+B:IF A<LA THEN GOTO 150
270 GOTO 800
280 PRINT TAB(8+2*B,D)C#;"?"
290 B=B:NEXT:GOTO 150
300 E=0:D=0:FOR N=1 TO LEN(B#)
310 C#="MID$(B#,N,1):GOSUB 400
320 IF E=1 THEN D=N:N=4:NEXT:RETURN
330 D=D*16+X:NEXT:RETURN
400 X=ASC(C#)-48:IF X<0 THEN E=1:RETURN
410 IF X<10 THEN RETURN
420 X=X-7:IF X<10 THEN E=1:RETURN
430 IF X>15 THEN E=1
440 RETURN
500 H#="0123456789ABCDEF"
510 FOR A=SA TO LA:STEP 8
520 PRINT A;" ";T=(A-32768)AND255
530 FOR B=0 TO 7:X=PEEK(A+B):GOSUB 600
540 T=T+X:NEXT:PRINT";"
560 Y=INT(T/256):PRINT MID$(H#,Y+1,1)
570 X=255 AND T:GOSUB 600:PRINT
580 NEXT:GOTO 900
600 PRINT MID$(H#,INT(X/16)+1,1)
610 PRINT MID$(H#,1+(XAND15)+1):RETURN

```

THE PROGRAMS given here will enable Spectrum, BBC, and CBM-64 owners to download via *Your Computer's* Telsoft service. Each month for each machine we transmit at least one — and usually two — of the main programs appearing in the current issue. Also available is the full user to user communications program, Dialsoft.

So far OE LTD's Telemod 2 and the VTX 5000 modems have been tested with the BBC and Spectrum but the service also works with

```

800 SYS 680:C#="CHR$(34)
810 PRINT PRINT" TO RECORD CODE "
815 PRINT PRINT" LOAD"C#;"DOWNLOAD"
820 PRINTC#",1,1 (RETURN)"
825 PRINT PRINT" THEN TYPE NEW"
830 PRINT" (RETURN)"
835 PRINT PRINT"TO RUN THE PROGRAM"
840 PRINT" SYS 51000 (RETURN)"
900 PRINT PRINT"1 ENTER DATA"
910 PRINT PRINT"2 PRINT DATA"
920 PRINT PRINT"3 SAVE DATA"
930 INPUT Z ON Z GOTO 100,500,800

```

```

51000 ? A9068D21D06D20D0=3E2
51008 ? A90F8D8602A90E20=2E4
51016 ? D2FFA9008D15D0A9=4DD
51024 ? FF8D8A02B8E92CE=510
51032 ? 20CAC920C7CB20F8=4D5
51040 ? CADD80CEC931F023=532
51048 ? C935F014C936D006=43F
51056 ? 208EC74C5BC7A914=410
51064 ? 20D2FF202FC8D0DB=52E
51072 ? 203FC8A92020D2FF=461
51080 ? 4C93C94C4AC82063=411
51088 ? CC2022CDA95B85F0=4F1
51096 ? A9CE85FE2029CDA0=547
51104 ? 002095CC202FCBC9=404
51112 ? 44F00BC954D0ED20=4E1
51120 ? D2FFA901D007A944=4EF
51128 ? 20D2FFA90085B8A2=4B9
51136 ? 25CDA90820A0BCA9=4A3
51144 ? BD85FDA9CDB5FEA0=6A0
51152 ? 002095CC2025CD20=383
51160 ? 95CC9848A0048C83=4CC
51168 ? CE20D8C968A92025=4C4
51176 ? CD2095CC9848A906=4C5
51184 ? 8D83CE20D8C9ADA7=5E3
51192 ? CE85FBAD88CE85FC=6EA
51200 ? 68A82060CB9A9185=38A
51208 ? B985B998A293A0CE=539
51216 ? 208DFFA9A9CEACAA=567
51224 ? CEE8D001C82025CD=479
51232 ? A9FB20D8FF20F1CB=597
51240 ? 6020D9CC90D000B=3FE
51248 ? A90085C7A92020D2=3E0
51256 ? FFA90D20D2FF60A9=4E7
51264 ? 0D2029C8A90D00D=306
51272 ? FF602063CCA000A9=43F
51280 ? FF9993CEC8D0FA20=5FB
51288 ? D2CB90FB20D2CBB0=5ED
51296 ? FB8D72CEA0008C7C=4D0
51304 ? CE8C7DCE202ECCAD=4D4
51312 ? 72CE29F0C98D0E4=5C6
51320 ? 20D2CBB0DA9973CE=599
51328 ? C8202ECC00A909F0=4EB
51336 ? A008AD76CE298D0=492
51344 ? 0FA52B85FB18A52C=3D8
51352 ? 6D75CE85FC4CAAC8=587
51360 ? AD78CE85FBAD79CE=607
51368 ? 85FC20D2CBB0A820=55E
51376 ? D9CC20D2FFC820D9=607
51384 ? CC202ECC0010D0EA=528
51392 ? A92020D2FFAD75CE=56A
51400 ? 202CE2D2D2CBB087=4D7
51408 ? CD7CCE00B9A9520=503
51416 ? D2FF2030C84C57C=52C
51424 ? 20D2CBB0F8CD7DCE=65D
51432 ? D0EBAD75CEA88993=697
51440 ? CED00E2030C8A991=4EE
51448 ? 20D2FF4C7EC94C57=51F

```

```

51456 ? C8A0008C70CE8C7D=447
51464 ? CE20D2CBB0F091FB=5BF
51472 ? 202ECC00C77CE10=4D3
51480 ? F020D2CBB0E9CD7C=59E
51488 ? CEF00A995820D2FF=4D8
51496 ? 4C57C920D2CBB0CE=4CE
51504 ? CD7DCEFA0034C23C9=473
51512 ? 20ACC82030C8A075=409
51520 ? CEA8A9009993CEAD=506
51528 ? 84CEC902D02520BC=436
51536 ? CB9A820F3CB9A955=568
51544 ? 2016CDA95020F3CB=432
51552 ? 20C7CBAC73CEC888=54F
51560 ? B993CEAD02398D0F7=5D4
51568 ? 4C5BC7A9552016CD=3DF
51576 ? 20F1CB4C6309AC77=4EF
51584 ? CE20D2CBB0D0FA20=57D
51592 ? D2CB20D2C84C47C9=53E
51600 ? 4C5CC8A52B85FB85=4F5
51608 ? 2C85FCA000B1FB99=52A
51616 ? 2200C8B1FB8523F0=4CE
51624 ? 0BA52285FBA52385=447
51632 ? FC4C98C918A95FB6=97D
51640 ? 0262D852F8531A5=57B
51648 ? FC6900952E853085=412
51656 ? 32602063CCA9028D=3E1
51664 ? 84CEA90B0D02DE60=4A9
51672 ? 8E81CE8C82CE2020=533
51680 ? A9098D0CDE202FCB=4D4
51688 ? C914F016C90DF051=4E2
51696 ? C924D01920D2FF0D=544
51704 ? C3CE84CE5C9E000=64B
51712 ? D0E3E000F0DF20D2=554
51720 ? FFC84CE5C9930990=554
51728 ? D4C93A901548ADC3=444
51736 ? CEC924F004684CE5=460
51744 ? C968C941908FC947=48A
51752 ? B0BB20D2FF38E930=4D5
51760 ? C90A9002E907E005=36A
51768 ? F0A89DC3CE84CE5=61A
51776 ? C9E000F0A0E001D0=52A
51784 ? 07ADC3CEC924F095=4FF
51792 ? A92020D2FFA9FF9D=54F
51800 ? C3CEA2008CEFCBE=544
51808 ? D0CE8ED1CE8ED2CE=659
51816 ? ADC3CE8ED1CE8ED2CE=659
51824 ? 0F8DCDCE85BDC3CE=5DD
51832 ? C9FFF01D20CBA80=5B2
51840 ? 8DCFC8A9006DD0CE=524
51848 ? 8DD0CE8B020E84C75=534
51856 ? CADDCEFC8C83CE99=642
51864 ? A3CEC8AD00CE99A3=660
51872 ? CEC8188C83CEC82=561
51880 ? CEAE81CE602025CD=4ED
51888 ? A200BD41CEC921F0=500
51896 ? 0720D2FF84CBACA=570
51904 ? 4CDEC9ADCCE8DCE=65E
51912 ?

```

```

51920 ? CEADCFCE8DD1CEAD=6C1
51928 ? D0CE8DD2CE18AD01=639
51936 ? CE6D0CE8D0CFCEAD=68F
51944 ? D2CE6DD0CE8DD0CE=6BE
51952 ? B005CECECE8D0E660=625
51960 ? 20630CA90F8D0602=414
51968 ? A95185FDA9CDB5FE=575
51976 ? A000209DCC2025C0=343
51984 ? 209DCC209DCC209D=3DF
51992 ? CC2022CD20A9CC20=3A8
52000 ? 95CC2022CD2095CC=411
52008 ? 202FCB20D2FF608E=421
52016 ? 81CE8C82CE2069CC=480
52024 ? 20ECCD20CACC9000=48F
52032 ? D00D20F0DCC931F0=4F0
52040 ? 062001CC4C35CB8D=314
52048 ? 00CE8E81CEAC82CE=597
52056 ? 60AE92CE9A4C5BC7=4CE
52064 ? 202CD9A2285FDA9=465
52072 ? CE85FEA0002095CC=4DA
52080 ? 2025CD9A00FA9209=393
52088 ? 93CE88D0FA8D93CE=619
52096 ? 202FCBC914D010C0=417
52104 ? 00F0F520D2FF88A9=58F
52112 ? 209993CE4C80CB9=50A
52120 ? 0DF00B20D2FF9993=48D
52128 ? CEC8C010D0DA920=579
52136 ? 20D2FF60A92020D2=4B4
52144 ? FFA94F20D2FFA94B=58C
52152 ? 20D2FF60A9138D00=452
52160 ? DE9120D0CE8E0A9=4CD
52168 ? 538D00DEA9528D00=40E
52176 ? DE60A996188D87CE=547
52184 ? 8C82CE8C82CE2004=4D4
52192 ? CC20ECC08E87CE0D=677
52200 ? 02396020FDCB0EE=509
52208 ? 60A9FA8C82CE820=597
52216 ? 04CC88D0FAAC82CE=616
52224 ? 602004C08A2A8CA=3EE
52232 ? 0FD9A2069CC6020=454
52240 ? 25CD9A9220A8CC20=364
52248 ? 95CCAD8E8CE20D2FF=573
52256 ? A92020D2FFA90320=3A6
52264 ? ABC20D8C960AD7D=48A
52272 ? CE8D7DCEA208AD7D=4AA
52280 ? CE2A9010AD7DCE49=411
52288 ? 088D7DCEAD7DCE49=460
52296 ? 108D7DCE2E7DCE2E=3D5
52304 ? 7DCEAD0E160A000=516
52312 ? A9009900D4C8C018=40E
52320 ? D0F660A99320D2FF=5B3
52328 ? 6048A9A2290F01F=37E
52336 ? A5D448A5A22910F0=4A1
52344 ? 05A9A44C80CC920=42B
52352 ? 20D2FFA90085D4A9=51C
52360 ? 9D20D2FF6885D468=53F
52368 ? 6020D2FFC8B1FDC9=620
52376 ? 21D0F6C8602025CD=4B9

```

```

52384 ? A90C20A8CC2095CC=46D
52392 ? 60A9058E81CEAAA9=4E6
52400 ? 2020D2FFCAD0FAAE=503
52408 ? 81CE60C914FA08C9=505
52416 ? 7FF00160A91460A9=456
52424 ? 7F6020E4FFC9C190=504
52432 ? 07C9DBB00338E960=4FF
52440 ? 60C94190CE95B90=494
52448 ? 08C9619006C97BB0=49C
52456 ? 02492060488A4808=2D5
52464 ? 20E1FFD0034C59CB=533
52472 ? 2868A8680AD00DE=485
52480 ? 49016A9003A90060=250
52488 ? AD01DE6048AD00DE=3C7
52496 ? 49026A6A6860200C=223
52504 ? CD80FB8D01DE20CE=508
52512 ? CC602025CD2028CD=373
52520 ? A90D20D2FF60A829=3A0
52528 ? F06A6A6A6A930C9=3CA
52536 ? 3A300318690720D2=21F
52544 ? FF68290F0930C93A=31B
52552 ? 300318690720D2FF=21F
52560 ? 60444F574E4C4F41=2C4
52568 ? 44204D454E552131=243
52576 ? 2020202545434549=228
52584 ? 5645213520202045=1FE
52592 ? 58495420544F2042=28A
52600 ? 4153494321362020=22F
52608 ? 2053415645204259=28A
52616 ? 5445532128205553=285
52624 ? 4520122053544F50=26D
52632 ? 209220544F205245=2C4
52640 ? 5455524E20544F20=2CC
52648 ? 4D454E5520292145=28C
52656 ? 4E54455220415454=2F9
52664 ? 4245522021494620=281
52672 ? 4144445245535320=2E6
52680 ? 495320494E204845=2C8
52688 ? 582C119D9D9D9D9D=476
52696 ? 9D9D9D9D9D9D9D9D=5C0
52704 ? 9D9D9D9D9D9D9D9D=5C0
52712 ? 4958205749544820=305
52720 ? 2421535441524420=2E3
52728 ? 4144445245535320=236
52736 ? 464F522041524541=220
52744 ? 202146494E414C20=1D3
52752 ? 4144445245535320=236
52760 ? 464F522041524541=238
52768 ? 202150524F475241=22C
52776 ? 4D205449544C4520=237
52784 ? 284D415820313620=1E5
52792 ? 4348415227532920=219
52800 ? 21124E45F54205641=21B
52808 ? 4C4944922C205452=2A5
52816 ? 5920414741494E20=249
52824 ? 3A20214449534320=216
52832 ? 4F52205441504520=26B
52840 ? 2820442F54202920=1E0
52848 ? 3F21000000000000=0D0

```

TELSOFT



A reminder of how to use the Telsoft service.

a number of other makes. For the CBM-64 it will initially only be available with the OEL Comms pack together with the Telemond 2 or similar modem; later we hope to adapt the service to work with Commodore's modem.

To enter the download program first type in the hexloader for your machine — figure 1 — and then enter the machine code — figure 2. Once the program has been saved you can run it by entering CALL &6000 on the BBC, SYS 51000 on the CBM 64, RANDOMIZE USR

60000 on the Spectrum.

To find out what is available and how to receive software dial up Colchester (0206) 8068. This audio recorded information line will also advise you which telephone numbers to ring for the 300 and 1200 bit/s services.

When a program you want to download is on line, make sure your modem is set up and dial the number appropriate to its speed. As soon as you hear the modem tones switch the modem to line and replace the receiver. Select

Option 1 from the menu — Receive. After a block of data is received you will see "OK" printed if there are no errors, otherwise the program will wait for the blocks to come round again. When the "Program loaded OK" message appears return to the Telsoft menu and select Option 5. You can now save and run the program.

Note that CBM-64 owners will need to use Option 6 if machine code is to be saved.

Figure 1. BBC.

