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This month's cover was marked with a Special Pointless. A special thanks to SPCC (Spectrum Graphics for their confidence.

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Let the buyer beware

After years of watching Christopher Lee's GIP blood transfusions on Court Crocodile in countless horror movies, the Irish blood of Film Censor has now not down to pass judgement on the computer games.

CBS' last and greatest adventure, Crocodile, was submitted beforeboard after years were submitted it might be unsuitable for children. The result of the Censor deliberations was to slap a 15 certificate on it.

Now the precedent has been set and we can expect that more it not all games will have to be tested in this way.

As a guide to the suitability of games for younger age groups it may be a bad thing, and of course then a software house point of view a little notably never did so far anyone. So we can look forward perhaps to the first game to receive a parental Guidance certificate, (although notably children have been guiding their parents through games for years.)

CBS have called all the contemporary class for the adventures and forthcoming releases include Murder in Miami, Sybil and the Kings of the Jungle, Fergus McNeill and Jason Somerville. The adventure is set far from the dingy clefts of Middle Earth and is a well-crafted mystery set on a boat off the Miami coast. In 1992 based on the novel of the same name by Dennis Lehane. It costs £19.95.

Also set for December releases is Spiritual and as you would expect from the title it is a Hindu-themed game with the twist that your adventures are deeply Buddhist monks who prefer loose chop and double-edged words to prayers and incense. With a religious Guidance certificate too in order for this one!

The Disciple

Miller Gordon are a new name on the hardware scene and their first product on the market is the Disciple, a multi-purpose interface which acts as controller for disc or hard disk (or a pair of) networks.

The Disciple boasts an amazing resemblance with the Interface Cafe and it uses the same rated connector to fit between the specialist attach boxes all the computer input and output devices for desktop.

On the disk interface, Miller Gordon states there is a 330 double density file of 3.5 seconds and a 75 second load of less than half a second. The Disciple makes use of the Shadow RAM to avoid clipping into the computer's memory and has the ability to save individual files. There is a snapshot button that allows you when working in double density to take a more on the snapshot.

The printer interface drives a continuous printed paper and interface is included so that the operating system can be substituted to take into account what sort of paper, printer and other you are working with. Two joystick ports are included a (MIDI) standard and two HiLink connectors allow up to 64 Spectrums to be in an Interface 1 type network.

It not only looks like Interface 1, it also compatible with it so that any peripherals used formerly with the Interface 1 will work with the Disciple. A full review of the Disciple will be in next month's ZX. The Disciple costs at £79.95 + VAT and further details are available on 04-223 5994.



Graphic Gold

Inevitable between Graphic Crocodile is now opening a treasure chest of adventures. The first two releases are Inevitable from Gold Medallion (also with the Agents Gold) written by Peter Townsend author of Treasure and Treasure Digger, who has turned his attention to a gold prospecting quest in the Wild West and Winter Wonderland set in the Himalayas, where concealed from the outside world there is a lost civilization, which you must find back on the map.

Gold Medallion Adventures will retail at £7.95 and Inevitable will certainly have no shortage of submitted adventures in the future if other figures are anything to go by. Ian Rogers, an Inevitable Software director, informs us that Inevitable's sales at GAC have just topped the £1 million mark.

Static Buster

Static electricity can be blamed for an awful lot of problems these days and if you are worried that it could be affecting your computer set up then you might want to check out Static Buster from Integrity Solutions. Backing up their argument that static can be damaging the computer produce some wonderful results. Did you know that simply touching a metal computer case 50,000 will charge it and even placing up a polythene bag can contain 50,000 volts!

The Static Buster comes in a 'Static Neutral Equator' which allows static from the screen to a grounding point, and static absorbing fluid and helps, you will have to keep picking up static of polythene bags near your Spectrum to justify the price of £19.95 and even then you may never get that bottom to rock to you! Further help again. Integrity Solutions can be contacted on 0795 54455.



Spectrum Games Top Ten

- 1 () Initiator
- 2 () Shadow's Road
- 3 () Computer Arts
- 4 (4) Paper Boy
- 5 () Golfman
- 6 () Knight II
- 7 (2) Titled Pursuit
- 8 () Highlander
- 9 () They Sold a Million 2
- 10 () Crash Smashes II

U.S. Gold

The Edge

Benzer Jolly

Elite

Imagine

The Edge

Domark

Gremlin

Not Taped

Gremlin

Chart supplied by WSI, London

Another month, another Number One, with Titled Pursuit being replaced with a newcomer by Initiator (to be reviewed next month).

There are less than three competitors in the top ten and with more on the way than previously every software house that's got a back catalogue, no less the prospect of a Christmas chart dominated by old games in new packaging.

Music Machine

We never have been electronics obsessed the Music Machine then an independent record group has been set up. Called The Four Pack, the group plans to run on a subscription basis (12 a year) and publish a monthly magazine. Computer & Music informs us that the club will get on a focus for Music machine users to solve problems, swap ideas and tips etc. It is also hoped that some hardware upgrades will be available at minimal cost. For further details send on 44 and 441 to The Music Press, 19, Sandringham Road, Wellesbourne, Leamington CV72 5HT



Zaxxon II by Gremlin. High speed version of above. Postponed until to be released by Amstrad 640K.

A presentation from AMR's new 640K utility providing a 640K environment for the microcomputer. It costs £14.95 and there will be a 1.5 volume next month. AMR 6025 415551



Legions of Death. Lustrous detail, atmospheric & not lacking the above quality in graphics. Does it all and would be another success £9.95

Gilsoft strike back

Gilsoft (The Guild) and Interactive 640K are now locked in competition for the interactive 640K market and that's good news for the consumer as standards will continue to rise.

The latest from Gilsoft is The Professional Adventure Writer with a new text parser facilities to people provide intelligent characters and text compression.

The PAF (as it will inevitably become known) will be in two versions for the Amstrad Spectrum. An integrated package aimed largely at the 128 has the graphics and text editor on one menu and will allow you to adventure using 640K of memory to be shared 100 to 128.

The second version is aimed more at the Amstrad 640K and the graphics and text editor are separate programs to allow maximum use of memory for those adventures writing. The new people machine is reported to be able to do the entire screen in 2.7 seconds. The versions will cost £20.95 each.

Also available from Gilsoft is the PAF, a text compressor for use with the Guild which will cost £14.95.

To make way for the PAF Gilsoft has reduced its prices for the Guild and Shadow which now sell for £8.95 each.



Jungle Kingdom. A glimpse of the game. Amstrad 640K. Released due to imminent release it priced £9.95

Amstrad have responded quickly to the 128-32 new device configuration by bringing out a 640K compatible interface £4.95

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1. *Journal of the American Medical Association*, 2000; 283: 2689-2693.

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Figure 1

SUMMARY

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Graphics '86



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Every year the Computer Graphics Show demonstrates the latest and best in graphics. This year ZX snuck in with its Speedy hidden up its jumper to see how it compares.

As I've used to dealing mainly with humble home computers, I'd never been to the annual Computer Graphics Show before, dealing as it does with expensive, state-of-the-art computer hardware.

So when I got there, the most surprising thing about the show was to see how technologically familiar all that 'leading edge' graphics technology was. The machines on show might be faster than the Spectrum, and you can feel that none of them have to worry about attribute clashes, but a lightpen is still just

a lightpen whether it's attached to a Spectrum or a \$15,000 graphics rendering system.

The one piece of equipment that was most in evidence was the touchpad or graphics tablet. You've probably seen these before — they look a bit like one of those old Doh-a-dosh drawing tablets, except that in this case it's hooked up to the computer and whatever you draw on the surface of the pad instantly appears on the screen of your TV or monitor. Just about every computer had a touchpad attached, in conjunction with a pen or a mouse in order to demonstrate their graphics capability.

Now, both touchpads and mouse packages are available for the Spectrum (from Loga and Advanced Memory Systems), and while these are obviously limited by the Spectrum's graphics handling ability, if you've used one on a Spectrum you can use one on an IBM or any of the other mega-expensive machines on show without being

intimidated by the facilities they offer.

Many of the software packages also looked quite familiar. There were a number of powerful graphics utilities on show which not only sounded like something you might find on the Spectrum, but looked like it, too. Art System, Artwor Plan! Engine and others might cost thousands of pounds, but they all use the same sort of screen coordinates system as Firstbird's Art Studio (or rather Art Studio uses the same layout as they did), so you'd feel right at home with them.

11,182,080 colours

Most of the customers who can afford this sort of technology are large businesses, so inevitably there were a lot of not terribly exciting graphs and bar charts on show. Personally I couldn't see the point of spending thousands of pounds on graphics equipment when all you do with it is plot a chart for 66 years of Gaudy — that's the sort of thing that you could do just as well with the Spectrum and a lot more cheaply.

One company announced their new 50-£ system which is capable of high bit graphics featuring up to 11,182,080 different colours on screen all of once (compared to the Spectrum's eight), and all they had on show was a picture of a food blender. Some people have got no imagination.

And you, some people have got quite a lot. Interestingly these days the main users of computer graphics equipment are television and film companies, and it's the artists and designers who work in these areas who are doing really interesting things with

Generated using Sinclair Paintbox





computer graphics. Richard Jackson's Virgin empire already includes a games software house, and now they've started Virgin Computer Graphics who are currently doing some work for Thames TV.

At the moment, most of the computer-generated material that we see on our screens is restricted to title sequences of the sort of programmes or short films for new programmes. Because of the cost of the equipment (some machines can cost up to \$300 an hour to hire, and have got queues of people waiting to use them through to the end of next year). But it's particularly possible to produce longer features (such as Disney's *Ten*) using this technology as long as you can afford it, and on the second evening of the show the Computer Animation Film Festival was held, demonstrating what computer graphics are capable of (and there's a report on the festival further on).

Paintbox

But the star of the show, the stand which consistently drew the largest crowds, was the Quantel Paintbox. Quantel is a company which was set up specifically to develop computer graphics for use on television. And the Paintbox is their biggest success. There are 55 Paintboxes

in use; fourteen of them are owned by the BBC and most of the others by film companies, producers of music videos and so on. And Quantel recently won two BAFTA awards for technology from American television.

Using a simple touchpad and pen as your drawing device, Paintbox allows you to create and manipulate on screen virtually any sort of image that could be created using conventional artistic materials, whether it's chalk, oil paint, pen, pencil or whatever. The quality of the picture that you can achieve is so high that you can connect Paintbox to a video camera, freeze the video picture on the computer screen without any loss of quality (known as 'frame grab') and then just redraw whatever parts of the picture you feel like changing before re-recording the new image. Paintbox automatically adjusts the same colours as those in the picture, so alterations are undetectable allowing you to virtually restore pictures.

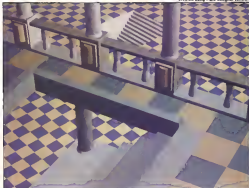
All this hi-tech might seem a long way from your Spectrum or QL, but as someone said just recently "the gap between today's microcomputer and tomorrow's is about five years". And as I've said, the hardware and software that was on show isn't ultimately that different from what we're used to on the Spectrum, or from the sort



Generated using Paintbox designer software.

of machines that are just beginning to make their way into the upper end of the home computer market. So who knows, if Amstrad don't let us down it might be just a few years before we're all plugged into video machines and making our own music videos.

Generated using Paintbox designer software.



Graphics '86

Computer Animation '86



Created using Sarcos software

Things change very quickly in the computer animation industry (and just a few technological advances are this year's old hat). At the Computer Animation Film Festival, an offshoot of the computer '86 tentation, where the industry gathers to hand out its Oscars I overheard a damning criticism of one of the nominations which was described as being "very 86".

Animated computer graphics are now commonplace, having infiltrated every area of film, video and TV. It's hard to think that there was a time when the opening titles of news programmes didn't have to come out and run inside out before becoming legible. In the general public's opinion several familiar sequences were up for an award, notably the opening of *Remington World* (featuring Charles Chaplin and a human head that is being constantly transformed) and *Channel 4's* promotional interlude (remember the table with the New Year?). The winner was a promotional film for an advertising agency which those outside the industry can hardly even see. It seems an oversight that there isn't the occasional documentary on TV about computer animated graphics in their own right rather than just using them as purveyors of products in commercials or title sequences.

days when scoring over wire frame city scapes can impress. Now the concerns of those experimenting at the edge of what is technically possible centre on "realistic surfaces" and "modulated wave functions" to you and me it evokes the realistic representation of transforming solids and making the surface of the sea look believable. Another challenge is successfully representing the effects of light especially when reflected through glass — a technique known in the trade as ray tracing. The winner of this section reflected these concerns by first creating a totally believable shoreline landscape which was the setting for a solid pyramid of suspended glass balls which prevented and inverted for our delectation to show that reflection of light was consistently authentic from all angles and while in motion to show that even at the bottom of computer definition there is still a place for humans, other various other effects had been displayed we returned to the original landscape where all the water in the ocean suddenly disappeared down a huge plug hole.

In a field where anything new developments are the norm, it won't be too long before old hat will be a solid plug hole rotating through 360 degrees with perfect reflection of light. After all it's getting close to the time when even the best of this year's entrants will be treated upon as being "very 86".

In the commercial category the award was carried off by the frenetic *Stanley 10 Per Cent More* advert against close competition from the Midland Bank (the one which combines live action with a digitised Centre).

State of the art

It was the 'State of the Art' section that will perhaps be the most interesting from the point of view of what will be filtering through to us as TV viewers in the near future. Here are the

Created using Rite designer software



ON LINE WITH SPECTRE

Spectre Comms Pack Specific Communications £19.95

(or \$99.95 with GCOM modem)

The Spectre communications pack isn't a modem as such, but when used in conjunction with one (and with the Landata GCOM modem in particular) it offers a wide range of comms facilities.

The comms pack has been designed with the GCOM modem in mind, and is constructed in the same square block, modular style as the Landata range of comms equipment, but it can be used with most modems (including 1200/75 or 300/300 full duplex, and 1200/300 in both full and half duplex — but it's probably wise to contact Spectre Communications if you're thinking of using the comms pack with anything other than a GCOM).

Setting up a simple link, the pack is connected to the Spectremin via a ribbon cable (with an additional connector to allow

use of printers etc) and the GCOM fits snugly on top of the pack. Your phone is plugged into the modem, and the modem into your phone socket. On the front of the comms pack, facing you, are two buttons — for 'Modem' and 'Fax', selecting Modem or user to user mode. If you're using a different type of modem and to route the signal from the phone line, it's a minor irritation that neither of these are labelled, neither is there any indication of which position of the buttons selects which mode. This information is given in the instruction manual, but its inconvenient, when first starting to use the equipment, to have to keep referring back to the manual.

Menus

Inside the comms pack is a 16K EPROM containing all the software you'll need to access ProdataMiner and other Viewdata services, as well as bulletin boards and a number of utilities for uploading or downloading images, saving frames and so on. The GCOM modem can only access services which operate at 300/75 baud (which includes ProdataMiner and many of the most popular boards and Viewdata systems), though of

course other modems offer different baud rates.

Once power is turned on you'll be presented with the main menu displaying the various options available, and choosing an option from these will lead you to the relevant sub-menu. Most of these options are fairly standard, but it's very convenient to have them all gathered together on an EPROM and to have instant access to them, rather than to keep loading several items of software or to often reprogram. And the menu system makes it simple to choose an option or to allow the software to do all the work for you.

Logging on

Logging on to ProdataMiner was relatively painless. The first attempt failed because I hadn't gotten the 'full' and 'modem' buttons sorted out but on the second attempt I was in straight away. Just for comparison I might add that it took me ages to figure out how to get the Vix 8000 modem (recommended by Monitor) working when I first got one of those, so two attempts on the Spectre/GCOM set up is good going.

Initially the Spectre pack is the only unit to be operated by Monitor for use with 198 modems of the Spectremin.

Setting onto a couple of bulletin boards proved a bit trickier but after a little perseverance the manual (grudgingly let me have the reproduction I was trying for. As a matter of fact the Spectre manual is better than most hardware manuals, and covers most of the available options in reasonable detail, but it still seems to assume a little more than it ought to).