```
10 REM BBC HEX CODE LOADER
15 HIME=569FF
20 CLS:PRINT
30 INPUT "START ADDRESS (Hex)";A#
40 A=EVAL("&"+A#)
50 IF A>=6F7 THEN 200
60 IF A<=2A00 OR A>=6FE7 THEN 20
```

```
70 PRINT "A"
80 INPUT "I";B#;C#
90 IF LEN(B#) <> 16 THEN 50
100 T=0
110 FOR N=0 TO 7
120 X# = MID$(B#,2*N+1,1); GOSUB 300
130 IF E=1 THEN 260
140 X# = MID$(B#,2*N+2,1); GOSUB 300
150 IF E=1 THEN 260
```

```
160 B# = EVAL("&"+MID$(B#,2*N+1,2))
170 "A=B#A+A+1:T=T+B
180 NEXT
190 FOR M = 1 TO LEN(C#)
200 X# = MID$(C#,M,1);GOSUB 300
210 IF E = 1 THEN A=A+1; GOTO 260
220 NEXT
230 IF T = EVAL("&"+C#) THEN 50
240 PRINT "CHECKSUM ERROR !"
```

```
250 A=A-B;GOTO 50
260 PRINT "TYPING ERROR !"
270 A=B*(A DIV B);GOTO 50
280 *SAVE "DOWNLOAD" 6000,6F7
290 END
300 E=B:IF ASC(X#)<40 THEN E=1:RETURN
310 IF ASC(X#)<50 THEN RETURN
320 IF ASC(X#)<65 THEN E=1:RETURN
330 IF ASC(X#)>71 THEN E=1
340 RETURN
```

Figure 2. BBC.

```
6000 1A9CB0A0FEA20120F4,4C6
6001 1FF20616C20406DC9,38A
6002 131F00BC934F0E9C9,4C8
6003 135F0064C0C6A4C47,200
6004 16AA90C20E3FFA9E8,4B2
6005 1A000A2FF20F4FFA9,4FD
6006 103A20020F4FFA902,363
6007 1A20220F4FFA9C0A0,4C8
6008 1FEA20020F4FF60A9,4BC
6009 10C20E3FF20F760A9,439
6010 15A20120F4FFA000,3E8
6011 1A9FF0099056F0DFA,507
6012 1A915A20120F4FF20,394
6013 10C6C90FB200C6C00,34B
6014 1FBA0000477047004,416
6015 179047A8478057020,38B
6016 105A00047829F0C900,4B9
6017 108E2200C6C000099,46B
6018 17100C020056DC009,364
6019 100F0000065742900,422
6020 10000A51C057610A5,454
6021 10A5730577200C6,209
6022 1000520E3FFC02005,524
6023 106C0100F0A057320,435
6024 1B26D200C6C000A0C5,3CC
6025 17AF000A95020E3FF,47B
6026 120E7FF4C676200C,44C
6027 16C000C570F000A9,39F
6028 15820E3FF20E7FF4C,44C
6029 1676AA573A009056F,43E
6030 1D00E20E7FFA90020,38B
6031 1E3FF4C836A4C676A,469
6032 1A000047A0470200C,2C9
```

```
6000 16C00F2917620056D,477
6001 1C0C475D0F1200C6C,45A
6002 100E3C57AF000A950,4CE
6003 120E3FF20E7FF4C67,40B
6004 16A200C6C00CF57B,3C1
6005 1F000A95020E3FF4C,447
6006 1676A20C76020E7FF,429
6007 1A573A0A90099056F,3F6
6008 1A50AC90200502007,419
6009 160A9C820556CA955,30B
6010 120306EA90200556C,298
6011 1A915A20120F4FF20,394
6012 1F760A471C0000905,505
6013 16FD0519000F7A90C,444
6014 120E3FF20A50495A,437
6015 10502A96F0503A907,3D7
6016 120006E20F06D20A0,20B
6017 16DA90520006EA900,2DA
6018 120E3FF20F06DA902,502
6019 120E0FF4C0C6A955,38F
6020 120306EA99A20056C,20E
6021 14C6A6AA475200C6C,2D2
6022 10000FA200C6C200C,316
6023 16C4C406A4C6CA0A9,336
6024 12020E3FFA95F20E3,43D
6025 1FFA96B20E3FF60A9,51E
6026 19CA000A60A000200,41E
6027 100A21320FAFFA212,307
6028 120F4FF60A29720F4,4C0
6029 1FFA29620F4FF60A9,553
6030 19CA000A60A000200,41E
6031 1EBA25320FAFFA252,4E7
6032 120F4FF6010A99056F,43E
6033 10F847EA991A20020,38B
6034 1F4FF000907EA0005,444
6035 1A604C0C6AA47E20,2D4
```

```
6040 1496CC60F00023060,374
6041 1A50AC90200620779,369
6042 16E00EC00A991A201,447
6043 120F4FF90A47E000F,55C
6044 1600AA2D2CAEBCA00,5AA
6045 1FBAA00A900047E00,450
6046 120496C0000FAA47E,449
6047 160A9E0000A2FF20,452
6048 1FAFA900050AA90C,460
6049 120E3FF20A06DA904,3E4
6050 120006EA9090502A9,2F0
6051 16F0503A00020F06D,39C
6052 1201560C941F000C9,372
6053 142F011C943F0174C,3A0
6054 1616CA900A20120F4,335
6055 1FF4C0B76CA900A203,3C4
6056 120F4FF4C0B76CA900,433
6057 1A20420F4FFE60A05,4CE
6058 120E3FF3FFA47E20A0,46B
6059 160A90020006E20F0,2C4
6060 160A017201560C941,200
6061 1F000C942F011C943,413
6062 10F174C616CA9007A2,372
6063 10120F4FF4C0B76DA9,37F
6064 107A20320F4FF4C0B,314
6065 16DA907A20420F4FF,3D6
6066 1E60A050AC7000009,443
6067 1A9E0A000A20120F4,3E0
6068 1FFA57C20E3FF20E3,495
6069 16C20536C0200A06D,2E3
6070 1A90520006E20F06D,2C1
6071 120A06DA90520006E,274
6072 120F06D20A06DA905,36B
6073 120006E20F06D20A0,2DE
6074 160047EA90320006E,2A9
6075 1A9D220E0FF057C60,40B
```

```
6080 1A90C20E3FF20A06D,3EF
6081 1A90720006EA99A05,306
6082 102A96E0503A00020,361
6083 1F06D20A06D20996D,3C0
6084 120996D20996D20A0,317
6085 16020A06DA9022000,270
6086 16020A06DA9022000,270
6087 16020A06DA9022000,270
6088 1E7FFA90220E0FF40,500
6089 1A90FA20020F4FF60,3D5
6090 160A90020006E20F0,2B7
6091 16020A06D0620A06D,33A
6092 120A06D20E7FF20E7,445
6093 1FF0A029F06A06A,3FE
6094 160A930C93A000310,1F1
6095 1690720E3FF60290F,312
6096 10930C93A00031009,1F0
6097 10720E3FF60A57005,3AE
6098 170A200A570A2000C,30B
6099 1A570A9000570A57A,390
6100 14910057A267A2670,299
6101 1CA00E0A020E3FF0C,5AC
6102 1B102C90000F06C00,4F7
6103 10670DAAA92020E3FF,470
6104 1C0DF0A067060C97F,55F
6105 10000A900620F4FF0,4FD
6106 100F012A977C92000,3C3
6107 10EC900F000A9000F,3A1
6108 106C907F000A20000,2D1
6109 1057C0670047EA991,440
6110 1A20120F4FFA903A2,404
6111 10720F4FFA996A200,403
6112 120F4FF9029020F4,40A
6113 1A47CA997A20920F4,41F
6114 1FFA903A20420F4FF,464
6115 1A991A20020F4FF0,49F
```

Figure 1. Spectrum.

```
5 REM SPECTRUM 40k
10 REM Hex Code Loader
15 CLEAR 59000
20 POKE 23650,0: CLS: PRINT
30 INPUT "Start Address";A
50 IF A>=1135 THEN GO TO 200
60 IF A<=0000 THEN GO TO 20
70 PRINT A;
```

```
80 INPUT "I";I#;J#
85 IF B#="END" THEN GO TO 200
90 IF LEN(B#) > 20 THEN GO TO 260
100 LET t=INT(A/256)
110 FOR N=0 TO 7
120 LET X# = B#(2*N+1 TO 2*N+1)
125 GO SUB 300: LET Y# = X#
130 IF E=1 THEN GO TO 260
140 LET X# = B#(2*N+2 TO 2*N+2)
145 GO SUB 300: LET Y# = X#
```

```
150 IF E=1 THEN GO TO 260
170 POKE A,Y: LET A=A+1
180 LET t=t+Y: NEXT N: LET Y=0
190 FOR M=1 TO 3
200 LET X# = B#(17*M TO 17*M)
205 GO SUB 300: LET Y# = X#
210 IF E=1 THEN LET A=A+1: GO TO 260
220 NEXT M
230 IF t=Y THEN PRINT "I";I#;J#; GO TO 50
```

```
240 PRINT "Checksum Error"
250 LET A=A-B: GO TO 50
260 PRINT "Typing Error"
270 LET A=INT(A/8): GO TO 50
280 SAVE "download" CODE 60000,1136
290 POKE 23650,0: STOP
300 LET E=0: LET X# = CODE X#-40-7*(X#>9)
310 IF X# < 0 OR X# > 15 THEN LET E=1
320 RETURN
```

Figure 2. Spectrum.

```
60000 1CD15EDC307ECCD15,4C7
60001 1EDCD36ECCD06EDCD,631
60002 150EDCD047EE30FBCD,5AF
60003 10BEDFE31CA900A6,69A
60004 135CA07EAC366EACD,5D0
60005 115ED3EACD04EDCD,5FD
60006 115EDC9CD15EDC366,553
60007 1E0C66ED11E5EE06,50C
60008 1A0CEFF121310FCCD,45B
60009 115E11CD0E06173E,3D2
60010 120121310FCCD1FD,3DA
60011 100F00D50EDCD1FD,30B
60012 130F03265EF3E0032,3E9
60013 10CF326FEF3270EF,544
60014 13665EFCDE0ECC3A65,5A1
60015 1E0A60F0E0020E0E,627
60016 1091165EFC01FDDA,501
60017 1AAEA1312CE0E00,552
60018 120F23A69EFE60020,51A
60019 1002140C3A60E00E,36C
60020 1004709226E0E00E,1DA
60021 1110E0CD1FED309A,47F
60022 112130CDE0E079FE,45C
60023 1020F03A60E0CDB1,447
60024 1ECCD1FEDDAAEA21,574
60025 16FE0E20133E0B11,326
```

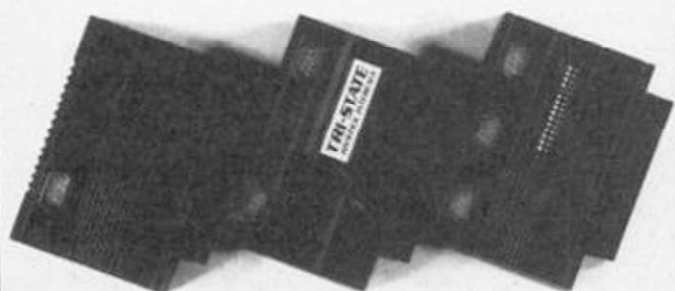
```
60200 1EBEE12133E0012CD,340
60201 1D7ECCDA6ECC3A0EA,601
60202 1CD1FEDDAAEA2170,510
60203 1EF0E20E121E5EE3A,524
60204 160E0F056F3E000C67,3CC
60205 13E000E2000CDD07EC,40F
60206 13E2132005CC3FF0B,402
60207 13E00326FEF3270EF,3C7
60208 1ED5060E0E00CD1F,40C
60209 1EDDAAEA3273EFC0,634
60210 1E0C3A60E0F0E0020,506
60211 1053A69EFE6003A73,453
60212 1EF12130C3A60E0F0,3FC
60213 1200CCD1FEDDAAEA,50B
60214 1216FEF0E0C220E0C0,504
60215 11FEDDAAEA2170EF,502
60216 10EC220E03E6F32E2,509
60217 1EE3E0032E3EE3E00,40F
60218 132E4E030E0CFE21,501
60219 12003CD15E0E0D7EC,553
60220 1CDA6EC21E5EE3A60,5C5
60221 1EF056F3E000C6736,422
60222 10021E5EE04066EF,561
60223 10C7EFE00C20DEA23,454
60224 10D20F63EFCAD0AED,509
60225 13E01D3EFC366EACD,50B
60226 11FED30FBC30E0AF3,594
60227 10603AFD3FF10F03E,3DB
60228 14003FF3E0FD3FF3E,56F
```

```
60440 131D3FF3E0F320F5C,305
60441 1320D5C32405C3E01,250
60442 1D3FE21915CC09E9F,56B
60443 1CD50EDC366EACD15,52F
60444 1EECD066ED030F1D3FE,556
60445 12165EE3E00C00F0E,442
60446 1C004ECCDA3ECCDA6,654
60447 1EC23CD77ECCD77EC,50F
60448 1CDA0ECCD04ECCDA6,661
60449 1EC233E0DC00F0ECCD,4CF
60450 104EC23CDA3ECC03,490
60451 1C00F0ECCD04ECC0C,600
60452 1A3EC3E07C00F0ECCD,561
60453 104EC23C97FE00C0,520
60454 1C000E23C30E0EFC,651
60455 100C0F53E20C00EED,520
60456 1F130C30F0ECCDA0E,65D
60457 1CDA3ECCDA6ECC0E,566
60458 1C000E3E0F320C3C,574
60459 1C9F513E6F0C01FC,60C
60460 1FCB1FC01FF630FE,4CF
60461 13AFAC6ECC0071213,490
60462 1F1E0FF630FE3AFA,606
60463 1D4ECC0E071213C921,46C
60464 1CDEE5C0D04ECC100,69C
60465 1173E20772310FC3E,339
60466 10077C9E52170EFAE,530
60467 177C0E007EA70C17,449
60468 1300D7EE00773A6F,3C9
```

```
60672 1EFEE10326FEF3721,3D5
60673 16FEFC01623C01600,350
60674 120E2C1E1C9110501,394
60675 1216A00C000503C93E,32F
60676 1963277EFCDA7EDDA,529
60677 12EEDF1C366EACD0C,5C0
60678 1ED70E601F002D3FE,540
60679 1AF2177EFC5200237,2FC
60680 19C2077E030E0C9C0,5F0
60681 147E00F0E0C0037C9,5E6
60682 1F5D0FF3A01E0F0E0,5C7
60683 120043E3610023E37,107
60684 1D3FF07FF1C9F53A,675
60685 101E0F0E0020043E36,376
60686 1D3FF0050EDF1C93E,644
60687 1000BFF60037C000,59
60688 1FF060237C000FF0E,626
60689 1302004007FA7C93A,308
60690 101E0F0E0020043E37,397
60691 110023E36D3FF007F,452
60692 1C9C2077E03A73EFD0,5D0
60693 1F1C366EAF53ED23D,5EE
60694 10F3DF1C9CDAED3D,62A
60695 120FAC9C5D5E5F5FE,70D
60696 17F2013C0F9EDF0C,537
60697 1200C0E0020053E20,20A
60698 1D73E00D710103E20,34F
60699 1073E00D73A005CFE,40B
60700 12120033E00D73E5F,2E6
```

```
60904 1D73E00D71E1D1C1,640
60905 1C9FE07201FCFC020,4F3
60906 119FE0C20149F0020,30B
60907 10FE00200CFE020FA,367
60908 10FE0E000A11EE3E,40A
60909 100C93E07C9CDA000,32C
60910 13E02C001163E1032,1C4
60911 1095CC93E121601C0,302
60912 1122C93E121600C0,257
60913 1122C93E121600C0,257
60914 1C00116CD47EE30F0,451
60915 1C05CE01D1C1C93A,50C
60916 13B5CCE06F200C300,20F
60917 15CF3213B5CC0AEF1,4C3
60918 1A7C93FC9F511000,3D6
60919 1CD10EDF1C944F57,4D0
60920 14E4C4F4144494E47,204
60921 12040284D4545003120,216
60922 12020524543454506,276
60923 14500352020450570,217
60924 1697420746F204261,320
60925 17369630020205573,2D0
60926 165205379606266C,393
60927 12053606966742020,300
60928 1204700746F205265,2C9
60929 17475726E20746F20,39C
60930 1405454552020045,270
60931 14E4455202045540,309
60932 14245522000000000,1C1
```

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Interface

(continued from previous page)

Line 10 sets up the array of variables, and from there onwards, they may be treated as independent variables. The advantage of this system only really comes to light when the array is used in conjunction with a loop. A simple loop can be set up using Goto, with a counter and decision to get out of it at the right time. This principle is used in the program below, which does just the same as the previous one, but in 22 less lines:

```

10 LET COUNT = 0
20 DIM A (26)
30 LET COUNT = F COUNT + 1
40 INPUT A (COUNT)
50 IF COUNT < 26 THEN
  GOTO 30
60 ...

```

Using a For . . . Next loop, the program can be simplified still further:

```

10 DIM A (26)
20 FOR C = 1 TO 26
30 INPUT A (C)
40 NEXT C

```

The two programs function identically, but with the second version, the programmer does not have to bother keeping count himself; nor does he have to remember which line the original For command is on: the computer works out where to go to itself.

The same principle can be used for strings of letters, but, on the Spectrum, the length of the string must be defined, as though, on another computer, a two-dimensional array was being created:

```
10 DIM A$(20,10)
```

will, on the Spectrum, create an array of 20 words, each 10 letters long. This is, in effect, the same as creating a two-dimensional array of characters, and, due to the string splicing commands, can be treated exactly as that. In most Basics, A\$(20) is all that is required for a string array, and the variables can be of any length. Although the Spectrum's approach is more logical, and requires less memory, the latter system is more suited to data comparison and retrieval.

Once an array is set up, the component variables may be manipulated in the same way as any variable, but they may also be treated as a group, e.g.:

```

10 FOR X = 1 TO 26
20 LET A(X) = A(X) + 1
30 NEXT X

```

will add one onto each number in the array A. Using Step, every second value, for example:

```

10 FOR X = 1 TO 26 STEP 2
20 LET A(X) = A(X) + 1
30 NEXT X

```

```

... or only the second 13:
10 FOR X = 14 TO 26
20 LET A(X) = A(X) + 1

```

30 NEXT X

So far, arrays of only one "dimension" have been looked at; but any number of dimensions is possible: Dim A (10,10) creates a 2-D array of 10 numbers by 10 numbers (100 in all), and Dim A (10,10,10) will create a 3-D array. In practice, most programs seldom use more than two dimensions, so, to turn back to the 10 by 10 array:

Each of the primary "columns" has another 10 sub-rows: there are numbers ranging from A(1,1) through A(1,2) . . . A(1,10) . . . A(2,1) . . . A(10,10). This capability is important when sets of data must be processed: e.g. when programming a "Monopoly" card. The dimensions needed for "Rent — six values for each card, of which there are 22 — would be R(22,6).

Every card is referred to by a number (1 to 22), and each house state by a number from one to six, where one is "site only", two is "with one house", etc. up to six, which is "Hotel". The rent, then, for three houses, on property 18 is in R(18,4). The names of the properties could be stored in a string array, e.g. P\$(22), so P\$(1) would be "Old Kent Road".

In practice, it would be extremely tedious to enter all these values each time a game was to commence, or to write a program where the data are given on a one-to-one basis with their variable's name, and to alleviate this chore, there exists the Data command set to do this automatically.

After the command Data in a program, there exists a storage place for numbers or strings, e.g. 10 DATA "Old Kent Road",2,10,30,90,160,250,"Whitechapel Road",4,20,60,180,320,450 (etc)

The program below reads this data line in the same basic way as the previous programs inputted data, but as there are two dimensions, it uses a "nest" of two loops, X and Y.

```

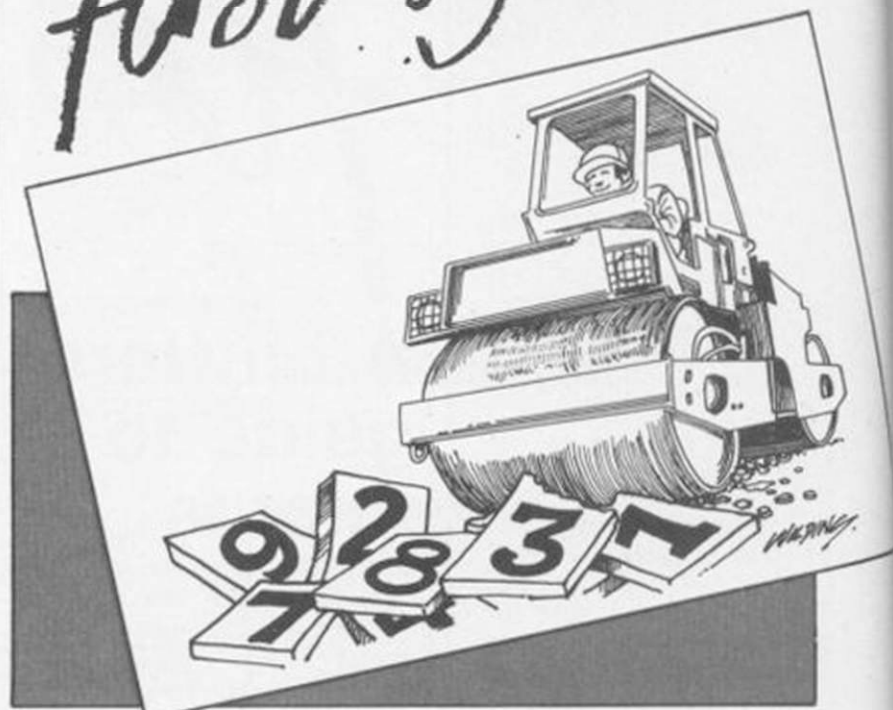
10 DATA (as above)
20 DIM R(22,6): DIM P$(22)
  (P$(22,20) on the Spectrum)
30 RESTORE
40 FOR X = 1 TO 22
50 READ P$(X)
60 FOR Y = 1 TO 6
70 READ R(X,Y)
80 NEXT Y: NEXT X

```

Restore resets the Data market so that data is read from the beginning of the line onwards. Read reads the data into the specified variable, and moves the market on one "data element", so that the next item is read next time. Note that, as there is only one string element to be read for each property, the Read P\$(X) command is outside the inner nested loop.

BEGINNERS

first bytes



How to come forth

FORTH IS very different from Basic and, indeed, most other high-level languages. It was originally developed by Charles Moore to control radio telescopes at the Kit Peak National Observatory, Arizona, in the early 1970s.

Described as a "high-level" language, Forth is effectively an extensible "macro language". It comes with a standard dictionary of words — i.e. macro definitions — which can be used and expanded to create the user's program. Each new word can be made up of those already in the dictionary or with assembly language mnemonics.

A macro definition is a collection of similar, or lower, level commands which make up a higher level function. This creates a language on a higher level than machine code but with very nearly the same execution speed.

Since each word can be used in successive words the user ends up with a program which is executed by typing one single word. The outcome of all this is that the user creates virtually a new language based around the original dictionary, so you can tailor the language to meet your requirements.

What really makes Forth a high-level language is that fully structured programming methods are employed as a fundamental feature. This is done through the use of control structures such as If . . . Else . . . Endif and Begin

. . . While . . . Repeat. They give it many advantages over Basic such as the ability to support recursive structures.

Another major difference between Forth and Basic is the way in which the former evaluates arithmetic expressions.

Forth employs the use of a stack on which data are held and operated on. All access is to the top of the stack. Therefore, the last number on is the first off.

Operations upon the data use a convention called Reverse Polish Notation (RPN). As an example: 1 2 + 3 x is the RPN equivalent of (1+2)x3. As can be seen the operators are input after the data upon which they operate.

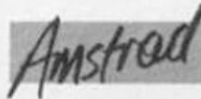
The 1 and 2 go on to the stack where they are added together. The result is placed at the top and the 3 is placed on the stack and then multiplied by the previous result. The final result is again left at the top of the stack.

Unlike nearly all implementations of Basic, standard Forths use integer arithmetic for their operations. In most cases they can handle up to 32-bit precisions if required. Floating-point routines can be incorporated but these would result in a reduction in execution speed.

Debugging a Forth program can be a real headache. This is mainly because of the way in which a Forth program is built up.

Patch On

M K Mostowyj,
Peterborough.



ANYONE WHO owns a DMP1 Printer should already know that the character matrix used is only 5 by 7. Whilst the printout is reasonably good, it could be improved by using a larger character matrix. This program does just that. It works by inserting a patch in the appropriate jump block to redirect the printer routine to a new one in memory.

The new routine provides the DMP1 with a matrix of 8 by 7 with a maximum width of 60 characters in normal mode and 30 characters when printing double width. Although the width is reduced the clarity is increased considerably, and this ability to redefine the complete printer character set is included. Also the # and £ symbols can be mied without the need to alter the Dip switches on the printer.

When the routine is in memory and has been called two RSX commands are logged on. These are:

:PATCHON to turn on the routine
:PATCHOFF to turn it off

All RSX commands must be preceded with the : symbol. Shifted @?;

First of all type in listing one, and save it before running in case of any errors you may make. When this is run, if all is well, you will be given the opportunity to save the resultant code to tape.

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File

Once this is done you can reload it any time with:
MEMORY 41659:LOAD"PATCH":CALL 41660

This can either be a direct command or a line within your basic program.

Now enter listing two and save it on a separate tape. When this program is run you will be asked for the name of the character set you wish to load. The original is saved as patch. Once you have loaded the set various options are open to you.

Menu 1.

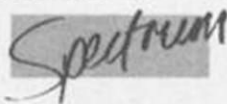
N — New Character. If pressed the prompt enter character is issued. Enter any Character from the keyboard and press enter. Menu 2 is Then displayed.

- S — Save driver and code. Saves Character set and driver complete with any Alterations you may have made. A Library of different set can be compiled.
- Menu 2.**
- ARROWS — Moves cursor around grid.
- COPY — Sets/resets bit Occupied by curso.
- ENTER — Large enter key stores character as defined in grid.
- C — Clear grid.
- I — Inverse character.
- Q — Quits character Without Storing it and returns to menu 1.