On the whole though, I found the two units fairly simple to use. The system of menu boxes a lot of the fuss out of using them and they gave me fewer headaches than most items of comms equipment do. If you want a modem solely for accessing ProdataMiner then you could opt for the cheaper Vix 8000, but then you really are limited to just that service. Buying a combination like the Spectre/GCOM set up also allows you to access a great range of interesting (and often free) bulletin boards as well. Even then the combined price of £99.95 probably isn't the lowest you could find, but the convenience of having the comms pack alongside so much of the fuss that seems to come along at standard with modems. It's probably worth it — especially if you're new to comms.

Further information from Spectre on 0925-362, or Monitor 800 on 01 278 3643.



Spectre Comms Pack with GCOM modem

RED BOXES

**Carol Brooksbank
courts domestic chaos
to try out the Red
Boxes home
automation kit.**

**Red Boxes Starter Pack
Red Boxes
£129**

What is your Spectrum doing while you are asleep, or out of the house? Not a lot, I suspect unless you are an electronics wizard. But it could be the key to a system which protects your home against intruders, opens the garage door, turns a light on when you walk into a room, or anything you can think of, so long as you can plug the appliance you wish to control into the ring mains.

The Red Boxes starter pack contains three modules: Red Leader, Red One and Red Two. Despite the awful names, it is a very ingenious system. Red Leader is the microcomputer which controls the system, and it uses the Spectrum as its monitor. After programming, it is disconnected from the Spectrum, leaving the computer free for normal use, and runs the system independently. The program is required until power to the controller is restored as Red One is a slave switching device, incorporating a 55 amp socket, plugged into the ring mains with the appliance to be controlled connected to it. Red Two is a slave infrared sensor, also plugged into the mains, which detects movement in its vicinity by responding to the change in heat level. The link between the controller and the slaves is the infra red, whose codes carry the messages between them. This makes the system very flexible and easy to install. The only electrical expertise needed is the ability to pull a plug in a socket and switch on.

Red Leader

To program Red Leader, you connect it to the Spectrum via the cassette socket. (GASD 11) is entered, and returning on Red Leader causes it to download its control program to the



Spectrum. The handbook could be more helpful here. It mentions which way the jackplugs are connected to the DinkMk sockets, but the handbook does not say so, or tell you which is which. Grief if wrong and the program crashes.

Each slave device has a unique code number, known only to the master which must be entered into the control program. Only a bungler or an expert hacker could tell you whether this, coupled with the random coding of messages between devices, makes the system tamper proof. I am neither, so I will take the manufacturer's word for it, especially as the rest of the system performs as they say it should.

The built-in clock is easily set, and devices can be programmed to go on and off at specific times, or can be linked together, so that a light or an alarm connected to Red One could go on when Red Two detects movement. They can stay on for a specified period, until a particular time, or until switched off manually. Operations can be performed once or repeated daily.

The Spectrum screen shows the current "ON" or "OFF" status of all devices, and the times and links programmed. The program can be saved to tape but, again, the handbook is less than helpful. When you enter the XDF (save) command, the screen

goes blank except for a cursor at the top. There is no response to the keyboard and the Spectrum emits strange beeping, but as the handbook happens to say that this is normal — the program is being downloaded to the Spectrum — you wait a minute or so and unplug everything. After a third try you decide to let it go on and see what happens, and eventually the beeping stops, and the screen prompts for the SAVE operation appears.

Red Basic

For more complex control, incorporating system switching, changing links between devices etc., Red Leader has its own built-in BASIC. There are no Spectrum keywords used, commands must be spelt out in full. In addition to the common BASIC commands, there are special ones like TELL, used to change the ON/OFF status of a device, or INCMV, to link a new device to the system. The date can be programmed and incorporated into instructions. The status of devices can be read and returned as a string. It took me some time to discover that the bug in the program was caused by the ON string being "ON". Personally, on when used with the TELL command has no space. Despite such small irritations the BASIC is very powerful, and only your own programming ability limits the complexity of the systems you can devise.

There is no doubt that efficient and sophisticated automation and security systems can be developed with the Red Boxes, but I have some reservations. One is cost. There is really very little that you can do with the unengaged starter system. Mounted 3m above floor level, Red Two can detect human movement up to about 4m away in a direct line, decreasing as the angle sharpens. Most homes would require at least two, covering the door and window areas, for real security. At £24.95 each, I will leave you to work out the cost of total cover for your home. Each Red Two needs its own power point, which would make it impractical in most houses I have been in. Red One could be used for an alarm, but if you also want to turn lights on and off to give an impression of an occupied house, you will need more of those at the same price. It may be possible to make a less pricey system, using window and door switches and pressure mats; the manufacturers are developing, and less Red Two, but no details or prices are available yet.

The red boxes are smart but, dotted around your home — some of them on up the walls —

Red Control 13 48 29

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32

Enter Command

10Up	10Down	10Set
10On	10Off	10Repeat
10Lock	10Time	10On
10Repeat	10On Time	10Off Time
10Lock	10Off	10Off

SCREEN DUMP OF RED 4086S CONTROL PROGRAM DISPLAY

with their bright red cables trailing to the nearest power point, will hardly blend inconspicuously into your decor. The system will probably appeal most to someone venturing into home automation, who can expand it gradually or to someone interested in retrofitting computers, because an 80386 device is also

planned. No details are given, but it suggests possibilities for networking with no linking cables other than the ring mains.

This is an interesting system, and great fun to use, but the £229 for the starter pack has to be seen as the first of many payments if a practical system is to be put together.

ARE YOU A BUDDING PROGRAMMER?

X is always looking for top quality games and utilities for publication. If you have a top notch game or a useful utility for the Spectrum or QL, why not send it to us for the prospect of an cassette or microdrive compilation with a listing if possible.

There is also our new feature Short Cuts to showcase your practical, new & imaginative short routines with cash prizes for published listings. For longer programs we pay competitive rates, and if you have an idea for an article or series for ZX — drop us a line or phone Bryan or Cliff on 04-437 0526 to talk it over.



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COMPUTER AND MAGAZINES



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1995

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WIN THE COLOUR OF MAGIC!

Escape from the mundane everyday world into the strange realm that is known as Discworld via our Colour of Magic competition.

Police software house Planika have snatched up the rights to Terry Pratchett's spoof fantasy novel, The Colour of Magic, and transformed it into an adventure. There are thirty copies of the adventure waiting to be won in this simple to enter competition.

Discworld, a kingdom set on a rubber ball is populated by a very weird bunch indeed. There's Twoflower Discworld's first four-footed down with his fifty-nine minds. Rincewind, a second-rate wizard entrusted with protecting the other four-footed in his travels and of course there's Death, sailing from cemetery but always up to mischief. Then there is the question of where the many-legged luggage lies in to all this. The easy way to find out the answer to this mystery is to win the game itself.



Identify Parade

All you have to do to enter is look at the illustration opposite and identify the four ghouls aboard the flying luggage. They are Rincewind, Death, Twoflower and The Pious Trip. They are marked 1 to 4 in the book and while outline pictures on this page. Simply put the numbers against the names on the entry coupon. Please remember to put the numbers and the names on the outside of your envelope.

The competition is open to all ZX readers except employees of Amiga, Microsoft Publications, Planika Software and those Web Closing date for entries is January 7th 1987.

COLOUR OF MAGIC COMPETITION

Put in the correct numbers

Death is number _____

Rincewind is number _____

The Pious Trip is number _____

Twoflower is number _____

Name _____

Address _____

Send your entry to Colour of Magic Competition, ZX Computing Monthly No 1 Golden Square, London, W9 3JL.

Toni Baker shows how the 128's extra memory can be used for super smooth animation.

As I sit here at my TV screen I am looking at an amazing effect which I would not have thought possible only a few months ago. A multi-colored spliced shape is rotating before my eyes, taking about five seconds for each revolution. The shape — which can only be adequately described as a three-sided cube-pyramid — is drawn on a transparent, so that I can see the back of the shape as well as the front. It's rather incredible — but beautiful.

But, what is most astonishing of all is that this effect is being produced by some other than the ZX Spectrum! The secret lies in the vast untapped resources of memory on the Spectrum 128, making it possible to store whole screens, and recall them in sequence. Full screen high resolution animation is at last possible.

Even more astonishing is the knowledge that the BASIC program which drives the individual frames was knocked up in only a few hours. The splendid appearance of the rotating figure is a consequence of the simplicity of the BASIC program. Had I spent a few days playing with an art studio program I could have achieved full colour shading with light glinting off each facet as it passes the screen — but that kind of modification I shall leave to you. There are many methods of drawing screen pictures, but the animation effect was produced by a little piece of machine code of my own.

Memory map

In understanding how the program works it is necessary to know all about the organization of the memory on the Spectrum 128. This is very simple, so I shall now explain it. Memory on the 128 is organized in 16Kb's. These are eight such pages, numbered 0000 to 0007, and each page of memory contains 16K. Hence we have $16 \times 8 = 128$ K of memory altogether. In addition there are two ROMs, but these aren't important as far as this program is concerned.

Addresses in paged memory begin at 0000 and end at 0FFF. Thus for each page of RAM the addresses overlap. Address 0000 on page zero is just the same thing as address 0000 on page one. They are different locations,

despite having the same address. Now then is it possible to access all of this memory if in all pages imposed on top of itself with the same address referring to any one of eight pages?

The answer is a technique called PAGING. Only one 16K page may be paged in, at a time. 'Paged in' means that a page may be accessed — it may be P0000 or P0001 (as used in the normal way, if a page is NOT paged in then it may not be accessed at all, with just two exceptions — which we'll come to later).

Because the addresses overlap, only one page may be paged in at a time. At all times, one of the pages will be paged in. When you use the computer normally, either in BASIC or machine code then page zero will be paged in, and it is important for one machine code program to restore page zero before returning to BASIC.

As mentioned machine code will know memory on the Spectrum appears to start at 4000h and go continuously off the top up to 0FFF and then stop. Below 4000h is the ROM, or at least one of the ROMs (but appears to be the operative word). Memory is organized in eight 16K pages of five explained, and the appearance of a continuous stretch of RAM from 4000h to 0FFF is a nice illusion and it's all brought about by hardware, not software.

Pages

The first chunk of memory runs from 4000h to 7FFF. This chunk is in fact RAM page five! The second chunk runs from 8000h to BFFF — this is RAM page two! The last chunk, which runs from C000 to FFFF is RAM page zero. In practice this means that if you page in RAM page five then addresses C000 to FFFF will access precisely the same memory locations as addresses 4000 to 7FFF. PAGING an address in the range C000 to FFFF will actually PAGE the corresponding address in the range 4000 to 7FFF. In a similar fashion, if page

five is paged in then PAGING an address in the range 0000 to 0FFF will PAGE the corresponding address in the range 8000 to BFFF. That the appearance of continuity is maintained for the machine code programmer is more than pages two and five are identical. They appear to be fixed in memory and have fixed addresses less than C000. Pages two and five are, in fact, always paged in, and this is an advantage.

Page five is special in another way too — a major modifier way. If there the screen. PAGING an address in the range 4000 to 0FFF (or an address in the range C000 to 0FFF when page five is paged in) will directly PAGE the screen. This you know, but the Spectrum 128 has not one but TWO memory mapped screens. Let us for a while explore this concept.

Screens

There are two screens, but only one of them may be visible at any one time. Normally this is screen zero. Screen zero is said to be ACTIVE whenever its contents appear on the TV, and similarly screen one is said to be ACTIVE whenever its contents appear on the TV. Screen one is stored in page seven, and this is a hardware modification, not a software one, so you cannot change the location of screen one in this way. Page seven is special too. Locations C000 to DFFF store the screen bytes, while locations D000 to DFFF store the attributes, but remember these addresses refer to RAM page seven, not to RAM page zero, so it is not sufficient to PAGE the addresses. Page seven must be paged in too!

As far as the screens are concerned, it doesn't make any difference which page is paged in. Screen zero or screen one may be active regardless of whatever page of RAM is paged in. Only one screen may be active at a time (obviously), and it is impossible to deactivate both screens at once.

128 Animation



```

10 REMARK: 100000
20 GOTO "RAMPAGE" CODE
30 GOTO 10
40 REM 1000
50 REM 1000
60 REM 1000
70 REM 1000
80 REM 1000
90 REM 1000
100 REM 1000
110 REM 1000
120 REM 1000
130 REM 1000
140 REM 1000
150 REM 1000
160 REM 1000
170 REM 1000
180 REM 1000
190 REM 1000
200 REM 1000
210 REM 1000
220 REM 1000
230 REM 1000
240 REM 1000
250 REM 1000
260 REM 1000
270 REM 1000
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810 REM 1000
820 REM 1000
830 REM 1000
840 REM 1000
850 REM 1000
860 REM 1000
870 REM 1000
880 REM 1000
890 REM 1000
900 REM 1000
910 REM 1000
920 REM 1000
930 REM 1000
940 REM 1000
950 REM 1000
960 REM 1000
970 REM 1000
980 REM 1000
990 REM 1000
1000 REM 1000

```

READ on RAM page is. What the machine code instruction set makes it impossible to refer to such locations directly (eg LD A,00000) is impossible if it is nonetheless a useful notation for us human beings. In this notation we could say that screen one occupies addresses 70000 to 704FF inclusive (including the attribute bytes). This notation has its disadvantages too. Because RAM page two is permanently mapped in at 4000 to 3FFF then we can describe the position of screen two in one of two different ways — either as 4000 to 5AFF, or as 50000 to 504FF. Both of these descriptions refer to the same chunk of memory.

For completeness, I should add that there are also two 16K ROMs, although, as has already been stated, the ROMs aren't really relevant to this program. The two ROMs each occupy addresses 8000 to 9FFF, so, as with the RAM pages, only one ROM may be paged in at a time. Using the same convention as for the RAM pages we can uniquely specify a ROM address as five digit hexadecimal number so that ROM refers to address 1000 in ROM zero whereas 70234 refers to address 70234 in ROM one. Surprisingly, the ROM which appears to be paged in normally (which you can FIND either from BASIC or

machine code) is actually ROM page ONE, not zero. This ROM is the same as the old 16K ROM which was present on 10K and 48K Spectrums, with just a couple of changes.

Enough of ROMs — let's get back to RAM pages and screens. Exactly HOW do you page them? The answer is the OUT instruction, and is now system variable called BANK. At its address is 5850 (or 50500) to keep hopping on about the same point over and over again. Figure one will explain exactly what each of its bits is for. In machine code it is possible to change RAM page or to change which screen is active, by the simple procedure of loading BC with 7FFF, loading the A register with a value constructed from Figure one, and then performing two steps — in this order:

- 1) Store the value from the A register in the system variable BANK_16.
- 2) then use the machine code instruction OUT 585A.

The order of the last two instructions is important. If you put these two entries into a loop then the system will go wrong if an interrupt occurs between the two instructions — this may sound a little odd, it is also possible to change ROM page by the method, but interrupts must be

— so either one or the other will always be showing on the TV. This means that it is possible to create flicker free animation. If you draw on screen one while screen two is active then only screen two will appear on the screen. Once the drawing is complete then you can activate screen one and the TV picture will change INSTANTLY. Now, with screen one active, you can draw on screen zero — only screen one (the previously completed drawing) will be showing on the TV. When this drawing is complete you can re-activate screen zero. Once again the TV image will change INSTANTLY with no flicker whatsoever. This, then, is the principle of my program.

When we write Spectrum 128 addresses down it is conventional to use a five digit hexadecimal number, rather than a four digit number. The first digit refers to the RAM page number in that way I could uniquely refer to address 8000 on page four or address 40000. It would be difficult here, say, 00000 which refers to address

10	RAM_16	0000 10	
20	BANK_16	00 00	One optional page/screen number.
30000	SR_L_1	0000 00	One optional page/screen number.
4000	SR_P_16	0000 00	
50	SR_1	00 00	
10000	SR_16_0000	00 00 0000	One optional page to change page/screen.
20000	SR_L_16_0000	00 00 0000 00	One optional page/screen number.
3000	SR_16_16	00 00 00	
4000	SR_16_16	00 00 00	
5000	SR_16_16	00 00 00	
6000	SR_16_16	00 00 00	
7000	SR_16_16	00 00 00	
8000	SR_16_16	00 00 00	
9000	SR_16_16	00 00 00	
10000	SR_16_16	00 00 00	
11000	SR_16_16	00 00 00	
12000	SR_16_16	00 00 00	
13000	SR_16_16	00 00 00	
14000	SR_16_16	00 00 00	
15000	SR_16_16	00 00 00	
16000	SR_16_16	00 00 00	
17000	SR_16_16	00 00 00	
18000	SR_16_16	00 00 00	
19000	SR_16_16	00 00 00	
20000	SR_16_16	00 00 00	
21000	SR_16_16	00 00 00	
22000	SR_16_16	00 00 00	
23000	SR_16_16	00 00 00	
24000	SR_16_16	00 00 00	
25000	SR_16_16	00 00 00	
26000	SR_16_16	00 00 00	
27000	SR_16_16	00 00 00	
28000	SR_16_16	00 00 00	
29000	SR_16_16	00 00 00	
30000	SR_16_16	00 00 00	
31000	SR_16_16	00 00 00	
32000	SR_16_16	00 00 00	
33000	SR_16_16	00 00 00	
34000	SR_16_16	00 00 00	
35000	SR_16_16	00 00 00	
36000	SR_16_16	00 00 00	
37000	SR_16_16	00 00 00	
38000	SR_16_16	00 00 00	
39000	SR_16_16	00 00 00	
40000	SR_16_16	00 00 00	
41000	SR_16_16	00 00 00	
42000	SR_16_16	00 00 00	
43000	SR_16_16	00 00 00	
44000	SR_16_16	00 00 00	
45000	SR_16_16	00 00 00	
46000	SR_16_16	00 00 00	
47000	SR_16_16	00 00 00	
48000	SR_16_16	00 00 00	
49000	SR_16_16	00 00 00	
50000	SR_16_16	00 00 00	
51000	SR_16_16	00 00 00	
52000	SR_16_16	00 00 00	
53000	SR_16_16	00 00 00	
54000	SR_16_16	00 00 00	
55000	SR_16_16	00 00 00	
56000	SR_16_16	00 00 00	
57000	SR_16_16	00 00 00	
58000	SR_16_16	00 00 00	
59000	SR_16_16	00 00 00	
60000	SR_16_16	00 00 00	
61000	SR_16_16	00 00 00	
62000	SR_16_16	00 00 00	
63000	SR_16_16	00 00 00	
64000	SR_16_16	00 00 00	
65000	SR_16_16	00 00 00	
66000	SR_16_16	00 00 00	
67000	SR_16_16	00 00 00	
68000	SR_16_16	00 00 00	
69000	SR_16_16	00 00 00	
70000	SR_16_16	00 00 00	
71000	SR_16_16	00 00 00	
72000	SR_16_16	00 00 00	
73000	SR_16_16	00 00 00	
74000	SR_16_16	00 00 00	
75000	SR_16_16	00 00 00	
76000	SR_16_16	00 00 00	
77000	SR_16_16	00 00 00	
78000	SR_16_16	00 00 00	
79000	SR_16_16	00 00 00	
80000	SR_16_16	00 00 00	
81000	SR_16_16	00 00 00	
82000	SR_16_16	00 00 00	
83000	SR_16_16	00 00 00	
84000	SR_16_16	00 00 00	
85000	SR_16_16	00 00 00	
86000	SR_16_16	00 00 00	
87000	SR_16_16	00 00 00	
88000	SR_16_16	00 00 00	
89000	SR_16_16	00 00 00	
90000	SR_16_16	00 00 00	
91000	SR_16_16	00 00 00	
92000	SR_16_16	00 00 00	
93000	SR_16_16	00 00 00	
94000	SR_16_16	00 00 00	
95000	SR_16_16	00 00 00	
96000	SR_16_16	00 00 00	
97000	SR_16_16	00 00 00	
98000	SR_16_16	00 00 00	
99000	SR_16_16	00 00 00	
100000	SR_16_16	00 00 00	

The machine code is in three parts. It is stored at address 1000 which corresponds to address 20000. Note that although page two is in fact used to store address, these address actually locations 20000 to 20499 only locations above this are free for machine code and will not be overwritten by the various manuals.

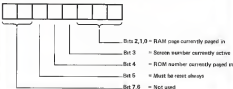
The last part of the code is called `Page`. A (address: 500) it gives in the request and page, and collects the required data, as specified by the A (address: 501) and the current code. This is quite boring, simple, the second part of the code is a bit more interesting. A (address: 502) and is called from `MSDK` to transfer the image authority on the screen, and that is — the correct screen used by `MSDK` into its specific place in memory. The last piece of code is called `ANIMATED`.

A whole host of new system variables and stuff. Even numbered frames are stored at address 0000 on the relevant page, while odd numbered frames are stored at address 0001 on the same page.

The program makes use of all of these techniques, the machine code program is extraordinarily simple, provided you understand the screen and paging system that I have just described. I have achieved animation by storing twelve complete screen images throughout the vast spread of memory available. The attribute bytes in this case are not saved since they are the same for each frame, but you could adapt the program to store the attribute bytes as well with no difficulty. I have stored two complete frames as RAM pages `jump one, five, three, four and five` I have not used page five because page five contains screen two and the third program doing this the system reserves the machine code, removing the machine cluster immediately and so on. I have not used page seven because page seven contains screen one and

Year	Country	Population (millions)	Urban population (millions)	Urban population (%)
1980	China	954	190	19.9
1980	India	854	110	12.9
1980	USA	226	150	66.4
1980	Japan	123	90	73.2
1980	France	56	38	67.9
1980	Germany	61	42	68.9
1980	Italy	57	38	66.7
1980	UK	56	40	71.4
1980	Spain	40	28	70.0
1980	Sweden	8.5	6.5	76.5
1980	Norway	4.5	3.5	77.8
1980	Denmark	5.0	3.5	70.0
1980	Netherlands	15.5	12.5	80.6
1980	Belgium	10.5	8.5	80.9
1980	Switzerland	7.0	6.0	85.7
1980	Austria	8.0	6.5	81.2
1980	Portugal	10.5	5.5	52.4
1980	Greece	10.5	4.5	42.9
1980	South Korea	33.0	15.0	45.5
1980	Taiwan	20.0	10.0	50.0
1980	Singapore	2.0	1.5	75.0
1980	Malaysia	14.0	6.0	42.9
1980	Thailand	50.0	10.0	20.0
1980	Philippines	60.0	10.0	16.7
1980	Indonesia	140.0	20.0	14.3
1980	Brazil	130.0	50.0	38.5
1980	Argentina	27.0	15.0	55.6
1980	Chile	10.0	5.0	50.0
1980	Colombia	20.0	10.0	50.0
1980	Venezuela	20.0	10.0	50.0
1980	Peru	20.0	10.0	50.0
1980	Ecuador	10.0	5.0	50.0
1980	Bolivia	10.0	5.0	50.0
1980	Paraguay	10.0	5.0	50.0
1980	Uruguay	10.0	5.0	50.0
1980	Costa Rica	2.0	1.0	50.0
1980	Panama	1.0	0.5	50.0
1980	Cuba	11.0	5.0	45.5
1980	Haiti	6.0	1.0	16.7
1980	Dominican Republic	3.0	1.0	33.3
1980	Jamaica	1.0	0.5	50.0
1980	Trinidad and Tobago	1.0	0.5	50.0
1980	Barbados	0.2	0.1	50.0
1980	Guyana	0.7	0.3	42.9
1980	Suriname	0.4	0.2	50.0
1980	French Guiana	0.2	0.1	50.0
1980	Guadeloupe	0.1	0.05	50.0
1980	Martinique	0.1	0.05	50.0
1980	Reunion	0.1	0.05	50.0
1980	Mayotte	0.1	0.05	50.0
1980	Comoros	0.1	0.05	50.0
1980	Madagascar	10.0	0.5	5.0
1980	Mozambique	15.0	0.5	3.3
1980	Botswana	1.0	0.1	10.0
1980	Swaziland	0.5	0.05	10.0
1980	Lesotho	0.5	0.05	10.0
1980	Namibia	1.0	0.1	10.0
1980	South Africa	20.0	1.0	5.0
1980	Angola	10.0	0.5	5.0
1980	Cape Verde	0.1	0.05	50.0
1980	Senegal	1.0	0.1	10.0
1980	Gambia	0.5	0.05	10.0
1980	Sierra Leone	0.5	0.05	10.0
1980	Liberia	0.5	0.05	10.0
1980	Ivory Coast	1.0	0.1	10.0
1980	Ghana	0.5	0.05	10.0
1980	Togo	0.5	0.05	10.0
1980	Benin	0.5	0.05	10.0
1980	Niger	0.5	0.05	10.0
1980	Chad	0.5	0.05	10.0
1980	Sudan	1.0	0.1	10.0
1980	Egypt	50.0	1.0	2.0
1980	Syria	10.0	0.5	5.0
1980	Lebanon	0.5	0.05	10.0
1980	Jordan	0.5	0.05	10.0
1980	Israel			

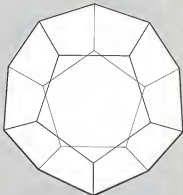
Figure 1. The meaning of the bits of the system variable BANK_M at address 085C. When output to port 7FFD will change pages as follows.



address 0000) and it is this program which animates the twelve sized frames of a cycle of twelve frames per second. This rate is completely flicker free and gives one second of continuous full screen free flowing movement. If the twelve frames are designed to repeat in a cycle, as in my example, then you have a cycle of continuous movement which goes on forever. Fortunately my program does allow you to break out by pressing (RESET).

The BASIC which I have included is an example of how to use the ANIMATE routine. The outer FOR/NEXT loop, FOR I = 0 TO 11, will draw a quite pretty geometric figure with twelve different angles. Line 20 will call the machine code SCREEN_PFRAME routine which will store each picture in memory once it is drawn. Finally, line 340 will call the ANIMATE routine to set the picture moving. You can adapt, or even change the BASIC program altogether if you like. The most impressive thing you could do would be to create twelve full screen pictures using an art studio type program, and store these on tape once they are drawn. Then you can write my BASIC program to simply load screen images from tape and store them in memory one at a time as they are loaded.

This program is quite interesting from a machine code point of view, and quite impressive from a visual point of view. It is my offering for the Winter Solstice — a present to you all for at least those of you who live in Spectrum 128 — the first 'twist' out now (and you never know — you might get one as a present this season). Happy Solstice everyone.



THE PROFESSIONAL TOUCH

THE PROFESSIONAL TOUCH

**Hewson's Steve Turner
with advice on getting
your mega-game
published, plus a
machine code sound
routine.**

There are two ways you can get your games on the market, you can either do the whole business of duplication and marketing yourself or find someone else to do all or part of it for you.

In the early days of home computing most games were sold by mail order and self-marketing was easy. All that was required was a small ad in one of the few computer magazines, but the market has changed considerably since then and now every product must compete against dozens of others. The major stores account for a huge proportion of sales of a game, and success or failure is affected by the acceptance of a game by the buyers for a few major distributors. They consider media coverage (the amount you spend on ads), reliability of the supplier as well as the quality of the game.

To succeed, a professional approach to advertising, packaging and publicity is needed. This all takes a great deal of time and money. A budget of £20,000 would not be excessive to cover advertising, a press launch, artwork and publicity. On top of that you need the initial duplication and print costs.

Clearly if you want to succeed you must have a wide range of skills or have the ability to set up and run a team. So unless you are a business tycoon in the making I advise you to spend your time writing programs and leave the marketing to the experts.

Licensing your program

Finding someone to market the program for you is a way of splitting the risk of the time and money involved in a game. The publisher's investment is usually many times that of the writer, so, in a royalty agreement, the publisher takes the lion's share. Royalty agreements differ widely but a typical split will be 15% of the wholesale price for the programmer. Wholesale prices may be only 40% of the retail price so this works out at 6p to 70p for each copy sold.

To find a publisher it is best to really polish up your game first. Publishers receive hundreds of games a year and can only afford the time to give most a short look. A direct mode or

Listing 1

SOUND ROUTINE BASED TESTED

LINE 10 LOADS THE MACHINE CODE FROM TAPE

```

10 LOAD 40000
15 LET SOUND#=-45000 LET SUMED=45000
20 LOAD "SOUND"CODE, 45000
30 DIM R(10)
40 FOR I=0 TO 9 LET R(I)=0 NEXT I
1000 CLS PRINT " SOUND TESTED?"
1010 PRINT "1.SOUND NUMBER".R(1)
1020 PRINT "2.START FREQ".R(2)
1030 PRINT "3.FREQ CHANGE".R(3)
1040 PRINT "4.CHANGE TIME".R(4)
1050 PRINT "5.REPEAT TIMES".R(5)
1060 PRINT "6.INCLUDE THE 1/2C.FREQ"
1070 PRINT " 0=SMOOTH" " 1=1/2 FREQ DASH" " 2=2X FREQ UP" " OTHER=1
  FREQ/2"
1080 PRINT "7.RESET FREQ".R(7)
1090 PRINT "8.CHANGE 7 RESET".R(8)
1100 PRINT "9.CHANGE TO 1/2".R(9)
1110 PRINT "10.DELTA ".R(10)
2000 INPUT "ENTER 0 TO FILE SOUND OR NUMBER TO CHANGE VALUES".I
4010 IF I=0 THEN GO TO 3000
2010 IF I>10 OR I<1 THEN GO TO 3000
2020 LET X=INT I
2040 INPUT "NEW VALUE 0-255 ".I
2050 IF I<0 OR I>255 THEN GO TO 2040
2060 LET R(X)=INT I
2080 IF X=1 THEN GO TO 2060
2090 REM STORE SOUND IN TABLE
2070 LET Q=SIGN(R(1)*I/40)*R(2)
2090 PLUS Q,R(3)
2090 GO TO 1000
2090 REM GET SOUND
4010 LET U=SIGN(R(1)*I/40)
2030 FOR X=0 TO 9 LET R(X)=PEEK Q LET U=U+1 NEXT X
2020 GO TO 1000
2040 REM CHL SOUND
3000 LET X=R(10)
3010 PRINT AT 20,1;"PRESS 0 TO REPEAT SOUND OR 1 TO CHANGE."
3020 FOR Q=0 UNTIL 10-1
3030 PLUS Q
3040 DIMENSIONIZE USE 45000 FOR Y=0 TO A NEXT Y IF DIR(Y)="" THEN GO TO 3000
3050 IF INKEY#="0" THEN GO TO 3020
3070 GO TO 1000
3080 FOR I=45000 TO 45000 PRINT FREQ I. NEXT I