```
>10 MODE 1
20 MEMORY 41659
30 sum=0:RESTORE 130
40 PRINT"PLEASE WAIT!!"
50 FOR n=41660 TO 41660+950
60 READ a$:POKE n,VAL("&" + a$)
70 sum=sum+VAL("&" + a$)
80 NEXT
90 IF sum<>60007 THEN CLS:PRINT"ERROR IN DATA!!!!":END
100 CLS:PRINT"Insert tape to save bytes"
110 SAVE "PATCH",b,41660,951
120 END
130 DATA 01,C9,A2,21,C5,A2,C3,D1,BC,00,00,00,00,D1,A2,
C3,E1,A2,C3,F3,A2,50
140 DATA 41,54,43,48,4F,CE,50,41,54,43,48,4F,46,C6,00,
2A,F2,BD,22,69,A3,21
150 DATA FF,A2,22,F2,BD,3E,3C,32,24,AC,C9,2A,69,A3,22,
F2,BD,3E,50,32,24,AC
160 DATA C9,E5,D5,FE,0E,20,17,3A,24,AC,CB,3F,32,24,AC,
3E,02,32,57,A3,17,17
170 DATA 17,32,4F,A3,AF,C3,66,A3,FE,0F,20,0C,3A,24,AC,
CB,27,32,24,AC,3E,01
180 DATA 18,E3,FE,20,38,36,FE,A3,20,02,3E,80,21,6B,A2,
47,11,08,00,19,10,FD
190 DATA 3E,1B,CD,68,A3,3E,4B,CD,68,A3,AF,CD,68,A3,3E,
08,CD,68,A3,06,08,C5
200 DATA 06,01,C5,7E,CD,68,A3,C1,10,F8,23,C1,10,F1,3E,
0F,D1,E1,C3,00,00,00
210 DATA 00,00,00,00,00,00,00,00,00,00,5F,5F,00,00,00,
00,07,07,00,07,07,00
220 DATA 00,14,7F,7F,14,7F,7F,14,00,00,24,2A,7F,7F,2A,
12,00,46,66,30,18,0C
230 DATA 66,62,00,30,7A,4F,5D,37,7A,48,00,00,00,04,07,
03,00,00,00,00,00,1C
240 DATA 3E,63,41,00,00,00,00,41,63,3E,1C,00,00,08,2A,
3E,1C,1C,3E,2A,08,00
250 DATA 08,08,3E,3E,08,08,00,00,40,70,30,00,00,00,
00,08,08,08,08,08,08
260 DATA 00,00,00,00,60,60,00,00,00,60,30,18,0C,06,03,
01,00,3E,7F,51,49,45
270 DATA 7F,3E,00,00,40,42,7F,7F,40,40,00,00,72,7B,49,
49,6F,66,00,00,22,63
280 DATA 49,49,7F,36,00,18,1C,16,53,7F,7F,50,00,00,2F,
6F,49,49,79,33,00,00
290 DATA 3E,7F,49,49,7B,32,00,00,03,03,71,79,0F,07,00,
00,36,7F,49,49,7F,36
300 DATA 00,00,26,6F,49,49,7F,3E,00,00,00,00,6C,6C,00,
00,00,00,00,40,6C,2C
310 DATA 00,00,00,08,1C,36,63,41,00,00,00,24,24,24,
24,24,24,00,00,41,63
320 DATA 36,1C,08,00,00,00,06,07,51,59,0F,06,00,3E,7F,
41,5D,5D,5F,1E,00,00
330 DATA 7C,7E,13,13,7E,7C,00,41,7F,7F,49,49,7F,36,00,
1C,3E,63,41,41,63,22
340 DATA 00,41,7F,7F,41,63,3E,1C,00,41,7F,7F,49,5D,41,
63,00,41,7F,7F,49,1D
350 DATA 01,03,00,1C,3E,63,41,51,73,72,00,00,7F,7F,08,
08,7F,7F,00,00,41,41
360 DATA 7F,7F,41,41,00,30,70,40,41,7F,3F,01,00,41,7F,
7F,08,1C,77,63,00,41
370 DATA 7F,7F,41,40,60,70,00,7F,7F,0E,1C,0E,7F,7F,00,
7F,7F,06,0C,18,7F,7F
380 DATA 00,1C,3E,63,41,63,3E,1C,00,41,7F,7F,49,09,0F,
06,00,3C,7E,43,51,33
390 DATA 6E,5C,00,41,7F,7F,09,19,7F,66,00,00,26,6F,49,
49,7B,32,00,00,03,41
400 DATA 7F,7F,41,03,00,00,3F,7F,40,40,7F,3F,00,00,1F,
3F,60,60,3F,1F,00,7F
410 DATA 7F,30,18,30,7F,7F,00,61,73,1E,0C,1E,73,61,00,
00,07,4F,78,78,4F,07
420 DATA 00,47,63,71,59,4D,67,73,00,00,00,7F,7F,41,41,
00,00,01,03,06,0C,18
430 DATA 30,60,00,00,00,00,41,41,7F,7F,00,00,00,04,06,7F,
7F,06,04,00,40,40,40
440 DATA 40,40,40,40,40,00,00,01,03,06,04,00,00,20,74,
54,54,3C,78,40,00,41
450 DATA 7F,3F,44,44,7C,38,00,00,38,7C,44,44,6C,28,00,
38,7C,44,45,3F,7F,40
460 DATA 00,00,38,7C,54,54,5C,18,00,00,48,7E,7F,49,03,
02,00,00,4C,5E,52,52
470 DATA 7E,3E,00,41,7F,7F,08,04,7C,78,00,00,00,44,7D,
7D,40,00,00,00,20,60
480 DATA 40,44,7D,3D,00,41,7F,7F,10,38,6C,44,00,00,00,
41,7F,7F,40,00,00,78
490 DATA 7C,0C,38,0C,7C,78,00,04,7C,78,04,04,7C,78,00,
00,38,7C,44,44,7C,38
500 DATA 00,42,7E,7C,52,12,1E,0C,00,0C,1E,12,52,7C,7E,
42,00,44,7C,78,4C,04
510 DATA 0C,08,00,00,48,5C,54,54,74,20,00,00,04,3F,7F,
44,64,20,00,00,3C,7C
520 DATA 40,40,7C,7C,00,00,1C,3C,60,60,3C,1C,00,3C,7C,
60,38,60,7C,3C,00,44
530 DATA 6C,38,10,38,6C,44,00,00,4E,5E,50,50,7E,7E,00,
00,4C,64,74,5C,4C,64
540 DATA 00,00,08,08,3E,77,41,41,00,00,00,00,77,77,00,
00,00,00,41,41,77,3E
550 DATA 08,08,00,02,03,01,03,02,03,01,00,55,55,2A,2A,
55,55,2A,2A,48,7E,7F
560 DATA 49,49,63,62,00
```

Rotate 'N' Roll

Dave Millen
Welwyn Garden City,
Hertfordshire.



ROTATE 'N' ROLL is an intriguing program for any Spectrum written in Basic, which enables the operator to produce three-dimensional wire frame images of prisms or polyhedrons. The number of sides is optional as is the size of the drawing. The shapes can be shown as a series of single frame movements or can be superimposed to create patterns. Apart from the fascination of the patterns produced, the program can be a valuable aid to secondary school teachers of technical graphics to help pupils to visualise objects in movement.

The rotate facility turns clockwise around a vertical axis and the roll turns the object clockwise around a horizontal axis. The size increase give the impression of movement towards the viewer. A combination of superimposed images using all three facilities simulates a solid moving in space, showing the loci of the sides for specified movements.

The program can be paused at any stage of drawing by holding down M. To continue or abort the drawing, follow the instructions on the screen.

Watching the Demo mode will give the operator an idea of what can be achieved. In Run mode the operator is required to program in his/her instructions. Here is a brief explanation of each input in turn. Each input must be terminated with Enter. Mistakes can be rectified

by pressing Caps Shift and Delete.

Polyhedron — a 3D shape with a flat base, number of sides optional, and lines from each corner joining in a point. Example: pyramid.

Prism — a 3D shape with a flat base and top, number of sides optional. Lines from each corner join the base and top. Example: Cube.

Enter number of sides — This is self-explanatory.

Enter Size(0-140) — Each unit represents one pixel on the vertical axis at 0 rotation and roll. 140 units is the maximum size, otherwise the program will stop drawing with the message "figures too big" when the roll approaches 45.

Enter initial rotation — To establish the starting position of the object in degrees. 0 degrees rotation gives a side view with a flat face towards the viewer. 45 deg. rotation of a cube would give a corner towards the viewer.

Enter initial roll — Again establishing the starting position of the object in degrees. 0 degrees rotation gives a side view of the object with the face towards the viewer determined by the rotation. The top of the object rolls towards the viewer. 90 deg. roll will give a top view of the object.

Repeat (Y/N) — If the viewer wishes just a drawing of the object already entered then N should be entered. If a sequence of drawings is required then enter Y.

How many! — Number of drawings required in the sequence.

Enter size inc/dec — To increase or decrease the size of the object during a sequence. To avoid exceeding the maximum size the initial size

should be subtracted from 140 and the result divided by the number of repeats previously entered.

When decreasing in size, enter a minus number in response to the prompt. If the size reaches 0 before and end of the sequence it will continue but start increasing in size.

Enter rotation increase — The number of degrees by which the object must rotate each time, in a sequence. 360 deg. gives a complete rotation and would give no change. A minus number causes the object to rotate anticlockwise.

Enter roll increase — The number of degrees by which the object must roll towards the viewer each time, in a sequence. 360 deg. gives a complete roll. A minus number causes the object to roll away from the viewer.

Superimpose? (Y/N) — If drawings are required as separate images one after another then enter N. To overlay each successive drawing onto the previous drawings, in the sequence, enter Y.

Enter paper colour — Use keys 0 to 7 to enter your desired paper colour.

Enter ink colour — Use keys 0 to 7 to enter your desired ink colour.

The program will now proceed to follow the instructions entered. Details of each drawing are printed on the left of the screen display. Rotate 'n' roll is very easy to use and provides endless fascination for young and old alike.

For those who do not like typing in listings, I can supply copies on cassette for £3, including postage and packing. Send a cheque or postal order to Dave Millen, 28, Well Garth, Welwyn Garden City, Herts, AL 3AX.