```

Listing 2

1000	CLS		1000	CLS	1000	CLS		1000	CLS	
1010	PRINT	"SOUND"	1010	PRINT	1010	PRINT	"SOUND"	1010	PRINT	
1020	PRINT	"1.SOUND NUMBER".R(1)	1020	PRINT	1020	PRINT	"1.SOUND NUMBER".R(1)	1020	PRINT	
1030	PRINT	"2.START FREQ".R(2)	1030	PRINT	1030	PRINT	"2.START FREQ".R(2)	1030	PRINT	
1040	PRINT	"3.FREQ CHANGE".R(3)	1040	PRINT	1040	PRINT	"3.FREQ CHANGE".R(3)	1040	PRINT	
1050	PRINT	"4.CHANGE TIME".R(4)	1050	PRINT	1050	PRINT	"4.CHANGE TIME".R(4)	1050	PRINT	
1060	PRINT	"5.REPEAT TIMES".R(5)	1060	PRINT	1060	PRINT	"5.REPEAT TIMES".R(5)	1060	PRINT	
1070	PRINT	"6.INCLUDE THE 1/2C.FREQ"	1070	PRINT	1070	PRINT	"6.INCLUDE THE 1/2C.FREQ"	1070	PRINT	
1080	PRINT	" 0=SMOOTH" " 1=1/2 FREQ DASH" " 2=2X FREQ UP" " OTHER=1	1080	PRINT	1080	PRINT	" 0=SMOOTH" " 1=1/2 FREQ DASH" " 2=2X FREQ UP" " OTHER=1	1080	PRINT	
1090	PRINT	"FREQ/2"	1090	PRINT	1090	PRINT	"FREQ/2"	1090	PRINT	
1100	PRINT	"7.RESET FREQ".R(7)	1100	PRINT	1100	PRINT	"7.RESET FREQ".R(7)	1100	PRINT	
1110	PRINT	"8.CHANGE 7 RESET".R(8)	1110	PRINT	1110	PRINT	"8.CHANGE 7 RESET".R(8)	1110	PRINT	
1120	PRINT	"9.CHANGE TO 1/2".R(9)	1120	PRINT	1120	PRINT	"9.CHANGE TO 1/2".R(9)	1120	PRINT	
1130	PRINT	"10.DELTA ".R(10)	1130	PRINT	1130	PRINT	"10.DELTA ".R(10)	1130	PRINT	
2000	INPUT	"ENTER 0 TO FILE SOUND OR NUMBER TO CHANGE VALUES".I	2000	INPUT	2000	INPUT	"ENTER 0 TO FILE SOUND OR NUMBER TO CHANGE VALUES".I	2000	INPUT	
4010	IF I=0 THEN GO TO 3000		4010	IF I=0 THEN GO TO 3000		4010	IF I=0 THEN GO TO 3000		4010	IF I=0 THEN GO TO 3000
2010	IF I>10 OR I<1 THEN GO TO 3000		2010	IF I>10 OR I<1 THEN GO TO 3000		2010	IF I>10 OR I<1 THEN GO TO 3000		2010	IF I>10 OR I<1 THEN GO TO 3000
2020	LET X=INT I		2020	LET X=INT I		2020	LET X=INT I		2020	LET X=INT I
2040	INPUT "NEW VALUE 0-255 ".I		2040	INPUT "NEW VALUE 0-255 ".I		2040	INPUT "NEW VALUE 0-255 ".I		2040	INPUT "NEW VALUE 0-255 ".I
2050	IF I<0 OR I>255 THEN GO TO 2040		2050	IF I<0 OR I>255 THEN GO TO 2040		2050	IF I<0 OR I>255 THEN GO TO 2040		2050	IF I<0 OR I>255 THEN GO TO 2040
2060	LET R(X)=INT I		2060	LET R(X)=INT I		2060	LET R(X)=INT I		2060	LET R(X)=INT I
2080	IF X=1 THEN GO TO 2060		2080	IF X=1 THEN GO TO 2060		2080	IF X=1 THEN GO TO 2060		2080	IF X=1 THEN GO TO 2060
2090	REM STORE SOUND IN TABLE		2090	REM STORE SOUND IN TABLE		2090	REM STORE SOUND IN TABLE		2090	REM STORE SOUND IN TABLE
2070	LET Q=SIGN(R(1)*I/40)*R(2)		2070	LET Q=SIGN(R(1)*I/40)*R(2)		2070	LET Q=SIGN(R(1)*I/40)*R(2)		2070	LET Q=SIGN(R(1)*I/40)*R(2)
2090	PLUS Q,R(3)		2090	PLUS Q,R(3)		2090	PLUS Q,R(3)		2090	PLUS Q,R(3)
2090	GO TO 1000		2090	GO TO 1000		2090	GO TO 1000		2090	GO TO 1000
2090	REM GET SOUND		2090	REM GET SOUND		2090	REM GET SOUND		2090	REM GET SOUND
4010	LET U=SIGN(R(1)*I/40)		4010	LET U=SIGN(R(1)*I/40)		4010	LET U=SIGN(R(1)*I/40)		4010	LET U=SIGN(R(1)*I/40)
2030	FOR X=0 TO 9 LET R(X)=PEEK Q LET U=U+1 NEXT X		2030	FOR X=0 TO 9 LET R(X)=PEEK Q LET U=U+1 NEXT X		2030	FOR X=0 TO 9 LET R(X)=PEEK Q LET U=U+1 NEXT X		2030	FOR X=0 TO 9 LET R(X)=PEEK Q LET U=U+1 NEXT X
2020	GO TO 1000		2020	GO TO 1000		2020	GO TO 1000		2020	GO TO 1000
2040	REM CHL SOUND		2040	REM CHL SOUND		2040	REM CHL SOUND		2040	REM CHL SOUND
3000	LET X=R(10)		3000	LET X=R(10)		3000	LET X=R(10)		3000	LET X=R(10)
3010	PRINT AT 20,1;"PRESS 0 TO REPEAT SOUND OR 1 TO CHANGE."		3010	PRINT AT 20,1;"PRESS 0 TO REPEAT SOUND OR 1 TO CHANGE."		3010	PRINT AT 20,1;"PRESS 0 TO REPEAT SOUND OR 1 TO CHANGE."		3010	PRINT AT 20,1;"PRESS 0 TO REPEAT SOUND OR 1 TO CHANGE."
3020	FOR Q=0 UNTIL 10-1		3020	FOR Q=0 UNTIL 10-1		3020	FOR Q=0 UNTIL 10-1		3020	FOR Q=0 UNTIL 10-1
3030	PLUS Q		3030	PLUS Q		3030	PLUS Q		3030	PLUS Q
3040	DIMENSIONIZE USE 45000 FOR Y=0 TO A NEXT Y IF DIR(Y)="" THEN GO TO 3000		3040	DIMENSIONIZE USE 45000 FOR Y=0 TO A NEXT Y IF DIR(Y)="" THEN GO TO 3000		3040	DIMENSIONIZE USE 45000 FOR Y=0 TO A NEXT Y IF DIR(Y)="" THEN GO TO 3000		3040	DIMENSIONIZE USE 45000 FOR Y=0 TO A NEXT Y IF DIR(Y)="" THEN GO TO 3000
3050	IF INKEY#="0" THEN GO TO 3020		3050	IF INKEY#="0" THEN GO TO 3020		3050	IF INKEY#="0" THEN GO TO 3020		3050	IF INKEY#="0" THEN GO TO 3020
3070	GO TO 1000		3070	GO TO 1000		3070	GO TO 1000		3070	GO TO 1000
3080	FOR I=45000 TO 45000 PRINT FREQ I. NEXT I		3080	FOR I=45000 TO 45000 PRINT FREQ I. NEXT I		3080	FOR I=45000 TO 45000 PRINT FREQ I. NEXT I		3080	FOR I=45000 TO 45000 PRINT FREQ I. NEXT I

0070	200000	00000	LD	1000000.0	1000000.0
0080	00	00000	LD	0	0
0090	000000	00000	LD	0.000000	0.000000
0100	00000	00000	LD	0.0000	0.0000
0110	000000	00000	LD	0.000000	0.000000
0120	00000	00000	LD	0.0000	0.0000
0130	00000	00000	LD	0.0000	0.0000
0140	00000	00000	LD	0.0000	0.0000
0150	00000	00000	LD	0.0000	0.0000
0160	00000	00000	LD	0.0000	0.0000
0170	00000	00000	LD	0.0000	0.0000
0180	00000	00000	LD	0.0000	0.0000
0190	00000	00000	LD	0.0000	0.0000
0200	00000	00000	LD	0.0000	0.0000
0210	00000	00000	LD	0.0000	0.0000
0220	00000	00000	LD	0.0000	0.0000
0230	00000	00000	LD	0.0000	0.0000
0240	00000	00000	LD	0.0000	0.0000
0250	00000	00000	LD	0.0000	0.0000
0260	00000	00000	LD	0.0000	0.0000
0270	00000	00000	LD	0.0000	0.0000
0280	00000	00000	LD	0.0000	0.0000
0290	00000	00000	LD	0.0000	0.0000
0300	00000	00000	LD	0.0000	0.0000
0310	00000	00000	LD	0.0000	0.0000
0320	00000	00000	LD	0.0000	0.0000
0330	00000	00000	LD	0.0000	0.0000
0340	00000	00000	LD	0.0000	0.0000
0350	00000	00000	LD	0.0000	0.0000
0360	00000	00000	LD	0.0000	0.0000
0370	00000	00000	LD	0.0000	0.0000
0380	00000	00000	LD	0.0000	0.0000
0390	00000	00000	LD	0.0000	0.0000
0400	00000	00000	LD	0.0000	0.0000
0410	00000	00000	LD	0.0000	0.0000
0420	00000	00000	LD	0.0000	0.0000
0430	00000	00000	LD	0.0000	0.0000
0440	00000	00000	LD	0.0000	0.0000
0450	00000	00000	LD	0.0000	0.0000
0460	00000	00000	LD	0.0000	0.0000
0470	00000	00000	LD	0.0000	0.0000
0480	00000	00000	LD	0.0000	0.0000
0490	00000	00000	LD	0.0000	0.0000
0500	00000	00000	LD	0.0000	0.0000
0510	00000	00000	LD	0.0000	0.0000
0520	00000	00000	LD	0.0000	0.0000
0530	00000	00000	LD	0.0000	0.0000
0540	00000	00000	LD	0.0000	0.0000
0550	00000	00000	LD	0.0000	0.0000
0560	00000	00000	LD	0.0000	0.0000
0570	00000	00000	LD	0.0000	0.0000
0580	00000	00000	LD	0.0000	0.0000
0590	00000	00000	LD	0.0000	0.0000
0600	00000	00000	LD	0.0000	0.0000
0610	00000	00000	LD	0.0000	0.0000
0620	00000	00000	LD	0.0000	0.0000
0630	00000	00000	LD	0.0000	0.0000
0640	00000	00000	LD	0.0000	0.0000
0650	00000	00000	LD	0.0000	0.0000
0660	00000	00000	LD	0.0000	0.0000
0670	00000	00000	LD	0.0000	0.0000
0680	00000	00000	LD	0.0000	0.0000
0690	00000	00000	LD	0.0000	0.0000
0700	00000	00000	LD	0.0000	0.0000
0710	00000	00000	LD	0.0000	0.0000
0720	00000	00000	LD	0.0000	0.0000
0730	00000	00000	LD	0.0000	0.0000
0740	00000	00000	LD	0.0000	0.0000
0750	00000	00000	LD	0.0000	0.0000
0760	00000	00000	LD	0.0000	0.0000
0770	00000	00000	LD	0.0000	0.0000
0780	00000	00000	LD	0.0000	0.0000
0790	00000	00000	LD	0.0000	0.0000
0800	00000	00000	LD	0.0000	0.0000
0810	00000	00000	LD	0.0000	0.0000
0820	00000	00000	LD	0.0000	0.0000
0830	00000	00000	LD	0.0000	0.0000
0840	00000	00000	LD	0.0000	0.0000
0850	00000	00000	LD	0.0000	0.0000
0860	00000	00000	LD	0.0000	0.0000
0870	00000	00000	LD	0.0000	0.0000
0880	00000	00000	LD	0.0000	0.0000
0890	00000	00000	LD	0.0000	0.0000
0900	00000	00000	LD	0.0000	0.0000
0910	00000	00000	LD	0.0000	0.0000
0920	00000	00000	LD	0.0000	0.0000
0930	00000	00000	LD	0.0000	0.0000
0940	00000	00000	LD	0.0000	0.0000
0950	00000	00000	LD	0.0000	0.0000
0960	00000	00000	LD	0.0000	0.0000
0970	00000	00000	LD	0.0000	0.0000
0980	00000	00000	LD	0.0000	0.0000
0990	00000	00000	LD	0.0000	0.0000

0000	0000	0000	LD	0.0000	0.0000
0010	0000	0000	LD	0.0000	0.0000
0020	0000	0000	LD	0.0000	0.0000
0030	0000	0000	LD	0.0000	0.0000
0040	0000	0000	LD	0.0000	0.0000
0050	0000	0000	LD	0.0000	0.0000
0060	0000	0000	LD	0.0000	0.0000
0070	0000	0000	LD	0.0000	0.0000
0080	0000	0000	LD	0.0000	0.0000
0090	0000	0000	LD	0.0000	0.0000
0100	0000	0000	LD	0.0000	0.0000
0110	0000	0000	LD	0.0000	0.0000
0120	0000	0000	LD	0.0000	0.0000
0130	0000	0000	LD	0.0000	0.0000
0140	0000	0000	LD	0.0000	0.0000
0150	0000	0000	LD	0.0000	0.0000
0160	0000	0000	LD	0.0000	0.0000
0170	0000	0000	LD	0.0000	0.0000
0180	0000	0000	LD	0.0000	0.0000
0190	0000	0000	LD	0.0000	0.0000
0200	0000	0000	LD	0.0000	0.0000
0210	0000	0000	LD	0.0000	0.0000
0220	0000	0000	LD	0.0000	0.0000
0230	0000	0000	LD	0.0000	0.0000
0240	0000	0000	LD	0.0000	0.0000
0250	0000	0000	LD	0.0000	0.0000
0260	0000	0000	LD	0.0000	0.0000
0270	0000	0000	LD	0.0000	0.0000
0280	0000	0000	LD	0.0000	0.0000
0290	0000	0000	LD	0.0000	0.0000
0300	0000	0000	LD	0.0000	0.0000
0310	0000	0000	LD	0.0000	0.0000
0320	0000	0000	LD	0.0000	0.0000
0330	0000	0000	LD	0.0000	0.0000
0340	0000	0000	LD	0.0000	0.0000
0350	0000	0000	LD	0.0000	0.0000
0360	0000	0000	LD	0.0000	0.0000
0370	0000	0000	LD	0.0000	0.0000
0380	0000	0000	LD	0.0000	0.0000
0390	0000	0000	LD	0.0000	0.0000
0400	0000	0000	LD	0.0000	0.0000
0410	0000	0000	LD	0.0000	0.0000
0420	0000	0000	LD	0.0000	0.0000
0430	0000	0000	LD	0.0000	0.0000
0440	0000	0000	LD	0.0000	0.0000
0450	0000	0000	LD	0.0000	0.0000
0460	0000	0000	LD	0.0000	0.0000
0470	0000	0000	LD	0.0000	0.0000
0480	0000	0000	LD	0.0000	0.0000
0490	0000	0000	LD	0.0000	0.0000
0500	0000	0000	LD	0.0000	0.0000
0510	0000	0000	LD	0.0000	0.0000
0520	0000	0000	LD	0.0000	0.0000
0530	0000	0000	LD	0.0000	0.0000
0540	0000	0000	LD	0.0000	0.0000
0550	0000	0000	LD	0.0000	0.0000
0560	0000	0000	LD	0.0000	0.0000
0570	0000	0000	LD	0.0000	0.0000
0580	0000	0000	LD	0.0000	0.0000
0590	0000	0000	LD	0.0000	0.0000
0600	0000	0000	LD	0.0000	0.0000
0610	0000	0000	LD	0.0000	0.0000
0620	0000	0000	LD	0.0000	0.0000
0630	0000	0000	LD	0.0000	0.0000
0640	0000	0000	LD	0.0000	0.0000
0650	0000	0000	LD	0.0000	0.0000
0660	0000	0000	LD	0.0000	0.0000
0670	0000	0000	LD	0.0000	0.0000
0680	0000	0000	LD	0.0000	0.0000
0690	0000	0000	LD	0.0000	0.0000
0700	0000	0000	LD	0.0000	0.0000
0710	0000	0000	LD	0.0000	0.0000
0720	0000	0000	LD	0.0000	0.0000
0730	0000	0000	LD	0.0000	0.0000
0740	0000	0000	LD	0.0000	0.0000
0750	0000	0000	LD	0.0000	0.0000
0760	0000	0000	LD	0.0000	0.0000
0770	0000	0000	LD	0.0000	0.0000
0780	0000	0000	LD	0.0000	0.0000
0790	0000	0000	LD	0.0000	0.0000
0800	0000	0000	LD	0.0000	0.0000
0810	0000	0000	LD	0.0000	0.0000
0820	0000	0000	LD	0.0000	0.0000
0830	0000	0000	LD	0.0000	0.0000
0840	0000	0000	LD	0.0000	0.0000
0850	0000	0000	LD	0.0000	0.0000
0860	0000	0000	LD	0.0000	0.0000
0870	0000	0000	LD	0.0000	0.0000
0880	0000	0000	LD	0.0000	0.0000
0890	0000	0000	LD	0.0000	0.0000
0900	0000	0000	LD	0.0000	0.0000
0910	0000	0000	LD	0.0000	0.0000
0920	0000	0000	LD	0.0000	0.0000
0930	0000	0000	LD	0.0000	0.0000
0940	0000	0000	LD	0.0000	0.0000
0950	0000	0000	LD	0.0000	0.0000
0960	0000	0000	LD	0.0000	0.0000
0970	0000	0000	LD	0.0000	0.0000
0980	0000	0000	LD	0.0000	0.0000
0990	0000	0000	LD	0.0000	0.0000

special key to tip to entry since it's a good idea. The game instructions should be short and to the point, don't write pages describing the game (just include a list of its special features) as you would if you were advertising the game. Remember, in this you are trying to sell the game and show how organized you are.