```

5 GO SUB 8000
10 GO SUB 5000
20 GO SUB 6000
30 IF a3=1 THEN GO TO 4000
2000 FOR U=1 TO d+1
2002 LET J=172
2004 LET J1=J
2006 LET M=b
2010 LET K=88+a/1.4+COS (c+PI/180)
2015 LET K1=k
2020 FOR I=1 TO 2
2025 LET X=J+a+SIN (M+PI/180): L
ET Y=K+a+COS (M+PI/180)+SIN (c+P
I/180): IF Y>175 OR Y<0 THEN GO
TO 7000
2028 PLOT X,Y: LET XX=X: LET YY=
Y
2030 FOR M=b TO b+365 STEP 0
2035 LET X=J+a+SIN (M+PI/180): L
ET Y=K+a+COS (M+PI/180)+SIN (c+P
I/180): IF Y>175 OR Y<0 THEN GO
TO 7000
2038 DRAW X-XX,Y-YY: LET XX=X: L
ET YY=Y
2040 NEXT M
2140 NEXT I
2150 LET K=88+a/1.4+COS ((c+180)
+PI/180)
2160 NEXT I
2170 LET X=J+a+SIN (M+PI/180): L
ET Y=K+a+COS (M+PI/180)+SIN (c+P
I/180): PLOT X,Y: LET XX=X: LET
YY=Y
2180 FOR M=b TO b+365 STEP 0
2185 LET X=J+a+SIN (M+PI/180): L
ET Y=K+a+COS (M+PI/180)+SIN (c+P
I/180): PLOT X,Y
2200 LET XX=J1+a+SIN (M+PI/180):
LET YY=K1+a+COS (M+PI/180)+SIN
(c+PI/180): DRAW XX-X,YY-Y
2230 NEXT M
2240 IF d$="1" THEN GO TO 2310
2300 IF t$="n" OR t$="N" AND r$="
n" OR r$="N" THEN GO SUB 9000
GO TO 10
2310 IF t$="n" OR t$="N" THEN GO
TO 2370
2320 IF INKEY$="M" OR INKEY$="m"
THEN GO SUB 9000
2325 IF u=d+1 THEN GO TO 2360
2330 IF r$="n" OR r$="N" THEN CL
S
2335 LET a=a+a1/2: IF a>70 THEN
GO TO 7000
2340 LET b=b+b1: IF b>360 THEN L
ET b=b-360
2350 LET c=c+c1: IF c>360 THEN L
ET c=c-360
2355 GO SUB 6000
2360 NEXT U
2370 IF d$="1" THEN RETURN
2380 GO SUB 9000
2385 CLS
2390 GO TO 10
4000 FOR U=1 TO d+1
4002 LET J=172
4004 LET J1=J
4006 LET M=b
4010 LET K=88+a/1.4+COS ((c+180)
+PI/180)
4015 LET K1=k
4020 LET X=J+a+SIN (M+PI/180): L
ET Y=K+a+COS (M+PI/180)+SIN (c+P
I/180): IF Y>175 OR Y<0 THEN GO
TO 7000
4025 PLOT X,Y: LET XX=X: LET YY=
Y
4030 FOR M=b TO b+365 STEP 0
4035 LET X=J+a+SIN (M+PI/180): L
ET Y=K+a+COS (M+PI/180)+SIN (c+P
I/180): IF Y>175 OR Y<0 THEN GO
TO 7000
4038 DRAW X-XX,Y-YY: LET XX=X: L
ET YY=Y
4140 NEXT M
4150 LET J=172
4160 LET K=88+a/1.4+COS (c+PI/180)
4170 FOR M=b TO b+365 STEP 0
4175 LET X=J1+a+SIN (M+PI/180):
LET Y=K1+a+COS (M+PI/180)+SIN (c
+PI/180): PLOT X,Y: DRAW J-X,K-Y
4200 NEXT M
4210 GO TO 2300
4999 STOP
5000 INK 0: PAPER 6: BORDER 6: C
LS: INPUT "Polyhedron(1) or Pri
sm(2) ?":a3: IF a3>2 OR a3<1 THE
N GO TO 5000
5002 LET U=0: LET d=1: LET a1=0:
LET b1=0: LET c1=0: LET r$="n":
LET t$="n"
5004 DIM c$(6,7): LET c$(1)="Blu
e": LET c$(2)="Blue": LET c$(3)
="Red": LET c$(4)="Magenta": LET
c$(5)="Green": LET c$(6)="Cyan"
: LET c$(7)="Yellow": LET c$(8)
="White"
5005 IF a3=1 THEN PRINT "Polyhed
ron."
5007 IF a3=2 THEN PRINT "Prism."
5010 INPUT "Enter No. of sides.
":h: PRINT "Sides.....":h
: LET bb=(INT (h/2)+h/2)
5020 LET o=360/h
5030 INPUT "Enter size (0-140).
":a: PRINT "Size.....":a
: LET a=a/2: IF a<-70 OR a>70 THE
N GO TO 5030
5070 INPUT "Enter initial rotati
on.(0-360) ":b: LET b=b+bb+(360
/(h+2)): PRINT "Rotation.....
";b-bb+(360/(h+2))
5110 INPUT "Enter initial roll.(
0-360) ":c: PRINT "Roll.....
":c
5190 INPUT "Repeat?(y/n) ":LINE
t$: IF t$="n" OR t$="N" THEN GO
TO 5360
5200 IF t$<>"y" AND t$<>"Y" THEN
GO TO 5190
5240 INPUT "How many? ":d: PRINT
"Repeats.....":d: LET u=0
5280 INPUT "Enter size inc/dec.
":a1: PRINT "Size inc/dec....":a
1
5320 INPUT "Enter rotation incre
ase. ":b1: PRINT "Rotation inc..
":b1
5330 INPUT "Enter roll increase.
":c1: PRINT "Roll increase....":
c1
5340 INPUT "Superimpose?(y/n) ":
LINE r$: IF r$="y" OR r$="Y" TH
EN PRINT "Superimpose": GO TO 53
60
5350 IF r$<>"n" AND r$<>"N" THEN
GO TO 5340
5360 INPUT "Enter paper colour (
0-7) ":p: IF p<0 OR p>7 THEN GO
TO 5360: BRIGHT (p=0)
5370 PRINT "Paper.....":c$(
p+1)
5375 INPUT "Enter ink colour (0-
7) ":q: IF q<0 OR q>7 THEN GO T
O 5375
5378 PRINT "Ink.....":c$(
q+1)
5378 FOR l=1 TO 100: NEXT l
5380 BORDER p: PAPER p: INK q: C
LS
5390 RETURN
6000 IF a3=2 THEN PRINT AT 0,0:
INK 9:"Prism."
6010 IF a3=1 THEN PRINT AT 0,0:
INK 9:"Polyhedron."
6020 PRINT AT 2,0: INK 9:"Sides=
":h:AT 4,0:"Size=":a+2,"":AT
6,0:"Rot.=":b-bb+(360/(h+2))-13
60 AND b+bb+(360/(h+2)):360):
":AT 8,0:"Roll=":c,"":AT 10,0
:"Moves=":u
6025 PRINT #1:AT 1,0:
"M":Pause
6030 RETURN
7000 PRINT #1:AT 0,0: FLASH 1:"F
IGURE TOO BIG"
7010 GO SUB 9000
7020 GO TO 10
8010 BORDER 1: PAPER 1: INK 2: C
LS

```

(continued on next page)

SOFTWARE *File*

```

176006 : CBS720031101003E = 405
17614 : FDDBFECB47200311 = 1052
17622 : FFFF048900072100 = 944
17630 : 00CB572003110100 = 343
17638 : 3EDB08BFE7F2803 = 1178
17646 : 119CFF3E8FDDFECD = 1357
17654 : 572003110100008F = 4387
17662 : 200311FFFF3E7E08 = 969
17670 : FEF7E7F2803116400 = 795
17678 : 197E87280AFE0828 = 686
17686 : 06AFED52C3294636 = 860
17694 : BDCDA640ED534040 = 1072
17702 : 227B402A0C401130 = 404
17710 : 02197E3DFE1B2005 = 532
17718 : 36252B18F5770E00 = 536
17726 : 3A2140470B785120 = 556
17734 : FB0308432A0C4011 = 535
17742 : 770119224C402A4A = 435
17750 : 402BE5AF324E40E1 = 920
17758 : 237E5E6320042A4A = 666
17766 : 407EE54F2A4C4011 = 697
17774 : DEFF19224C407EFE = 1056
17782 : 072002C1C93A4E40 = 635
17790 : 3C3C324E40472371 = 531
17798 : 10FC112100471971 = 527
17806 : 10FC47287110FC11 = 780
17814 : DFFF47197110FC10 = 970
17822 : 8E06090C521384722 = 508
17830 : 4A400603C5CD4A45 = 602
17838 : 0100050878B120F0 = 697
17846 : 2A4A402323232322 = 354
17854 : 4A40C110E7C110B0 = 1006
17862 : 2A1040115D0019CD = 462
17870 : D3402A0C40112E02 = 458
17878 : 197E8E0E20103DFE = 790
17886 : 1B200536252B18F1 = 463
17894 : 77CD4C4118E40604 = 727
17902 : 23361C10FB3A3C40 = 566
17910 : 3CFE0A20013D323C = 520
17918 : 403A21403DFE0220 = 568
17926 : 013C322140010000 = 209
17934 : 0B78B120FB2A0C40 = 709
17942 : 11AC01197E3CFE26 = 693
17950 : 2005361C2B18F577 = 550
17958 : C36443E52A104011 = 730
17966 : 780019CDD340E1CD = 1058
17974 : 64412A0C40116A01 = 407
17982 : 197E3C7701005A0B = 442
17990 : 78B120FB7E7E21C2 = 1187
17998 : 64430503C52A1040 = 405
18006 : 11990019CDD340C1 = 606
18014 : 10F2C9E5CD1C42E1 = 1212
18022 : CD1C42C9ED737840 = 1039
18030 : ED5B7B40210080AF = 851
18038 : ED52444D21E85822 = 851
18046 : 0440AFED42227B40 = 767
18054 : EBED802A7B40F9C9 = 1327
18062 : ED7378402ED407B40 = 1038
18070 : C90465020E0DF70E = 814
18078 : FFFF07210000E0100 = 605
18086 : 5670010E010007DF = 364
18094 : FF0EFFFF0E21000E = 840
18102 : 010007DFFF0225900 = 625
18110 : 0E01000F21000597 = 219
18118 : 000EFFFF0E21000E = 585
18126 : 010007DFFF0EFFFF = 1010
18134 : 0597000EFFFF0721 = 720

```

```

18142 : 000E01000721000F = 70
18150 : FFFF048900072100 = 601
18158 : 0E010007DFFF0F21 = 648
18166 : 000689000E010007 = 168
18174 : 21000EFFFF0E0100 = 572
18182 : 0721000FFFFF0500 = 707
18190 : 000E01000721000E = 60
18198 : FFFF0721000F0100 = 566
18206 : 0190000F21000409 = 334
18214 : 000E01000E21000E = 76
18222 : FFFF0EDFFF000000 = 1002
18230 : 003D0000000530000 = 304
18238 : 00630000000530000 = 462
18246 : 00630000000530000 = 464

```

Listing 4. Screen data loader.

```

10 LET A$="SHORT CIRCUIT
BY D.GREEN SCORE: 00000
60 DEFATS:0,GRIDS:001,THEM:
9,TIME:0000,
20 FOR N=1 TO LEN A$
30 POKE 18251+N,CODE A$(N)
40 NEXT N

```

Listing 5. Basic program.

```

10 REM >> SHORT CIRCUIT <<
(C) D.GREEN 1985
20 CLEAR
30 LET X$=".....READY TO FIG
HT?.....COMBAT IN PROGR
ESS.....OPPONENT DESTROYE
D.....ALL DESTROYED - KILL 50
NUS.....** DEFEATED **.....
.....** GAME OVER.....
40 GOSUB 620
50 PRINT " "
60 PRINT " "
70 PRINT " "
80 PRINT " "
90 PRINT " "
100 FOR N=1 TO 150
110 IF INKEY<>="" THEN GOTO 350
120 NEXT N
130 CLS
140 PRINT TAB 7;"SHORT CIRCUIT
";TAB 7;"** U
ELCME TO THE GAME GRID **
150 PRINT "FORCE THE ENEMY LI
GHT TRACERS TO CRASH INTO THE
JETWALLS."
160 PRINT "USE KEYS:
170 PRINT " "
U I 5 6 A D J K J
K A D E Z H

```

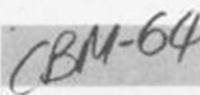
```

S H"
180 PRINT " (ALL OPTIONS ARE S
MULTANEOUS) "
190 PRINT "TAB 3;" "MORITURI T
E SALUTARI "
200 PRINT "TAB 2;">PRESS ANY K
EY TO START "
210 FOR N=1 TO 200
220 IF INKEY<>="" THEN GOTO 350
230 NEXT N
240 CLS
250 PRINT TAB 5;"* HIGH SCORES
";TAB 5;" "
260 FOR N=1 TO 10
270 PRINT " *** ";S$(N);" ....";
N$(N);" *** "
280 NEXT N
290 PRINT TAB 2;">PRESS ANY KEY
TO START "
300 FOR N=1 TO 200
310 IF INKEY<>="" THEN GOTO 350
320 NEXT N
330 CLS
340 GOTO 50
350 POKE 17532,54
360 IF USR 18062>30000 THEN LET
X=USR 18026
370 LET X=USR 17067
380 FOR N=1 TO 100
390 NEXT N
400 LET HL=PEEK 16396+256*PEEK
16397+209
410 LET A$=""
420 FOR N=0 TO 6
430 LET A$=A$+CHR$(PEEK (HL+N))
440 NEXT N
450 FOR N=1 TO 10
460 IF A$(N)="" THEN GOTO 500
470 NEXT N
480 GOTO 240
500 CLS
510 POKE 16410,2
520 PRINT AT 5,4;">CONGRATULAT
IONS<<" "YOU ARE REQUESTED TO
ENTER YOUR NAME FOR THE GAME GRI
D" " ** HALL OF FAME *
530 FOR B=10 TO N+1 STEP -1
540 LET S$(B)=S$(B-1)
550 LET N$(B)=N$(B-1)
560 NEXT B
570 INPUT N$(N)
580 POKE 16410,0
590 LET N$(N)="" +N$(N) ( TO 11)
600 LET S$(N)=A$
610 GOTO 240
620 POKE 16410,0
630 DIM S$(10,7)
640 DIM N$(10,12)
650 FOR N=2 TO 10
660 LET S$(N)=""
670 LET N$(N)="" ZX-01"
680 NEXT N
690 LET S$(1)=""0017150"
700 LET N$(1)="" A.X.E"
710 RETURN
720 SAVE "S"
730 RUN
750 REM THE END

```

Autodialler

John Derrick,
Cheddar,
Somerset.



I HAVE been using your Telsoft service. I wrote this to take advantage of the auto-dial facility. The program D3 is entirely machine code and is designed to work with D1 and D2 of the Dial-

soft program. To use it load the three programs and type

SYS 49188

and press Return. The program prompts for the number to dial. Type the number, with a minus sign separator if necessary, pressing Delete if you make a mistake. Pressing Return or typing 5 digits, causes the number to be dialed. D3 now passes control to D1 and the program proceeds

as normal. The program on tape is a Basic loader for the machine code, so the saver with the dialsoft program used to save D1 and D2 can be used to save D3 to tape or disc.

The D3 program isn't relocatable unless it is re-written, i.e. change the JSR's and some LDA's, but it doesn't matter if the program is over-written once you are on-line, as it won't be reused.

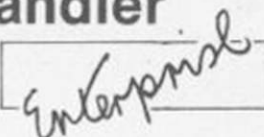
```

0 PRINT" D3 - COMMUNICATIONS PROGRAM"
1 PRINT" WRITTEN FOR YOUR COMPUTER"
2 PRINT" BY DAVID DERRICK 1-7-85."
10 TT=0:FORX=49152TO49482:READA:POKEA:TT=TT+A:NEXT
20 IF TT<41163 THEN PRINT"DATA ERROR":END
30 PRINT"TYPE 'SYS 49188' + RETURN TO ACTIVATE"
1000 DATA206,85,77,66,69,82,32,42,196,73
1010 DATA65,76,76,73,78,71,215,65,73,84
1020 DATA73,78,71,32,70,79,82,32,67,65
1030 DATA82,82,73,69,82,162,169,6,141,0
1040 DATA222,169,0,141,1,222,32,243,192,169
1050 DATA6,141,0,222,169,1,141,1,222,32
1060 DATA243,192,169,23,141,24,208,32,68,229
1070 DATA162,2,160,4,24,32,240,255,162,0
1080 DATA189,0,192,32,210,255,232,224,8,208
1090 DATA45,169,0,133,2,169,95,32,210,255
1100 DATA169,157,32,210,255,32,2,193,201,0
1110 DATA240,239,170,201,13,208,3,76,156,192
1120 DATA233,48,48,237,138,233,58,16,232,138
1130 DATA32,210,255,201,48,208,2,162,58,138
1140 DATA164,2,153,64,3,230,2,165,2,201
1150 DATA15,240,3,76,95,192,160,3,162,4
1160 DATA24,32,240,255,160,8,185,0,192,32
1170 DATA210,255,200,192,16,208,245,169,32,32
1180 DATA210,255,160,0,185,64,3,170,224,58
1190 DATA208,2,162,48,138,32,210,255,201,45
1200 DATA208,6,32,243,192,76,232,192,169,8
1210 DATA141,0,222,185,64,3,141,1,222,169
1220 DATA8,141,0,222,185,64,3,205,1,222
1230 DATA240,248,200,196,2,208,203,32,243,192
1240 DATA76,232,7,32,53,193,96,234,234,234
1250 DATA234,234,234,234,234,234,234,32,228
1260 DATA255,133,78,201,20,240,11,234,165,78
1270 DATA201,45,240,20,234,165,78,96,165,2
1280 DATA201,0,240,7,169,20,32,210,255,198
1290 DATA2,169,0,96,32,210,255,169,45,164
1300 DATA2,153,64,3,230,2,169,0,96,152
1310 DATA72,138,72,160,0,162,0,202,224,0
1320 DATA208,251,136,192,0,208,244,104,170,104,96
READY.

```

Screen Handler

Steven Meyfroide,
Middleton,
Manchester.



As YOU will probably have discovered, the screen handling on the Enterprise is very flexible. Like the Atari, previously unequalled for graphics, it has a total of 256 colours, and also like the Atari, different screen modes can be

displayed at the same time. For example, say you want a 16 colour hi-res screen for graphics and a small text screen above it for score etc, then just open the appropriate channels and display them wherever you want them:

```

100 set video mode 1 !Hi-res graphics
110 set video colur 2 !16 colours; horizontal res
160
120 set video x 40 !40 chars across
130 set video y 20 !20 chars down
140 open£1: "video:" !Open the hires page

```

```

150 set video mode 0 !40 column text
160 set video colour 0 !Two colours
170 set video y 4 !4 chars down
180 open£3:"video:" !Open the text page
At this stage the pages are not on the screen,
so display them
190 display£1:at 5 from 1 to 20 !16 colour hires
from 5-25
200 display£2:at 1 from 1 to 4 !Text from 1-4
Note that the settings for 'videox' etc are not
(continued on next page)

```

(continued from previous page)

erased by an open, ie they don't have to be defined for every channel if the channels have the same settings for any of them. Hence, in the program above, "video x" is defined once and this setting is used for both pages.

At the top of Ram is a block of memory that the video chip uses to display a screen. this is like a program, telling the chip what mode the next line is to be in etc, but more importantly, it holds a palette for every single line it has to display. If we could change this, we could change the palette for a given line within the same channel ie, Colour 1 could be red on the first line of channel 1, in which case anything drawn in colour one appears as red; and also, colour 1 could be blue on the next line.

The only problem is how to access this block of memory, but luckily, it is quite easy with the Speek and Spoke commands in IS Basic. Firstly, you need to know where the Line Parameter Block is so:

```
A=SPEEK(255,49140)+SPEEK(255,49141)*256.
```

An address will be put into A that is the beginning of the block of memory we want. A will usually be equal to 47872 in Basic. The format of this table is:

Disp Contents

00 Two's complement of scanlines in this modeline.
01 The video display mode for this line
02 See Technical manual
03 See Technical manual.
04 Lo byte of address of screen memory for this modeline.

05 Hi byte of address of screen memory for this modeline.
06 Lo of graphic memory in attribute mode or address of character definitions in text modes.
07 Hi of above.
08-15 Palette definition. (Colours 0-7)

The address of the screen memory (04-05) can be used to Poke the display in Basic or machine code — the format of the screen memory for the various modes is detailed in the Technical Manual. Moreover, the data we want is there at 08-15. All that is needed is a small program to change the palette definition to what we want - here is a simple one. Put the colours wanted for colours 0-7 in the Data statement and run it.

```
5 LET num =5
10 FOR A=47872 TO 47872 + num*16-6 STEP 16
20 FOR B=08 TO 15
30 READ C
40 SPOKE 255,A+B,C
50 NEXT B
60 NEXT A
70 END
100 DATA 15,25,35,45,55,65,75,85,
110 DATA 95,105,115,125,135,145,155,165
120 DATA 175,185,195,205,215,225,235,245
130 DATA 49,59,69,79,89,99,109,119
140 DATA 58,46,112,195,237,247,168,249
```

...etc for number of lines wanting to be changed...Just set 'num' to however many lines you want changing. Notice that the first line is the Status Line, and to miss this out change line 10 to:

```
10 FOR A=47872+16 TO 47872+16+...etc..
```

With the knowledge of what is in the Line

Parameter Block, I'm sure you can think of many interesting things to do — scrolling is easy, for example: just change the address of the screen memory on every line to equal the address of the line above or below it. Sideways scrolling can also be done but with a bit more difficulty.

One interesting project would be to install a new device driver so that a channel could be opened that simulated say a Spectrum screen (attribute mode is the obvious choice!) or BBC screen(s). The driver would have to be able to interpret control codes sent to it and act on them as the BBC or Spectrum would do.

This wouldn't be too difficult with a knowledge of machine code since the way to install device drivers is outlined in the Technical manual. If a BBC screen was simulated like this (but beware of the different modes, especially teletext — ignore colour control codes), then conversion from BBC Basic to IS Basic would be simple — procedures and functions are defined in similar ways (though the IS versions are more powerful with parameter passing by reference — including other functions and arrays).

You have probably noticed that you can't use FOR...NEXT loops in immediate mode! This can be very useful while editing to test the contents of memory, so to do this, type EDIT 200 to create a work space for program 200 (!) and type your For loop in as a separate program, eg:

```
EDIT 200
10 FOR A=1 TO 10
20 PRINT PEEK (A);
30 NEXT A
```

This can be run and then Newed. Type EDIT 0 or whatever to get to your real problem.

Turboload

R Grzasko,
London SE15.

Vic 20

THIS UTILITY program will load, save and verify programs six times faster than normal.

First of all type in program one save it then run it. This will move the start of basic above the part of Ram where the Turboload program is located.

Save in case of error

Next type in program two and save it in case of an error. Then run the program.

If all is well after a short time a message will appear on the screen — "You are now ready to Turboload programs". Type:

```
SYS5120
```

to activate the Turboload program. The Turboload program will not load programs that have not been saved by the Turboload program, also normal programs will not load with the Turbo-loader activated.

Press Run Stop and Restore

To overcome this problem press run stop and restore together. You can now load normal programs. Then you can type:

```
SYS5120
```

and save your program at turbo speeds.

When programs using the Turbo-loader are loading the border will turn blue. A more colourful display may be obtained by changing line 2000 to:

```
2000 DATA90,29,FC,EA,EA,49,04,8D,1123
```

If you experience load, verify and save problems try using a good quality computer tape.