To decide which publisher to approach, look at the quality of their advertisements. See how many mentions they get in the magazine and how well their programs do on average in the charts. Try to get more than one offer for your program so you can compare you are.

Money Matters

If you are successful and you start to receive your royalties there are several things to get sorted out. You will usually get paid without income tax being deducted. This means you will have to keep a record of your payments and declare them to the local income tax office. If you have no other job you just write and say you are now self-employed. You have to buy a monthly national insurance stamp so at the same time write

to the DSS office. Don't forget all the student self-employment incentives if you are unemployed. Contact a job centre and you could receive financial help.

If you have another job you will still have to declare your earnings to the inland revenue who will assess any

Then your publisher has to add VAT to your royalties and you have to send them an invoice for each royalty cheque. You will also have to keep certain records to find out more contact your local VAT office. Their latest leaflets are quite readable and very helpful.

Sound Routine

This month's program is a sound routine that I used in my last

game, *Quaxxon*. I always add the sound when I have almost finished a program. This is because I run it under Interrupt mode 2. The version that follows does not include the interrupt processing for the sake of simplicity.

The BBC Spectrum has a very limited sound capability. It has one channel that can be either on or off. This month's modulator routine produces complex sounds by changing the

frequency. This principle of frequency modulation can be applied to drive identified sound chips, so full centers should also read on. I used the same technique to drive the sound chip in the C&B Spectrum Yamaha DS synthesiser with a similar technique with up to four stages of modulation.

The routine applies linear modulation to the frequency in two stages. All this means is that the frequency is changed up or down according to values held in a data table. Figure 1 shows a plot of a constant beep such as BASIC can produce. It is essentially a square wave where the peaks are the same size as the troughs. Figure 2 shows the same beep at a plot of frequency against time.

First stage modulation

We can make the sound more interesting by changing the frequency either up or down, or both. My routine only does this in a linear fashion. This means that the rate of change is constant. If you want to improve the routine try applying formulae to the rate of frequency change. Figure 3 shows the two plots for a sweep up and a sweep down.

Sawtooth Modulation

This is easily produced by including a timing count. Every time this counts down to zero the frequency is reset to its start value. Another counter specifies how many times the routine must repeat the cycle of modulation. Figure 4 shows frequency plots of the two sawtooth patterns that can be produced.

Triangle Modulation

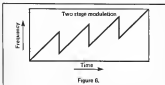
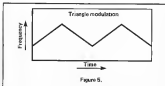
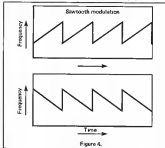
The routine can do this by simply negating the frequency change (steeply) at setting the frequency at the end of a modulation cycle. Figure 5 shows a frequency plot for this.

Second Stage Modulation

This is very limited in the routine, but there is no reason why this limitation could not be extended. Every time the frequency is reset the reset value can be changed. Figure 6 demonstrates this effect.

More complex sounds can be achieved by chaining several sounds together. When a sound has been completed this routine will initiate another sound if the chaining field is used in the sound table.

To create new sounds on you have to do is play with the values in the sound table. In the sound chip listen to the result. You will soon get the feel of the range of effects that can be produced.



THE DISCOVERY COLUMN

**More advice for owners
of the Discovery disc,
from John Wase.**

For more utilities for Discovery readers (again this month, the last, from George Brewster of Cocon, Co. Durham, lets you keep an up-to-date index of all the files on your discs, enabling you to locate easily that "lost" file by means of a search routine. The second, by Robert Kingsley of Rod Research, Luton, could also be used in conjunction with this, for it allows you to print a "near" index of the CUI file across the page. Finally there's one from me to add or remove files from an existing sequential file list such as *Opus*, examples, the infamous "test".

Index and Search

This one is virtually self-explanatory. A listing of the BASIC part of the program is shown in figure 1. Whilst the program is first set up, a character array sufficient to hold

all the filenames on all the discs is dimensioned (lines 10 to 30) in this case 64 filenames on 25 discs (readers with non-standard — eg. 10000 discs — might well have to alter the variable *I* in line 10 if this is too low). Next, a machine-code routine is *POKEd* into the appropriate addresses. The catalogue of each disc is then read into the appropriate part of the character array, overwriting any entries already existing. Finally, the machine-code routine (there is an assembly listing in figure 2) finds all the filenames matching the keywords entered. For this system to work, the disc names must start with a digit, followed by two digits or one digit and a space (provided that you have a space disc or two, it is very easy to remove discs not conforming to this system). Filenames themselves should not start with a digit because this is read off line 1000

as the end-of-catalogue marker. This routine will also run on microdrives if the CUI is line 1000 and the IH in line 1000 are omitted.

Near Catalogue

Users of non-standard large capacity discs, and also those who keep a large number of small files will find this routine particularly useful. It was designed to print the catalogue right across the printer width, that avoiding using yards of paper. It also prints to the screen in two columns, so doubling its capacity (and preventing information which is still needed being scrolled away).

A listing is given in figure 3. The drive number is first of all input into the program, which then *POKEs* a small machine-code subroutine into the appropriate addresses, starting





Figure 1 Index program listing

```

1000 REM ***** INDEX PROGRAM *****
1010 REM ***** INDEX PROGRAM *****
1020 REM ***** INDEX PROGRAM *****
1030 REM ***** INDEX PROGRAM *****
1040 REM ***** INDEX PROGRAM *****
1050 REM ***** INDEX PROGRAM *****
1060 REM ***** INDEX PROGRAM *****
1070 REM ***** INDEX PROGRAM *****
1080 REM ***** INDEX PROGRAM *****
1090 REM ***** INDEX PROGRAM *****
1100 REM ***** INDEX PROGRAM *****
1110 REM ***** INDEX PROGRAM *****
1120 REM ***** INDEX PROGRAM *****
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1180 REM ***** INDEX PROGRAM *****
1190 REM ***** INDEX PROGRAM *****
1200 REM ***** INDEX PROGRAM *****
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1370 REM ***** INDEX PROGRAM *****
1380 REM ***** INDEX PROGRAM *****
1390 REM ***** INDEX PROGRAM *****
1400 REM ***** INDEX PROGRAM *****
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1470 REM ***** INDEX PROGRAM *****
1480 REM ***** INDEX PROGRAM *****
1490 REM ***** INDEX PROGRAM *****
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1600 REM ***** INDEX PROGRAM *****
1610 REM ***** INDEX PROGRAM *****
1620 REM ***** INDEX PROGRAM *****
1630 REM ***** INDEX PROGRAM *****
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1670 REM ***** INDEX PROGRAM *****
1680 REM ***** INDEX PROGRAM *****
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1790 REM ***** INDEX PROGRAM *****
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1880 REM ***** INDEX PROGRAM *****
1890 REM ***** INDEX PROGRAM *****
1900 REM ***** INDEX PROGRAM *****
1910 REM ***** INDEX PROGRAM *****
1920 REM ***** INDEX PROGRAM *****
1930 REM ***** INDEX PROGRAM *****
1940 REM ***** INDEX PROGRAM *****
1950 REM ***** INDEX PROGRAM *****
1960 REM ***** INDEX PROGRAM *****
1970 REM ***** INDEX PROGRAM *****
1980 REM ***** INDEX PROGRAM *****
1990 REM ***** INDEX PROGRAM *****
2000 REM ***** INDEX PROGRAM *****

```

at line 2020. The printer or screen can be selected in lines 2035 to 2045. do make sure that the printer control codes match your own printer. Finally lines 2050, 2060 the filenames and how spaces are printed out. A sample printout is given in figure 4. add a screen dump in figure 5. note the difference. Again, this routine will work both with disks and with microdisks. For microdisks, simply add line 2020 to "cartridge name".

Afterfile

The Discovery manual on p 30 (the bit on random access files) comments on the famous "telephone" files as follows: "In

these programmes, the information is saved and retrieved one item after another. If you want to locate the third name and telephone number in the file you must first read and discard the first two names and telephone numbers. Altering the information is even more difficult. Random access files go have to be set up to the same lengths, unlike sequential files, and this can be very wasteful of space. Under these circumstances sequential files can be preferred, particularly with only 128K to spare. Here is a rather forlorn program which does just what the book says: it reads each item in turn, discards it if necessary inserts a

new record if necessary and finally saves each record in turn on a selected disk (in drive 2, the saving is given in figure 4. its fairly self explanatory, the only comment I would make is that single disc owners will have to set up a ram disc instead, save the file on this, and then save it subsequently to a floppy in drive 1).

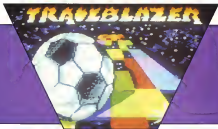
I have had some trouble with my new Basicdisk II-2 and Romantic Robot's multiface, which won't even work with the Copr 22 ROM when the ROM is in disk mode - given a disc ID every each time you try and write anything. Romantic Robot tell me that they have a new ROM model which will be on the