```
100 PRINT "THE FAST LOAD PROGRAM WILL TAKE A SHORT TIME TO LOAD SO PLEASE WAIT"
```

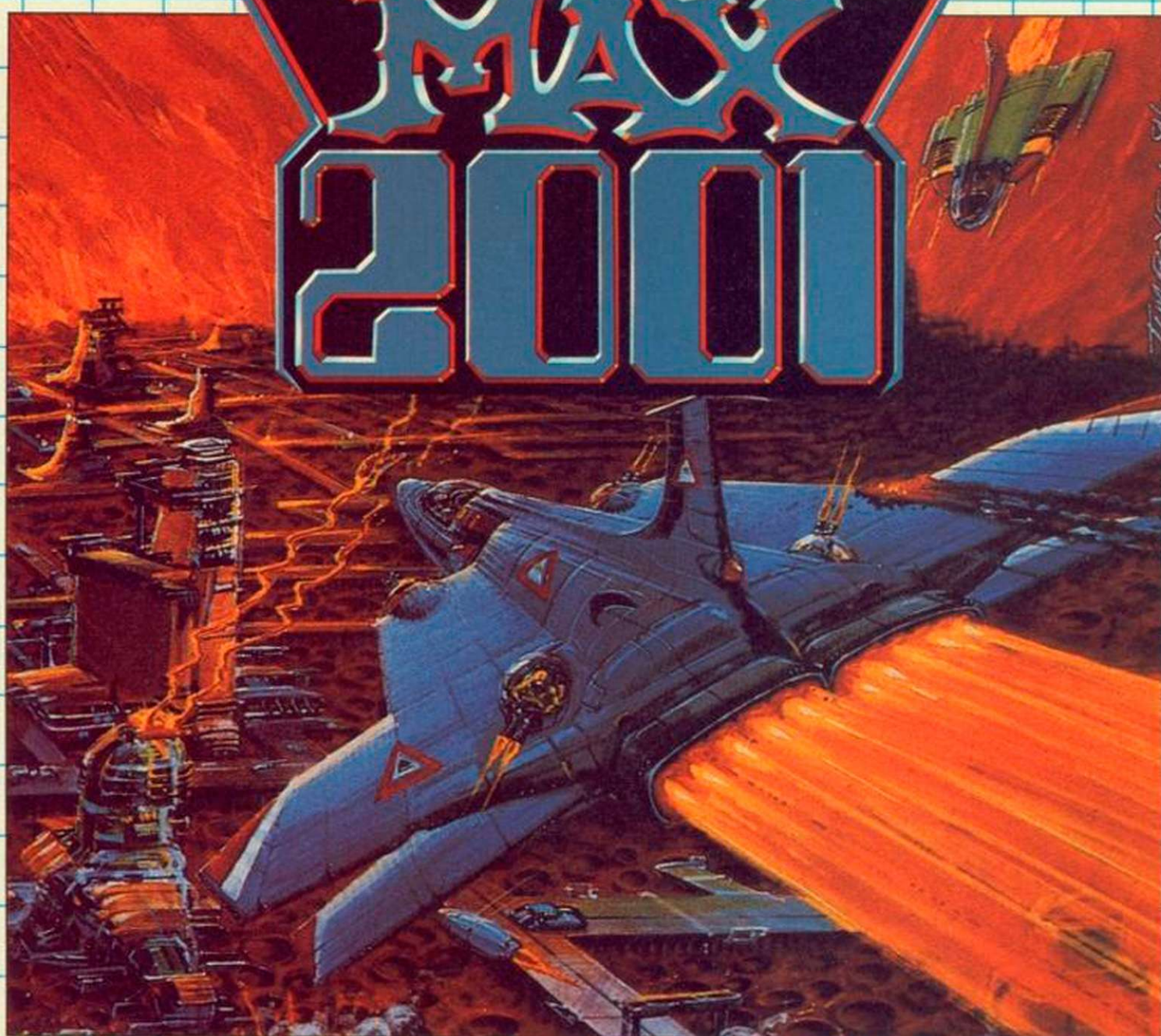
```
140 S=5120:N=0:AD=0
150 T=0
160 READA$:IF A$="END"THEN480
170 H=ASC(A$)-48:L=ASC(MID$(A$,2))-48
180 V=16*(H+7*(H>9))+L+7*(L>9)
185 T=T+V:AD=AD+V
190 IFRIGHT$(A$,1)="*"THENV=V+INT(S/256)
200 POKES+N,V:N=N+1
210 IFNAND7THEN160
220 READTT:IFTT=TTHEN150
480 READTC:IFTC=ADTHEN500
500 READTN:IFTN=NTHEN520
520 SYS5120
530 PRINT "YOU ARE NOW READY TO SAVE OR LOAD PROGRAMS USING THE FAST LOAD"
540 PRINT "WHEN YOU WISH TO LOAD THE NEXT PROGRAM YOU MUST PRESS RUN/STOP"
550 PRINT "RESTORE THEN PRESS LOAD"
1000 DATA9,B3,8D,30,03,A9,01*,8D,851
1010 DATA31,03,A9,22,8D,32,03,A9,618
1020 DATA00*,8D,33,03,A2,00,8D,9A,700
1030 DATA01*,F0,06,EA,EA,EA,EB,D0,1389
1040 DATAF5,60,A5,BA,C9,01,F0,03,1137
1050 DATA4C,85,F6,A9,00,85,90,A2,1063
1060 DATA1E,20,AB,F8,F0,07,20,B7,943
1070 DATAF8,B0,E6,A2,B4,86,A5,20,1327
1080 DATA2B,F7,A0,00,A5,B9,91,B2,1120
1090 DATAA5,C1,C8,91,B2,48,A5,C2,1312
1100 DATAC8,91,B2,48,A5,AE,C8,91,1279
1110 DATA82,48,A5,AF,C8,91,B2,48,1185
1120 DATA20,54,F8,A5,B7,A0,05,91,1022
1130 DATA82,A2,00,A9,20,E4,B7,B0,1128
1140 DATA0C,88,88,88,88,88,B1,BB,1056
1150 DATAC8,C8,C8,C8,C8,91,B2,1523
1160 DATAEB,C0,BF,90,E6,A5,A5,A2,1481
1170 DATAF0,20,A4,00*,68,85,AF,68,952
1180 DATA85,AE,68,85,C2,68,85,C1,1168
1190 DATA80,07,A9,14,A2,0F,20,A4,745
1200 DATA00*,A9,00,60,85,A5,86,AA,867
1210 DATA20,60,01*,A5,C1,85,C3,A5,990
1220 DATAC2,85,C4,A9,64,8D,16,91,1100
1230 DATAA9,00,8D,15,91,A9,FF,8D,1041
1240 DATA26,91,8D,25,91,A9,FF,8D,1071
1250 DATA25,91,A9,0F,20,28,01*,B0,615
1260 DATA49,AD,2D,91,29,40,F0,F2,1023
1270 DATAAD,24,91,C6,A5,D0,E6,A2,1317
1280 DATA0F,8A,20,28,01*,CA,10,F9,693