Figure 2 Assembly listing for machine code version of Index program

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1000 REM ***** INDEX PROGRAM *****
1010 REM ***** INDEX PROGRAM *****
1020 REM ***** INDEX PROGRAM *****
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1080 REM ***** INDEX PROGRAM *****
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1370 REM ***** INDEX PROGRAM *****
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1490 REM ***** INDEX PROGRAM *****
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1790 REM ***** INDEX PROGRAM *****
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1940 REM ***** INDEX PROGRAM *****
1950 REM ***** INDEX PROGRAM *****
1960 REM ***** INDEX PROGRAM *****
1970 REM ***** INDEX PROGRAM *****
1980 REM ***** INDEX PROGRAM *****
1990 REM ***** INDEX PROGRAM *****
2000 REM ***** INDEX PROGRAM *****

```

TRAILBLAZER
Gremlin
£7.95

Gremlin's new arcade release brings out the best in reflex action.

● It sounds simple enough — just guide a ball down a highway. Nothing to it, you might think, but the reality is an extraordinarily addictive game that tests concentration, timing and reflexes to the limit.

The appeal of the game is based on the cunning design of the 14 courses, they vary in length and difficulty and are made up of squares and shapes that produce dazzling effects on the ball under your control. Some you can roll across with ease but others will increase or decrease your speed, give you a free bounce or literally move the joystick controls.

The properties of each square can be deduced from their shading but the distinction between different squares can be difficult to discern when travelling at speed and it takes quite a while to master the basics.

There are additional hazards. Many of the courses are panned almost entirely with holes to fall down and if you fall from the edge of the path you are assigned to oblivion.

Seriously for a game of this kind a practice mode has been included which allows you to try any three of the courses in succession. To make it easier you are given unlimited jumps and a generous 99 second time limit to complete a course.

The timing of jumps means you must watch out for 'jump squares' or you won't have enough bounce to get you through. An important element to get right is the rhythm. Once you hit a good streak you can miraculously swim up the road almost without thinking because your reflexes are doing all the work. But if you miss a jump or disappear down a hole it's very difficult to get back into a winning rhythm. This is not helped by the joystick which throws the ball up the road in front of you. If it happens to be heading for a hole there is nothing you can do about it and if you are unlucky this disappearing act can be repeated several times before you are back in control.

Some courses are made up in part of huge letters which present their own difficulties to bounce across but the advantage is that memorising

the letters gives you a clear idea of what to expect next time round. Not surprisingly you will find yourself bouncing across letters that spell out words such as GREMLIN, that is if you don't fall down the hole in the 'N' first.

If you like arcade games you will undoubtedly like Trailblazer, it's fast, demanding and gives you just the right sense of embarrassed frustration when you just miss out on completing a course by a fraction of a second. Trailblazer is certainly not impossible to complete but it is devilishly difficult and is recommended for those who enjoy a challenge.





URIDIUM

Andrew
Hewson
£8.95

Uridium is the most difficult of games the Spectrum has ever seen. It's a shoot 'em up game in the Spectrum style of Asteroids. Uridium is such a game that the fact that it is a shoot 'em up is effectively in its the corner. As a result, even if you play the game for a week, you will still be learning the game. The Spectrum will have to be thankful for that.

All this is not to say that the game played as a shoot 'em up. It's a game that is a shoot 'em up, but it's a game that is a shoot 'em up.

At the end of the game, you are given a choice of three different endings. The first ending is the most difficult, the second is the most difficult, and the third is the most difficult.

The game is a shoot 'em up, but it's a game that is a shoot 'em up. It's a game that is a shoot 'em up, but it's a game that is a shoot 'em up.

The game is a shoot 'em up, but it's a game that is a shoot 'em up. It's a game that is a shoot 'em up, but it's a game that is a shoot 'em up.

The game is a shoot 'em up, but it's a game that is a shoot 'em up. It's a game that is a shoot 'em up, but it's a game that is a shoot 'em up.

The game is a shoot 'em up, but it's a game that is a shoot 'em up. It's a game that is a shoot 'em up, but it's a game that is a shoot 'em up.

A high speed shoot-em-up from Hewson that confounded the doubters.



The game is a shoot 'em up, but it's a game that is a shoot 'em up. It's a game that is a shoot 'em up, but it's a game that is a shoot 'em up.

The game is a shoot 'em up, but it's a game that is a shoot 'em up. It's a game that is a shoot 'em up, but it's a game that is a shoot 'em up.



CROWIRES

It's been a frustrating month and, yet again, the main issue has been printer compatibility.

09/27/2018 11:06 AM

1000

Q Could you please tell me if there is a final deadline to increase the Spenture-125 for the Spent URT printer if there is, where may I purchase one and also the price. Thank You
J.D. Smith

[illegible]

operations were back to the R2D2 (ARMOR) there is just one general of hope in Post Technology Research Limited, and friends of ours with their long-time interface, have produced a unit which converts the R2D2 output to standard COMBACD output from the R2D2, (28 R2D2) unit.

“It has a good reputation and it may prove the answer to today’s problems if replicated at \$19.00 from that of Unit 18. Central Heating, Radiators, Aircon, Mirrors, Tel: 0294 350447 for further details. Of course it doesn’t operate in day mode as the 1000 is a 2000 cc engine.”

Idemetric®/Blairsteel® Protidge says if the 316L SS-8 will work with the Intercept 105352. The answer is NO because the SS-8 has a Centronics port and you would have to buy a cable kit to use it.

Finally in the property's letter box David Goss, who syndicated or interface 1 bill to Compact disc postal code records, stated in

the trouble with using conventional simulation is that the problem could be in any one of them. First we need to support the traditional way to find it with another system of spectrum analysis and it is still unclear that it is definitely likely to find that the fault is connected directly or perhaps damaged. Of course, you will need to be able to handle the data more fully in the spectrum than not be used properly. . . . otherwise fault may be damaged.

advice was to wait for a couple of months then give the media call regarding the situation. He was sensible/unwilling to make any firm commitments, although personally confident that they should be producing something soon. AMS is on that issue, and as soon as they feel sure anything will pass the tests, will

1000

Q I have a problem with my Spectrum 486 and 28.5 megabyte 1 in order to connect to the French Internet system (nearly equivalent to your Internet system), I need to change the channel of the 486 to 7 bits, even parity and odd stop-bit instead of the default format.

Steenly Nout,
Philips, Paris,
France

A Unfortunately I don't know of any way to reprogram the 68030 and as far as I know it is not possible due to the strict interpretation of the 68030 protocol. Reasily reprogramming the complete hardware is 68030 depending system may work, but this is far too complex to do in consumer space.

The most simple situation would be to purchase a laptop that will do the specific task. There are some quite reasonable priced ones available at the moment. The HPDM V1000 can be purchased for around £250 and Maple (a) is a useful MS-DOS interface quite cheaply. And while we're on this topic...

Conclusion

1000

 Actual can figure compatibility: pointer is designed for interface and a 486 Sparcwork which is now replaced with a 128. The pointer and interface combination works on both 486 and 128 in 486 mode but it takes a lot in getting the pointer to work with the 128 in 128 mode. Can you help?

Computers seem to have gone out of fashion, if they're considered to apply from their phone, are you bored? Just bored.

A lot of things get forgotten here, not going out of business and they have just produced a new police interface to prove it. But I know what you mean about there being no one to contact.

Actually the *100k* mode is really the
 using a completely different compression
 and is more often found in the *100k* and
 different instructions for the machine.

Mouse Troubleshooting

Q I am considering the possibility of buying an Open Box drive to replace the performance of my Spectra 4 system which I use mainly for wordprocessing, but I'm glad the 4488 model could not be converted to work properly in hard.

A lthough both Cpus and Mts and both companies were very helpful, Cpu confirmed that there were no hardware conflicts and that any problems would be software-related.

Roger Smith of A&E was extremely helpful and stated that there was a collective responsibility of the character but they said that they were presently working on a version which would coincide with the Greek story.



STREAMS AND CHANNELS

PART ONE by TOM RACE

Streams and channels might sound like computer jargon, but if you can master them you can control some powerful new facilities.

Whenever we NAME something, or INPUT something, we are making use of streams and channels. NAME really means PRINT # 2, although the # 2 is often omitted. Similarly INPUT really means INPUT # 2, and LPRINT means LPRINT # 2. The number after the # symbol is called the STREAM NUMBER.

Now not every stream number is usable. If, after switching the Spectrum on, you type PRINT #2 you'll get an error report "Invalid stream". This is because stream number 2 is not attached to a CHANNEL, so before I do anything else I'll better explain what a CHANNEL is.

A CHANNEL is a device used for either inputting or outputting (or both) bytes of data. The "r" screen is channelised since characters may be printed onto it. Every channel has a name, consisting of a single letter of the alphabet. The screen is called channel "r" because "r" stands for screen. An OPEN statement is used to attach a channel to a stream, so if you type in the BASIC statement OPEN #2 "r" then from now on, whenever you use PRINT #2, the output will be printed to the screen.

Similarly, the keyboard is a device used for inputting, therefore it too is a channel. It has a name - "k" for keyboard. You can attach a stream to the

keyboard just as easily as to the screen. OPEN #10 "k" will attach stream number 10 to the keyboard. You can have a maximum of sixteen streams altogether and these are numbered from zero to fifteen.

There is no such thing as stream number zero, and if you attempt to use it then you'll get an error message. Streams zero to three, however, are already spoken for. Stream zero itself, stream one, are both attached to channel "k" (the keyboard), stream two is attached to channel "r" (the screen), and stream three is attached to channel "p" (the printer).

Channels "k" and "r" can only be used for output, so PRINT #2 is allowed, but INPUT #2 is not. Surprisingly though, channel "k" can be used either for inputting or for outputting. INPUT #0 is the same as a conventional INPUT statement, but PRINT #0 will print onto the lower two lines of the screen where INPUT text normally appears. If you follow a PRINT #0 statement with PAUSE, for example, then you'll see this effect in action.

CHANNEL "r"

Channel "r" is a weird one. On the 128 and 496 versions of the Spectrum, and also on the Spectrum 128 and 496 mode, channel "r" is the ZX Printer. On the Spectrum 128 and 128+ mode, however, channel "r" is the built in 8032 socket, into which you can plug a compatible printer, another computer or anything else you need like a terminal. On the Spectrum 128 in 128k mode you can also INPUT from channel "r". This simply means that the computer can accept data from its 8032 port, which means that

two computers can effectively talk to each other via this link. It is not possible to print to a ZX type Printer from the 128 in 128k mode, or least not in BASIC, but that's where the series comes in.

If you have connected a ZX Interface One then there will be other channels too. Channel "u" - the microdrives, channel "t" - the network, channels "1" and "2" - Interface One's 8032 port (as opposed to the Spectrum 128's 8032 port).

This, then, concludes the list of standard channels available on the Spectrum, but the use of channels to do anything else is vastly underrated. This four-part series is devoted to changing all that. It is the purpose of this series to explore many new programming techniques, to test out new channels and new information, to boldly go to frontiers which no stream has yet explored.

We shall meet, in machine code, new channels which can print to the screen in large or small letters, new channels which will allow the use of Windows on the screen for a GUI, new channels which allow completely successful communication between Spectrums and GBs over the network, new channels which enable the ZX Printer to work on the Spectrum 128 in 128k mode, new channels which will allow users of the Spectrum 128 to make use of large and file files in RAM-disk.

G.I.A.

So how does it all work? Well that is the question I intend to answer in this article. It all hinges on the area of memory that you probably haven't used before, called the "Channel Information Area", and which



happens to be situated directly below the BASIC program area. To create a channel you merely have to organize the memory in the channel information area in the correct way, and of course, provide the machine code to send PRNH and INPUT to and from the channel. Here's how it works:

Every channel must have a "Channel Information Block" stored in the channel. Initialization goes. This is simply a chunk of memory dedicated to the channel, containing all of its system variables and the addresses of its input and output subroutines. The three primary channels "A", "S" and "P" all use only five bytes, but they are exceptional. All other channels require a minimum of sixteen bytes. *See also: channel*

Incidentally, there is a fourth primary channel (that is, a channel available on the un-spread standard spectrum) called channel "9" but it is only available in machine code. Well, lots more of that later.

The channel information blocks for these two primary channels look like this:

Byte 0 and 1 Address of
PMT Channel
Byte 2 and 3 Address of
INUT routine
Byte 4 Name of channel (ASCII
character coded)

continued in the references given by
 0044-0203/06/0000-0000\$05.00/0

Our channels will look different again. We too shall use it to index the channel information, however our channels will look like this

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 1000 N. 1st St., Suite 100
 St. Paul, MN 55102

50+ del mundo en diferentes países
a lo largo de los años

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defined above
 2. If α is a limit ordinal, then α is the least ordinal greater than all $\beta < \alpha$.

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**STREAMS ARE
IMPORTANT TOO**

You see, each stream has its own unique two-byte system variable. STREAM_00 is at SC76, STREAM_01 is at SC78, and so on. In addition there are three streams which are available in machine code but not in BASIC. These are stream F0, stream F1, and stream F2. They too have system variables. STREAM_F0 is at SC80, STREAM_F1 is at SC82 and STREAM_F2 is at SC84. Streams 00

is permanently attached to channel 0, and should not be changed. Similarly stream 00 is permanently attached to channel 0.

Stream FF is interesting: it is permanently attached to Channel B — an internal machine code channel, which is capable of inserting bytes into the Spectrum's dynamic memory (RAM). We'll make use of this feature later on.

The **STREAM** variables themselves link the stream to the channel. If the **STREAM** variable for any particular stream contains 0000 then it means that the stream in question is closed (ie it has no channel attached to it). If the variable is non zero then the stream is attached to a channel. In particular it is attached to the channel whose channel information block begins at address **CHANSB + STREAM * 4**.

It follows, therefore, that if you surely be adding from a machine code point of view, to OPEN a channel then to CLOSE it, in order to open a channel all you have to do is to make room for the new channel integration on the end of the CHAN array, and to assign the appropriate SIBVD variable to attach the stream to, closing such a channel, on the other hand, may be more difficult, because if the channel

Using T

00	START ₀	SET SP,SP	Stack the entry flag.
00017		CALL FTR1,TR1,TR0,TR0_0	Go pointer to FTR0 table. Go to FTR0 table.
00		LD L,0	
01		INC L	
02		MOV R	Branch if stream already closed.
03		MOV RL	Stack pointer to FTR0 table.
00022		LD RL,TR0	
04		LD RL,RL	
05		MOV RL	Go pointer to FTR0 table.
06		MOV RL	Branch if channel is L ₀ ,L ₀ or F ₀ .
00027		LD L,0(CHANNEL)	
0003		LD RL,RL	
0004		INC L	Go pointer to channel table.
00005		LD L,0(ENVF)	
0014		CF L	
00		MOV RL	Branch if not a user defined channel.
00010		LD L,0(ENVF)	
0011		CF L	
00		MOV RL	Branch if not a user defined channel.
0000		LD L,0(ENVF)	
01		MOV RL	Load FTR0 table with shift to signal "stream closed".
0000		LD L,0(ENVF)	Stack CHANNEL displacement.
00000		LD L,0(ENVF)	
00001		LD L,0(ENVF)	Load address of FTR0 table.
00		LD SP,SP	
00000		LD L,0(ENVF)	Load displacement L ₀ register.

The standard PRST and INPRST subroutines in the ROM 55113 and CALL 15511PRST.ADJ will "expect" a pointer channel (therefore control will jump to the address given by bytes 5 and 6 for PRST, or to the address given by bytes 2 and 3 for INPRST.ADJ). In the case of the Interface One channels this address will in both cases be 0000. At this address the Shadow ROM is popped in and a routine in the Shadow ROM will execute.

STRT	FOR I%		R% = address of channel info.
ST	LD I% (STRT)		
STRT+1	LD I% (STRT)		Word length of channel info.
ST	FOR I%		Word length of channel info.
STRT+2	LD I% (STRT+2)		Parity mask used by channel.
ST	LD I% (ST)		Ass number of streams.
STRT+3	LD I% (ST)		It's just a 16-bit data for word 1
STRT+4	LD I% (ST)		Word 2 data.
ST	FOR I%		
STRT+5	LD I% (ST)		Word 3 data for stream 1.
ST	FOR I%		Word length of channel info declared
ST	FOR I%		Word 4 data of channel info
ST	FOR I%		
ST	LD I%		
STRT	LD I% (ST)		Word 5 data for stream 1.
STRT	LD I% (ST)		Word 6 data for stream 1.
STRT	LD I% (ST)		Word 7 data for stream 1.
STRT	LD I% (ST)		Word 8 data for stream 1.
STRT	LD I% (ST)		Word 9 data for stream 1.
STRT	LD I% (ST)		Word 10 data for stream 1.
STRT	LD I% (ST)		Word 11 data for stream 1.
STRT	LD I% (ST)		Word 12 data for stream 1.
STRT	LD I% (ST)		Word 13 data for stream 1.
STRT	LD I% (ST)		Word 14 data for stream 1.
STRT	LD I% (ST)		Word 15 data for stream 1.
STRT	LD I% (ST)		Word 16 data for stream 1.
STRT	LD I% (ST)		Word 17 data for stream 1.
STRT	LD I% (ST)		Word 18 data for stream 1.
STRT	LD I% (ST)		Word 19 data for stream 1.
STRT	LD I% (ST)		Word 20 data for stream 1.
STRT	LD I% (ST)		Word 21 data for stream 1.
STRT	LD I% (ST)		Word 22 data for stream 1.
STRT	LD I% (ST)		Word 23 data for stream 1.
STRT	LD I% (ST)		Word 24 data for stream 1.
STRT	LD I% (ST)		Word 25 data for stream 1.
STRT	LD I% (ST)		Word 26 data for stream 1.
STRT	LD I% (ST)		Word 27 data for stream 1.
STRT	LD I% (ST)		Word 28 data for stream 1.
STRT	LD I% (ST)		Word 29 data for stream 1.
STRT	LD I% (ST)		Word 30 data for stream 1.
STRT	LD I% (ST)		Word 31 data for stream 1.
STRT	LD I% (ST)		Word 32 data for stream 1.
STRT	LD I% (ST)		Word 33 data for stream 1.
STRT	LD I% (ST)		Word 34 data for stream 1.
STRT	LD I% (ST)		Word 35 data for stream 1.
STRT	LD I% (ST)		Word 36 data for stream 1.
STRT	LD I% (ST)		Word 37 data for stream 1.
STRT	LD I% (ST)		Word 38 data for stream 1.
STRT	LD I% (ST)		Word 39 data for stream 1.
STRT	LD I% (ST)		Word 40 data for stream 1.
STRT	LD I% (ST)		Word 41 data for stream 1.
STRT	LD I% (ST)		Word 42 data for stream 1.
STRT	LD I% (ST)		Word 43 data for stream 1.
STRT	LD I% (ST)		Word 44 data for stream 1.
STRT	LD I% (ST)		Word 45 data for stream 1.
STRT	LD I% (ST)		Word 46 data for stream 1.
STRT	LD I% (ST)		Word 47 data for stream 1.
STRT	LD I% (ST)		Word 48 data for stream 1.
STRT	LD I% (ST)		Word 49 data for stream 1.
STRT	LD I% (ST)		Word 50 data for stream 1.
STRT	LD I% (ST)		Word 51 data for stream 1.
STRT	LD I% (ST)		Word 52 data for stream 1.
STRT	LD I% (ST)		Word 53 data for stream 1.
STRT	LD I% (ST)		Word 54 data for stream 1.
STRT	LD I% (ST)		Word 55 data for stream 1.
STRT	LD I% (ST)		Word 56 data for stream 1.
STRT	LD I% (ST)		Word 57 data for stream 1.
STRT	LD I% (ST)		Word 58 data for stream 1.
STRT	LD I% (ST)		Word 59 data for stream 1.
STRT	LD I% (ST)		Word 60 data for stream 1.
STRT	LD I% (ST)		Word 61 data for stream 1.
STRT	LD I% (ST)		Word 62 data for stream 1.
STRT	LD I% (ST)		Word 63 data for stream 1.
STRT	LD I% (ST)		Word 64 data for stream 1.
STRT	LD I% (ST)		Word 65 data for stream 1.
STRT	LD I% (ST)		Word 66 data for stream 1.
STRT	LD I% (ST)		Word 67 data for stream 1.
STRT	LD I% (ST)		Word 68 data for stream 1.
STRT	LD I% (ST)		Word 69 data for stream 1.
STRT	LD I% (ST)		Word 70 data for stream 1.
STRT	LD I% (ST)		Word 71 data for stream 1.
STRT	LD I% (ST)		Word 72 data for stream 1.
STRT	LD I% (ST)		Word 73 data for stream 1.
STRT	LD I% (ST)		Word 74 data for stream 1.
STRT	LD I% (ST)		Word 75 data for stream 1.
STRT	LD I% (ST)		Word 76 data for stream 1.
STRT	LD I% (ST)		Word 77 data for stream 1.
STRT	LD I% (ST)		Word 78 data for stream 1.
STRT	LD I% (ST)		Word 79 data for stream 1.
STRT	LD I% (ST)		Word 80 data for stream 1.
STRT	LD I% (ST)		Word 81 data for stream 1.
STRT	LD I% (ST)		Word 82 data for stream 1.
STRT	LD I% (ST)		Word 83 data for stream 1.
STRT	LD I% (ST)		Word 84 data for stream 1.
STRT	LD I% (ST)		Word 85 data for stream 1.
STRT	LD I% (ST)		Word 86 data for stream 1.
STRT	LD I% (ST)		Word 87 data for stream 1.
STRT	LD I% (ST)		Word 88 data for stream 1.
STRT	LD I% (ST)		Word 89 data for stream 1.
STRT	LD I% (ST)		Word 90 data for stream 1.
STRT	LD I% (ST)		Word 91 data for stream 1.
STRT	LD I% (ST)		Word 92 data for stream 1.
STRT	LD I% (ST)		Word 93 data for stream 1.
STRT	LD I% (ST)		Word 94 data for stream 1.
STRT	LD I% (ST)		Word 95 data for stream 1.
STRT	LD I% (ST)		Word 96 data for stream 1.
STRT	LD I% (ST)		Word 97 data for stream 1.
STRT	LD I% (ST)		Word 98 data for stream 1.
STRT	LD I% (ST)		Word 99 data for stream 1.
STRT	LD I% (ST)		Word 100 data for stream 1.

channels. On entry the A register must contain the stream number to be closed. If the stream is already closed, or if the channel is not one of our user-defined ones, then the subroutine will return, leaving alone nothing at the other hand, the stream specified is attached to one of our new channels, then the routine will close the channel, return memory used by that channel, and adjust any of the STMS variables required. The carry flag must also be assigned on entry. If the carry flag is set it means that any data stored in buffers must be sent out, but if the carry flag is reset it means that any such data is to be ignored.

Also included is a program **CLEAR_CHANNELS** which will close all such user-defined channels. Any data stored in buffers will be lost if this routine is called.

You may think it strange starting with a **CLOSE** routine, whilst not having an **OPEN** routine, but that's where the challenge comes in. Next month I'll start opening some new channels — in particular I'll start with printing to the screen in large or small letters.

Remember that once a channel is opened it can be used as well in BASIC. As soon as you have a channel which can print arbitrary characters across the screen then you can use a common or garden BASIC PRINT statement to print things to the channel.

Study the programs I've listed. They are not relocatable, because they are designed to link in with all the other bits of program which you'll get in the next three episodes. If you still haven't properly understood the concepts of channels or streams then maybe next month you'll be a whole lot wiser when I start start giving you some concrete examples of the ideas in use.

See you then

information block is not the last one in the **CHANS** area then all of the channel information blocks which follow it will have down in memory, which in turn means that the corresponding **STMS** variable will have to be altered accordingly. Any or all

of the **STMS** variables may have to be altered if this is the case.

CLOSE_A

The main program accompanying this article is called **CLOSE_A**. Its purpose is to close one of our new

Listing 2

FOR I%	FOR I%	DEC I%	
ST	LD I% (ST)	DEC I%	
ST	FOR I%	DEC I%	
ST	LD I% (ST)	DEC I%	
STRT+1	LD I% (STRT+1)	DEC I%	
ST	FOR I%	DEC I%	
STRT+2	LD I% (STRT+2)	DEC I%	
ST	FOR I%	DEC I%	
STRT+3	LD I% (STRT+3)	DEC I%	
ST	FOR I%	DEC I%	
STRT+4	LD I% (STRT+4)	DEC I%	
ST	FOR I%	DEC I%	
STRT+5	LD I% (STRT+5)	DEC I%	
ST	FOR I%	DEC I%	
STRT+6	LD I% (STRT+6)	DEC I%	
ST	FOR I%	DEC I%	
STRT+7	LD I% (STRT+7)	DEC I%	
ST	FOR I%	DEC I%	
STRT+8	LD I% (STRT+8)	DEC I%	
ST	FOR I%	DEC I%	
STRT+9	LD I% (STRT+9)	DEC I%	
ST	FOR I%	DEC I%	
STRT+10	LD I% (STRT+10)	DEC I%	
ST	FOR I%	DEC I%	
STRT+11	LD I% (STRT+11)	DEC I%	
ST	FOR I%	DEC I%	
STRT+12	LD I% (STRT+12)	DEC I%	
ST	FOR I%	DEC I%	
STRT+13	LD I% (STRT+13)	DEC I%	
ST	FOR I%	DEC I%	
STRT+14	LD I% (STRT+14)	DEC I%	
ST	FOR I%	DEC I%	
STRT+15	LD I% (STRT+15)	DEC I%	
ST	FOR I%	DEC I%	
STRT+16	LD I% (STRT+16)	DEC I%	
ST	FOR I%	DEC I%	
STRT+17	LD I% (STRT+17)	DEC I%	
ST	FOR I%	DEC I%	
STRT+18	LD I% (STRT+18)	DEC I%	
ST	FOR I%	DEC I%	
STRT+19	LD I% (STRT+19)	DEC I%	
ST	FOR I%	DEC I%	
STRT+20	LD I% (STRT+20)	DEC I%	
ST	FOR I%	DEC I%	
STRT+21	LD I% (STRT+21)	DEC I%	
ST	FOR I%	DEC I%	
STRT+22	LD I% (STRT+22)	DEC I%	
ST	FOR I%	DEC I%	
STRT+23	LD I% (STRT+23)	DEC I%	
ST	FOR I%	DEC I%	
STRT+24	LD I% (STRT+24)	DEC I%	
ST	FOR I%	DEC I%	
STRT+25	LD I% (STRT+25)	DEC I%	
ST	FOR I%	DEC I%	
STRT+26	LD I% (STRT+26)	DEC I%	
ST	FOR I%	DEC I%	
STRT+27	LD I% (STRT+27)	DEC I%	
ST	FOR I%	DEC I%	
STRT+28	LD I% (STRT+28)	DEC I%	
ST	FOR I%	DEC I%	
STRT+29	LD I% (STRT+29)	DEC I%	
ST	FOR I%	DEC I%	
STRT+30	LD I% (STRT+30)	DEC I%	
ST	FOR I%	DEC I%	
STRT+31	LD I% (STRT+31)	DEC I%	
ST	FOR I%	DEC I%	
STRT+32	LD I% (STRT+32)	DEC I%	
ST	FOR I%	DEC I%	
STRT+33	LD I% (STRT+33)	DEC I%	
ST	FOR I%	DEC I%	
STRT+34	LD I% (STRT+34)	DEC I%	
ST	FOR I%	DEC I%	
STRT+35	LD I% (STRT+35)	DEC I%	
ST	FOR I%	DEC I%	
STRT+36	LD I% (STRT+36)	DEC I%	
ST	FOR I%	DEC I%	
STRT+37	LD I% (STRT+37)	DEC I%	
ST	FOR I%	DEC I%	
STRT+38	LD I% (STRT+38)	DEC I%	
ST	FOR I%	DEC I%	
STRT+39	LD I% (STRT+39)	DEC I%	
ST	FOR I%	DEC I%	
STRT+40	LD I% (STRT+40)	DEC I%	
ST	FOR I%	DEC I%	
STRT+41	LD I% (STRT+41)	DEC I%	
ST	FOR I%	DEC I%	
STRT+42	LD I% (STRT+42)	DEC I%	
ST	FOR I%	DEC I%	
STRT+43	LD I% (STRT+43)	DEC I%	
ST	FOR I%	DEC I%	
STRT+44	LD I% (STRT+44)	DEC I%	
ST	FOR I%	DEC I%	
STRT+45	LD I% (STRT+45)	DEC I%	
ST	FOR I%	DEC I%	
STRT+46	LD I% (STRT+46)	DEC I%	
ST	FOR I%	DEC I%	
STRT+47	LD I% (STRT+47)	DEC I%	
ST	FOR I%	DEC I%	
STRT+48	LD I% (STRT+48)	DEC I%	
ST	FOR I%	DEC I%	
STRT+49	LD I% (STRT+49)	DEC I%	
ST	FOR I%	DEC I%	
STRT+50	LD I% (STRT+50)	DEC I%	
ST	FOR I%	DEC I%	
STRT+51	LD I% (STRT+51)	DEC I%	
ST	FOR I%	DEC I%	
STRT+52	LD I% (STRT+52)	DEC I%	
ST	FOR I%	DEC I%	
STRT+53	LD I% (STRT+53)	DEC I%	
ST	FOR I%	DEC I%	
STRT+54	LD I% (STRT+54)	DEC I%	
ST	FOR I%	DEC I%	
STRT+55	LD I% (STRT+55)	DEC I%	
ST	FOR I%	DEC I%	
STRT+56	LD I% (STRT+56)	DEC I%	
ST	FOR I%	DEC I%	
STRT+57	LD I% (STRT+57)	DEC I%	
ST	FOR I%	DEC I%	
STRT+58	LD I% (STRT+58)	DEC I%	
ST	FOR I%	DEC I%	
STRT+59	LD I% (STRT+59)	DEC I%	
ST	FOR I%	DEC I%	
STRT+60	LD I% (STRT+60)	DEC I%	
ST	FOR I%	DEC I%	
STRT+61	LD I% (STRT+61)	DEC I%	
ST	FOR I%	DEC I%	
STRT+62	LD I% (STRT+62)	DEC I%	
ST	FOR I%	DEC I%	
STRT+63	LD I% (STRT+63)	DEC I%	
ST	FOR I%	DEC I%	
STRT+64	LD I% (STRT+64)	DEC I%	
ST	FOR I%	DEC I%	
STRT+65	LD I% (STRT+65)	DEC I%	
ST	FOR I%	DEC I%	
STRT+66	LD I% (STRT+66)	DEC I%	
ST	FOR I%	DEC I%	
STRT+67	LD I% (STRT+67)	DEC I%	
ST	FOR I%	DEC I%	
STRT+68	LD I% (STRT+68)	DEC I%	
ST	FOR I%	DEC I%	
STRT+69	LD I% (STRT+69)	DEC I%	
ST	FOR I%	DEC I%	
STRT+70	LD I% (STRT+70)	DEC I%	
ST	FOR I%	DEC I%	
STRT+71	LD I% (STRT+71)	DEC I%	
ST	FOR I%	DEC I%	
STRT+72	LD I% (STRT+72)	DEC I%	
ST	FOR I%	DEC I%	
STRT+73	LD I% (STRT+73)	DEC I%	
ST	FOR I%	DEC I%	
STRT+74	LD I% (STRT+74)	DEC I%	
ST	FOR I%	DEC I%	
STRT+75	LD I% (STRT+75)	DEC I%	
ST	FOR I%	DEC I%	
STRT+76	LD I% (STRT+76)	DEC I%	
ST	FOR I%	DEC I%	
STRT+77	LD I% (STRT+77)	DEC I%	
ST	FOR I%	DEC I%	
STRT+78	LD I% (STRT+78)	DEC I%	
ST	FOR I%	DEC I%	
STRT+79	LD I% (STRT+79)	DEC I%	
ST	FOR I%	DEC I%	
STRT+80	LD I% (STRT+80)	DEC I%	
ST	FOR I%	DEC I%	
STRT+81	LD I% (STRT+81)	DEC I%	
ST	FOR I%	DEC I%	
STRT+82	LD I% (STRT+82)	DEC I%	
ST	FOR I%	DEC I%	
STRT+83	LD I% (STRT+83)	DEC I%	
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STRT+84	LD I% (STRT+84)	DEC I%	
ST	FOR I%	DEC I%	
STRT+85	LD I% (STRT+85)	DEC I%	
ST	FOR I%	DEC I%	
STRT+86	LD I% (STRT+86)	DEC I%	
ST	FOR I%	DEC I%	
STRT+87	LD I% (STRT+87)	DEC I%	
ST	FOR I%	DEC I%	
STRT+88	LD I% (STRT+88)	DEC I%	
ST	FOR I%	DEC I%	
STRT+89	LD I% (STRT+89)	DEC I%	
ST	FOR I%	DEC I%	
STRT+90	LD I% (STRT+90)	DEC I%	
ST	FOR I%	DEC I%	
STRT+91	LD I% (STRT+91)	DEC I%	
ST	FOR I%	DEC I%	
STRT+92	LD I% (STRT+92)	DEC I%	
ST	FOR I%	DEC I%	
STRT+93	LD I% (STRT+93)	DEC I%	
ST	FOR I%	DEC I%	
STRT+94	LD I% (STRT+94)	DEC I%	
ST	FOR I%	DEC I%	
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ST	FOR I%	DEC I%	
STRT+96	LD I% (STRT+96)	DEC I%	
ST	FOR I%	DEC I%	
STRT+97	LD I% (STRT+97)	DEC I%	
ST	FOR I%	DEC I%	
STRT+98	LD I% (STRT+98)	DEC I%	
ST	FOR I%	DEC I%	
STRT+99	LD I% (STRT+99)	DEC I%	
ST	FOR I%	DEC I%	
STRT+100	LD I% (STRT+100)	DEC I%	
ST	FOR I%	DEC I%	
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ST	FOR I%	DEC I%	
STRT+102	LD I% (STRT+102)	DEC I%	
ST	FOR I%	DEC I%	
STRT+103	LD I% (STRT+103)	DEC I%	
ST	FOR I%	DEC I%	
STRT+104	LD I% (STRT+104)	DEC I%	
ST	FOR I%	DEC I%	
STRT+105	LD I% (STRT+105)	DEC I%	
ST	FOR I%	DEC I%	
STRT+106	LD I% (STRT+106)	DEC I%	
ST	FOR I%	DEC I%	
STRT+107	LD I% (STRT+107)	DEC I%	
ST	FOR I%	DEC I%	
STRT+108	LD I% (STRT+108)	DEC I%	
ST	FOR I%	DEC I%	
STRT+109	LD I% (STRT+109)	DEC I%	
ST	FOR I%	DEC I%	
STRT+110	LD I% (STRT+110)	DEC I%	
ST	FOR I%	DEC I%	
STRT+111	LD I% (STRT+111)	DEC I%	
ST	FOR I%	DEC I%	
STRT+112	LD I% (STRT+112)	DEC I%	
ST	FOR I%	DEC I%	
STRT+113	LD I% (STRT+113)	DEC I%	
ST	FOR I%	DEC I%	
STRT+114	LD I% (STRT+114)	DEC I%	
ST	FOR I%	DEC I%	
STRT+115	LD I% (STRT+115)	DEC I%	
ST	FOR I%	DEC I%	
STRT+116	LD I% (STRT+116)	DEC I%	
ST	FOR I%	DEC I%	
STRT+117	LD I% (STRT+117)	DEC I%	
ST	FOR I%	DEC I%	
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ST	FOR I%	DEC I%	
STRT+119	LD I% (STRT+119)	DEC I%	
ST	FOR I%	DEC I%	
STRT+120	LD I% (STRT+120)	DEC I%	
ST	FOR I%	DEC I%	
STRT+121	LD I% (STRT+121)	DEC I%	
ST	FOR I%	DEC I%	
STRT+122	LD I% (STRT+122)	DEC I%	
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ST	FOR I%	DEC I%	
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STRT+125	LD I% (STRT+125)	DEC I%	
ST	FOR I%	DEC I%	
STRT+126	LD I% (STRT+126)	DEC I%	
ST	FOR I%	DEC I%	
STRT+127	LD I% (STRT+127)	DEC I%	
ST	FOR I%	DEC I%	
STRT+128	LD I% (STRT+128)	DEC I%	
ST	FOR I%	DEC I%	
STRT+129	LD I% (STRT+129)	DEC I%	
ST	FOR I%	DEC I%	
STRT+130	LD I% (STRT+130)	DEC I%	
ST	FOR I%	DEC I%	
STRT+131	LD I% (STRT+131)	DEC I%	
ST	FOR I%	DEC I%	
STRT+132	LD I% (STRT+132)	DEC I%	
ST	FOR I%	DEC I%	
STRT+133	LD I% (STRT+133)	DEC I%	
ST	FOR I%	DEC I%	
STRT+134	LD I% (STRT+134)	DEC I%	
ST	FOR I%	DEC I%	
STRT+135	LD I% (STRT+135)	DEC I%	
ST	FOR I%	DEC I%	
STRT+136	LD I% (STRT+136)	DEC I%	
ST	FOR I%	DEC I%	
STRT+137	LD I% (STRT+137)	DEC I%	
ST	FOR I%	DEC I%	
STRT+138	LD I% (STRT+138)	DEC I%	
ST	FOR I%	DEC I%	
STRT+139	LD I% (STRT+139)	DEC I%	
ST	FOR I%	DEC I%	
STRT+140	LD I% (STRT+140)	DEC I%	
ST	FOR I%	DEC I%	
STRT+141	LD I% (STRT+141)	DEC I%	
ST	FOR I%	DEC I%	
STRT+142	LD I% (STRT+142)	DEC I%	
ST	FOR I%	DEC I%	
STRT+143	LD I% (STRT+143)	DEC I%	
ST	FOR I%	DEC I%	
STRT+144	LD I% (STRT+144)	DEC I%	
ST	FOR I%	DEC I%	
STRT+145	LD I% (STRT+145)	DEC I%	
ST	FOR I%	DEC I%	
STRT+146	LD I% (STRT+146)	DEC I%	
ST	FOR I%	DEC I%	
STRT+147	LD I% (STRT+147)	DEC I%	
ST	FOR I%	DEC I%	
STRT+148	LD I% (STRT+148)	DEC I%	
ST	FOR I%	DEC I%	
STRT+149	LD I% (STRT+149)	DEC I%	
ST	FOR I%	DEC I%	
STRT+150	LD I% (STRT+150)	DEC I%	
ST	FOR I%	DEC I%	
STRT+151	LD I% (STRT+151)	DEC I%	
ST	FOR I%	DEC I%	
STRT+152	LD I% (STRT+152)	DEC I%	
ST	FOR I%	DEC I%	
STRT+153	LD I% (STRT+153)	DEC I%	
ST	FOR I%	DEC I%	
STRT+154	LD I% (STRT+154)	DEC I%	
ST	FOR I%	DEC I%	
STRT+155	LD I% (STRT+155)	DEC I%	
ST	FOR I%	DEC I%	
STRT+156	LD I% (STRT+156)	DEC I%	
ST	FOR I%	DEC I%	
STRT+157	LD I% (STRT+157)	DEC I%	
ST	FOR I%	DEC I%	
STRT+158	LD I% (STRT+158)	DEC I%	
ST	FOR I%	DEC I%	
STRT+159	LD I% (STRT+159)	DEC I%	
ST	FOR I%	DEC I%	
STRT+160	LD I% (STRT+160)	DEC I%	
ST	FOR I%	DEC I%	
STRT+161	LD I% (STRT+161)	DEC I%	
ST	FOR I%	DEC I%	
STRT+162	LD I% (STRT+162)	DEC I%	
ST	FOR I%	DEC I%	
STRT+163	LD I% (STRT+163)	DEC I%	