1290 DATAA5,AA,20,28,01*,A9,00,85,710
1300 DATA8D,A5,C3,C5,AE,D0,06,A5,1299
1310 DATAC4,C5,AF,F0,18,A0,00,B1,1169
1320 DATAC3,48,20,28,01*,68,B0,12,638
1330 DATA65,BD,85,BD,E6,C3,D0,E1,1470
1340 DATAE6,C4,18,90,DC,A5,BD,20,1200
```


64

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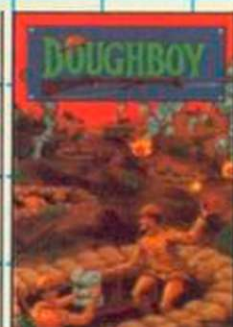
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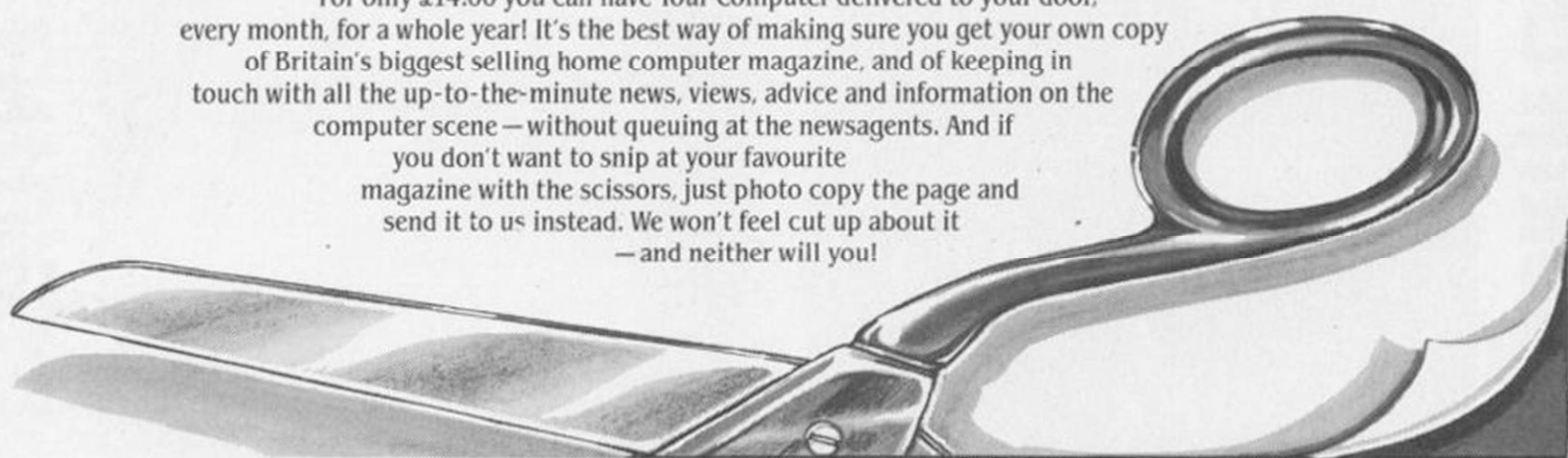
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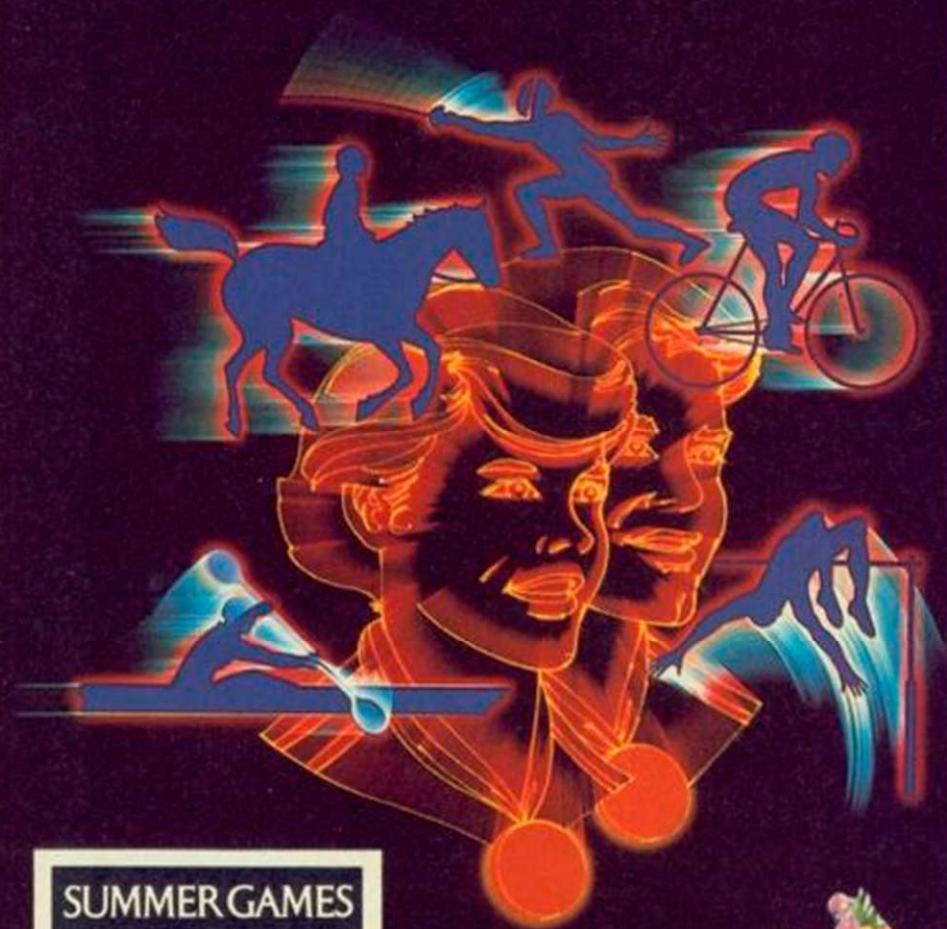
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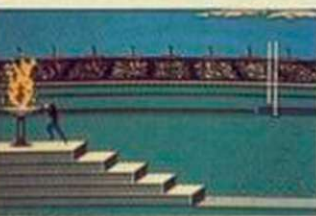


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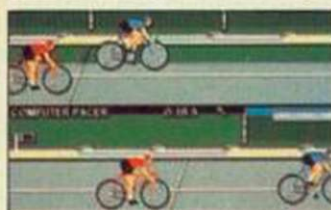
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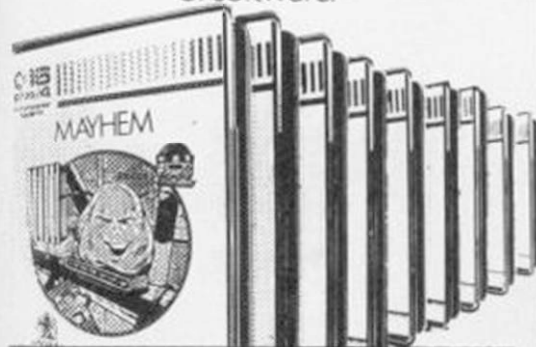


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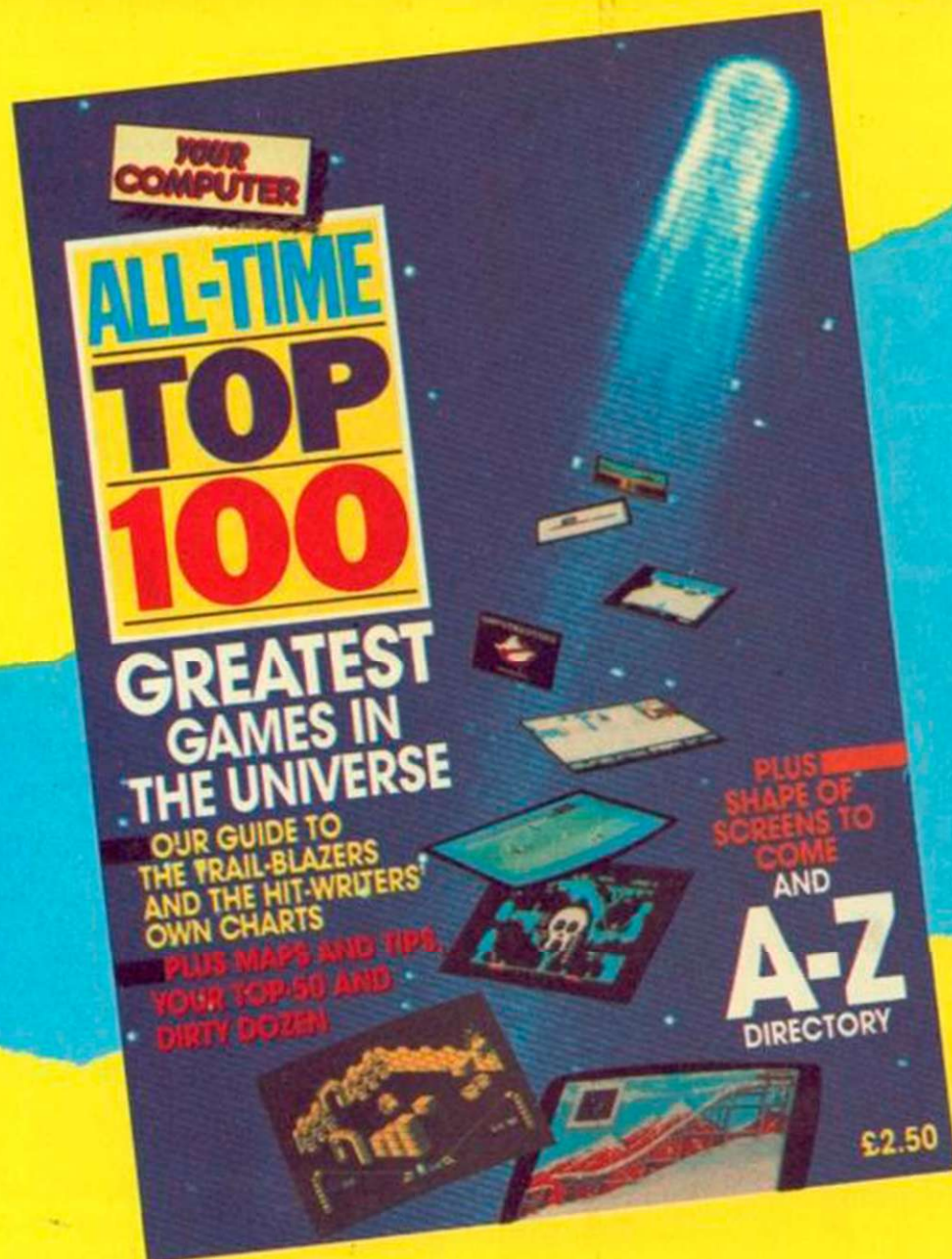
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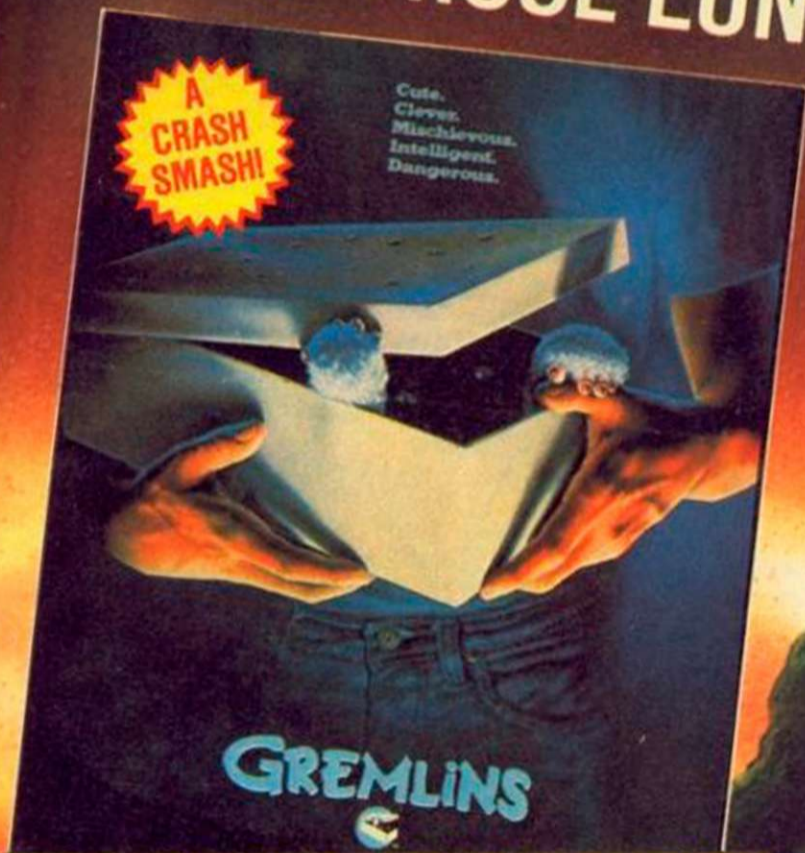
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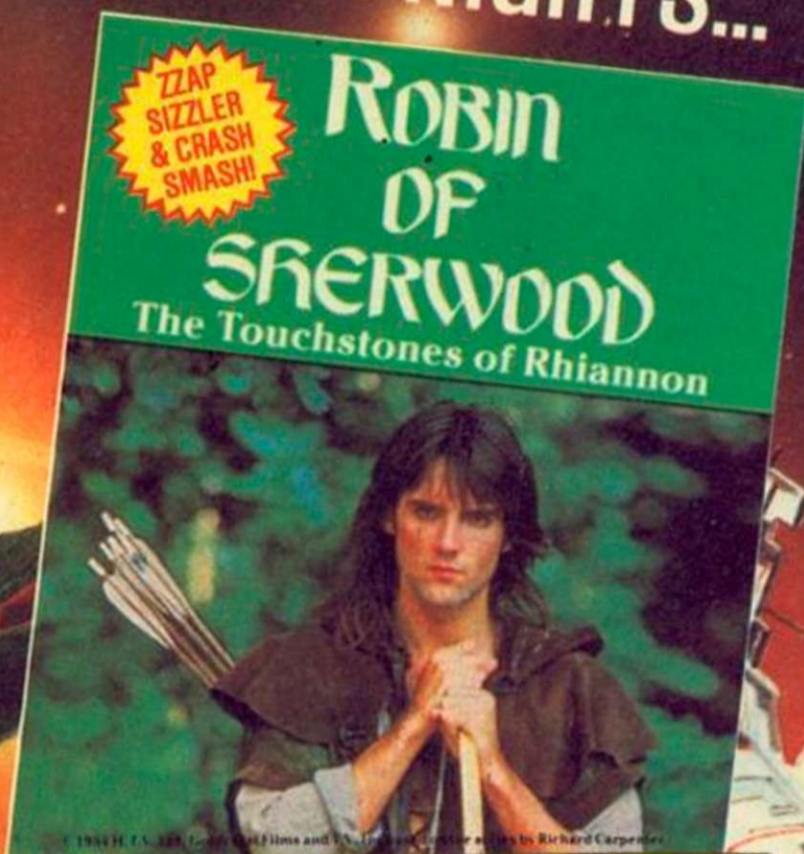
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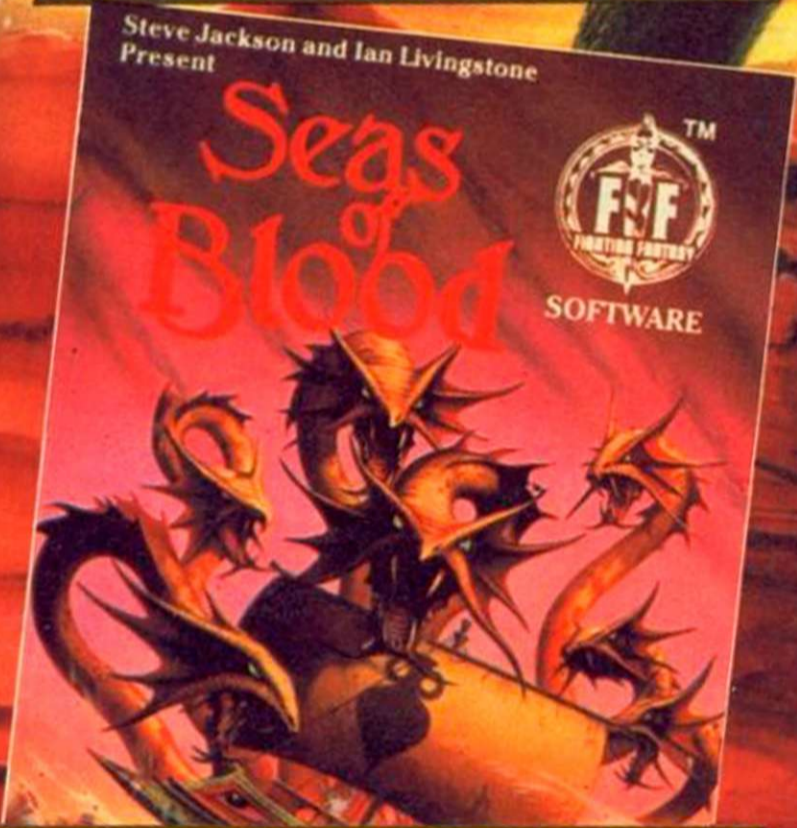
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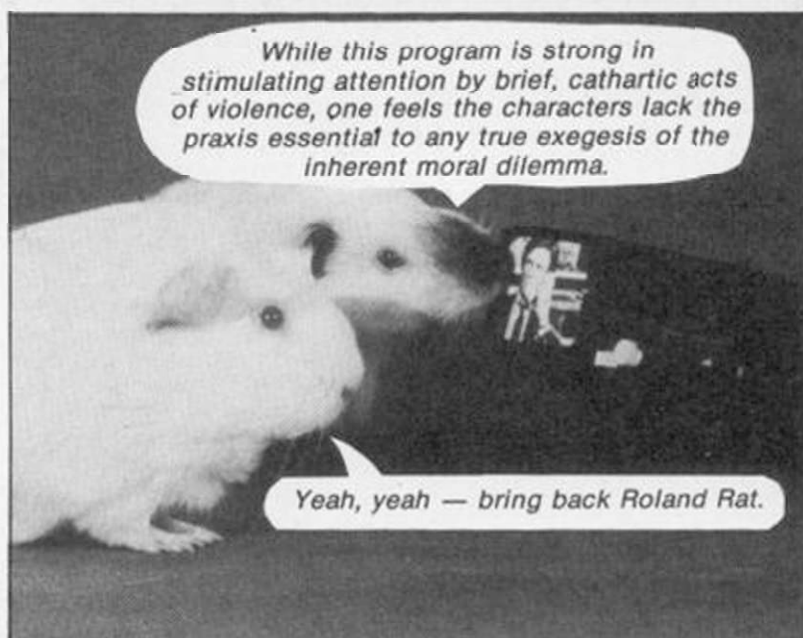
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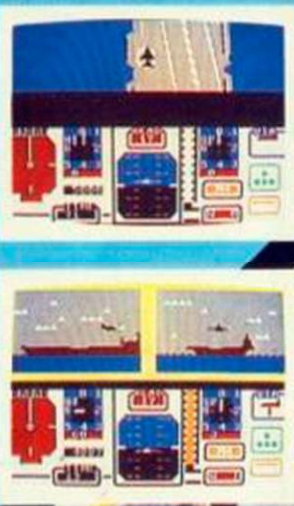
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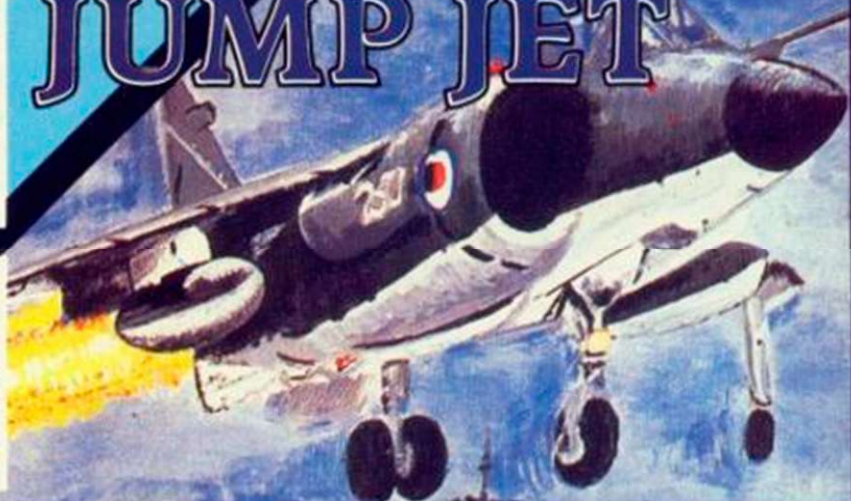
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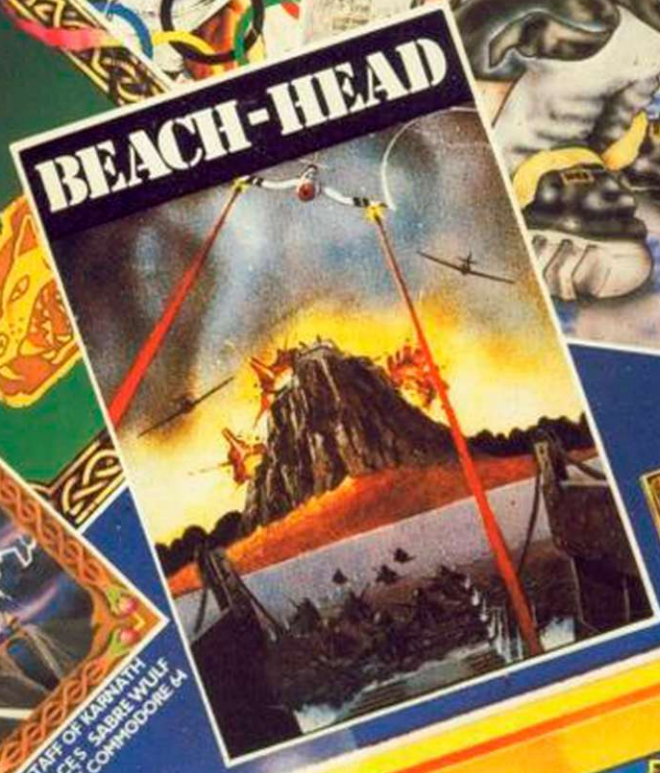
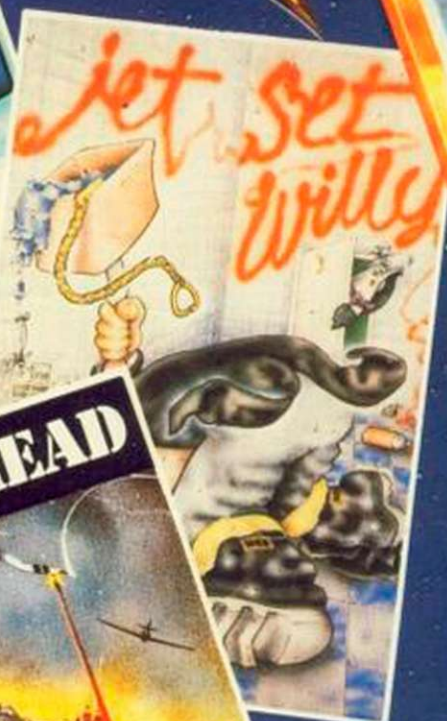
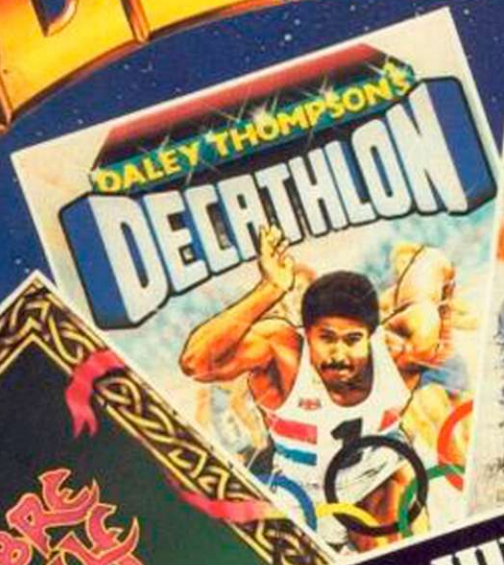


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