ST	FOR I%	DEC I%	
STRT+164	LD I% (STRT+164)	DEC I%	
ST	FOR I%	DEC I%	
STRT+165	LD I% (STRT+165)	DEC I%	
ST	FOR I%	DEC I%	
STRT+166	LD I% (STRT+166)	DEC I%	
ST	FOR I%	DEC I%	
STRT+167	LD I% (STRT+167)	DEC I%	
ST	FOR I%	DEC I%	
STRT+168	LD I% (STRT+168)	DEC I%	
ST	FOR I%	DEC I%	
STRT+169	LD I% (STRT+169)	DEC I%	
ST	FOR I%	DEC I%	
STRT+170	LD I% (STRT+170)	DEC I%	
ST	FOR I%	DEC I%	
STRT+171	LD I% (STRT+171)	DEC I%	
ST	FOR I%	DEC I%	
STRT+172	LD I% (STRT+172)	DEC I%	
ST	FOR I%	DEC I%	
STRT+173	LD I% (STRT+173)	DEC I%	
ST	FOR I%	DEC I%	
STRT+174	LD I% (STRT+174)	DEC I%	
ST	FOR I%	DEC I%	
STRT+175	LD I% (STRT+175)	DEC I%	
ST	FOR I%	DEC I%	
STRT+176	LD I% (STRT+176)	DEC I%	
ST	FOR I%	DEC I%	
STRT+177	LD I% (STRT+177)	DEC I%	
ST	FOR I%	DEC I%	
STRT+178	LD I% (STRT+178)	DEC I%	
ST	FOR I%	DEC I%	
STRT+179	LD I% (STRT+179)	DEC I%	
ST	FOR I%	DEC I%	
STRT+180	LD I% (STRT+180)	DEC I%	
ST	FOR I%	DEC I%	
STRT+181	LD I% (STRT+181)	DEC I%	
ST	FOR I%	DEC	

Nosferatu

COMPETITION

STAKE YOUR CLAIM

...to Nosferatu, Piranha's nightmarish new game, by entering our Vampire trivia quiz.



Thirty ZX readers can join the vampire hunt in their quest to destroy Dracula.

Based on the film Nosferatu, this game puts you in control of three characters who must do battle against the master of the vampires himself.

As one of the characters, Jonathan Harker, you must return the deeds to a house in Wismar that Dracula has purchased. If the Count is allowed to move in nothing can stop him from turning the townspeople into an undead community overnight.

Jonathan's wife Lucy must be kept alive at all costs as she is the only one who can ultimately destroy the largest of vampires. Jonathan has the help of a well-known vampire hunter but even before the serious business of hunting down Drac can begin they must subdue the gipsy mob that infect the town and eradicate those who have already succumbed to Dracula's power. There are many more daunting tasks to complete before the deed is done and the town is saved from the curse of vampirism!

Drop Fax

To enter, simply answer the following three questions on vampire lore.

- 1) When is a Vampire most vulnerable?
a) Midnight
b) Dawn
c) The early hours of the morning
- 2) What is the name of the real famous vampire hunter of there's any?
a) Ian Ben Pike
b) Van Helsing
c) Van Rensal
- 3) What material can keep vampires at bay?

- a) Paprika
b) Garlic
c) Seals

The competition is open to all ZX readers except employees of Angus Specialist Publications, Piranha Software, and Chase Media. Any entries from vampires will be disqualified. (If you are not sure whether you die or not try posting your entry in daylight.)

The closing date for entries is January 7th, 1987. Please remember to put the letters relating to your answers on the outside of the envelope.

NOSFERATU COMPETITION

The answers to the bloodcurdling questions are

1. _____

2. _____

3. _____

Name _____

Address _____

Send your entry to Nosferatu Competition, ZX Computing Monthly, No 1 Golden Square, London, W1P 3JL

GAMES

NOW GAMES 3

Version 3.0

Old games don't die, they just turn up on compactdiscs for an occasional replay.

Of course though, if there is to be an essential way of offering programs which have outlived their shelf life, the essential point is one they all worth looking! On this cassette, we find a definite yes and the collection comprises of:

Miss Fable Plays the Open, the best to have (Open on your) and provided one of the most enjoyable golf games that I've ever reviewed (graphics being good), the holes is fairly accurate representation of the hole (in George's golf club and the control being by an icon style graphics window system).

Reveries is a somewhat excellent puzzle game of the 'what is out yourself' type in which you are challenged to complete some 30 screens within a time limit in rounds of three, but before this is done.

Superman's 4th was the second of the Superman collection featuring large well con-

SCORP - 000000



nected text without quality graphics. It also featured very few details of what you had to do and resulted in almost total loss for help from many readers and provided quite a lively posting for a few months.

Colossus was a clear itself and clearly showed how this was underdevelopment in an extremely complex game demanding strategy and con-

centration to cope with a wide range of details as well as the results and high speed (like sequences) its much more than a simple top down game.

How to A. B. C. Colossus must have been extremely disappointing three part program, but that it was lost, just that there was nothing in any of the programs or techniques and appeared to be lost.

the time of its launch. As part of this collection it is worth noting for the occasional play.

If you were to purchase these separately they would have cost you over £30 to its pure necessity. Hence this cassette represents good value. There is a good selection of games and they should provide something for most gamers. As such, each of the programs is still worth having in its own right.

My only criticism is the instructions which are provided on an expanding hard disk. Even those with a hard disk are confused in places and added to be almost useless in others. What takes only 11 lines and I can imagine some players simply not bothering trying to play it as it is without even the book start.



MONSTER
WHITE

DRAGON'S LAIR

Software Projects
1989

What made the original Dragon's Lair such a hit was its first appearance in the arcade. It was the quality of the graphics made possible by the laser disc system. In the arcade machine, and up to somebody said to me while I was playing it — "It looks something in comparison from legend into the Spectrum, doesn't it?"

Surprisingly enough, it's not the graphics that are the main selling point — it's the music that is the main reason. But they are certainly acceptable — it's the gameplay. I found the game so hard to play and spent so much time trying to get past the early stages that I just gave up in frustration after only half the game for about a week.

For a start, the reading and setting up instructions aren't very good. The prompt to press a key to start a game appears before the option to speed (which is keyboard) controls, which is a bit odd, and it took



me about fifteen minutes just to work out how to start the controls and get started. I nearly gave up before I'd even got started.

There are three sections to the game, including telling

discs, loading tapes, the controls screen and so on, but even from the arcade version, but I started to play after two days of trying to get past the early sections. This was the first disc, where you have to

keep going till the end of the disc, the start into the dragon's lair. As you start on the disc, the dragon begins appearing to try and scare you off and you have to keep the dragon balanced on the disc. But the dragon starts flying before it appears on screen so you've hardly got any chance to get on, unless you can guess what it's likely to appear.

The main problem is that it's hard to judge what sound doing the right thing. There are three when it looks like you've got killed in the right place to kill something or help. So you'll go on to find yourself dying on the spot. In the end the game becomes more a matter of luck and error than of skill or reflexes — if you play the game enough times then by a process of elimination you'll work out what to do, where to stand and so on, but that doesn't make for a particularly exciting game in itself.

GOOD





MIAMI DICE

By Steve
Bart

Apart from the awful pun and absolutely no connection to the TV show of similar name, this is a very good gambling-type game on the lines of the common-but-rare (and/or legal) games of probability played in casinos.

The game is that of American Craps, a two-die game which someone who has followed any media in the USA should know well. Those who use the characters playing and perhaps even wondered what they were doing in an odd market of interest.

Actually the game is quite complex and the rules and options take a little time playing it well, even if these leaving mind options with different odds on each throw.

As with most of this type, its authors displays all the personalities and one atmosphere the program can generate, and all there is left is a difference between making a lot of your own money and (the) machine's pockets.

It is one of a good collection of alternatives are available to play both on the network and chosen to join in the game

or out. Up to four players can play and there are represented by pleasant characters on screen. The screen presentation is colourful and clear, control is by keyboard and mouse, and it is easy and effective, although at first I found it confusing and mislead.

I couldn't get the dice to be option to location, but this could be due to the machine's keyboard I was using. In some times, scores, eight problems, although you can play on your own if you want. I presented a few friends to play on well that very first evening and enthusiasm developed, then it became quite absorbing and enjoyable.

If you enjoy board games, card games, dice games or are on old games and want to visit the USA and want to visit this national game (even raising your own cash from this is a must). Just out of curiosity it is interesting to know how the game is played, it makes sense of a few American comments in what film and texts.



you onto the next level. Carter O'Connor, who has played this way have left behind them a number of books, Pyramids, and if you can find these they will boost your energy and provide you with a series of increasingly powerful weapons.

The game reminds me of an old Quaker that I used to like called Mighty Mouse, in that you have a sideways-on view of a maze rather than the usual overhead view and have to wander up and down between levels in order to find the correct route to the deepest level.

The graphics are good, and all the moving sprites, though small, are finely detailed. But for some reason the programmers have placed a large box of aspect ratio of the screen display so that the actual view showing

Goodies in the maze is very narrow. This gives the game a real, since it means that any creature approaching from the side is right on top of you as soon as it appears on screen which doesn't really give you enough time to react and defend yourself. And while the direction is good, the jump control seems to respond too slowly - there is noticeable delay between pushing the joystick up and actually seeing your figure jump.

These things don't ruin the game, could have to admit that I enjoyed playing the way

around the maze, but they do make it less enjoyable in the long run as you soon after find yourself getting hit and losing time throughout most of the game, but not a disaster.



TIMETRAX

By Steve
Bart

This is one of those games for budding scientists. It that it requires you to think about several possible options and options for each problem encountered.

The manual supplied with the game is ten pages long and is written in roman script and the first page is green and is the first and the last are descriptions of possible solutions. They recommend that you read it carefully before playing and it is a good idea.

It is a very frustrating and challenging game, there are elements of many other games, some of which are interesting and colourful cartoon ones of the screen. The operation is a bit on the slow side though but it is not too fast a simple arcade game.

The display is broken into sections and the largest, top half of the screen, is the three-level action screen, here your character walks, jumps, jumps and shoots at other beings. And you try to do as well as you can to find the path which will be supplied to be on the next screen.

Below this is a set of windows which give the items found and



GALIVAN

By Steve
Bart

At least I think it's called Galivan, as the various bits of packaging don't seem to decide whether it's Galivan or Golden. Anyway, whatever the pun name is, this is the last member of the Cosmic Pkz series and has been sent to the planet Omega to destroy the demons who have been terrorising the galaxy.

The player's avatar is hidden with techno-Goths, where lots of money or dangerous robots and aliens, and at the end of each level of players there is a multi-headed demon who has to be destroyed before you can



confused eye-straining visual display, strange disorienting times, time, dimension, sub-atomic and many obstacles, the thing isn't clear is perhaps the second most important in that a game you to perform many tasks not immediately possible from the action screen, such as look, take, use, drop, throw etc.

There are polymorph devils to find and use, time portals to transport you to another and weapons to discover and their combinations, charts, keys and eight minds which have to be given their correct task. There is even a variation of the 'bloomin' type of game known in all the land.

A real mindboggler of a game. This one is a real test of time and space, but it is a much more complex and well designed game. Not really suitable for those who want a simple shoot 'em up, but if you found the world game a challenge and have a few minutes to spare try it.



S.T.O.R.M.

Microtronics
£14.95

This is a straightforward maze game. A first step is to go to the start of the maze and then to the end of the maze. The maze is a simple one, but it is a challenge for those who want to go to the end of the maze. The maze is a simple one, but it is a challenge for those who want to go to the end of the maze.

Microtronics Storm and its successor the word Agavein (which means like the sea) and have to clear the maze and then to go to the end of the maze. The maze is a simple one, but it is a challenge for those who want to go to the end of the maze.

Agavein is the main character in the game. He is a simple one, but it is a challenge for those who want to go to the end of the maze. The maze is a simple one, but it is a challenge for those who want to go to the end of the maze.

Instructions are given on screen and are well written in a redesigned character font. The game screen itself is on a grid of 16x16 and is a colorful and clearly designed. The game is a simple one, but it is a challenge for those who want to go to the end of the maze.

Storm has covered a lot of ground and you can see the end of the maze. The maze is a simple one, but it is a challenge for those who want to go to the end of the maze. The maze is a simple one, but it is a challenge for those who want to go to the end of the maze.

A joystick option would have made playing much easier and the joystick or a joystick option would have made playing much easier.

Although this is a maze game, there is enough action and challenge to provide a few hours of hope. The maze is a simple one, but it is a challenge for those who want to go to the end of the maze. The maze is a simple one, but it is a challenge for those who want to go to the end of the maze.

Not value of this game for those who want to go to the end of the maze.



PUB GAMES

Microtronics
£14.95

Presented in a pub style front and menu page, this game has a lot of action and challenge. The game is a simple one, but it is a challenge for those who want to go to the end of the maze.

The program begins by asking for the names of the two players and if you want to play a single player or a two player game. The game is a simple one, but it is a challenge for those who want to go to the end of the maze.

The game is a simple one, but it is a challenge for those who want to go to the end of the maze. The game is a simple one, but it is a challenge for those who want to go to the end of the maze.

Each game consists of a predetermined number of turns. The game is a simple one, but it is a challenge for those who want to go to the end of the maze. The game is a simple one, but it is a challenge for those who want to go to the end of the maze.

and up with a reasonable amount of time and I find it difficult to believe in games where you end up with money in your pocket.

Each game is a simple one, but it is a challenge for those who want to go to the end of the maze. The game is a simple one, but it is a challenge for those who want to go to the end of the maze.

I don't remember a program to play this game which cost about £14.95. It is a simple one, but it is a challenge for those who want to go to the end of the maze.



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[illegible]

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Cheetah

—

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Abstract



Strike Force Warrior

100

This is an excellent right-animator of complex combat strategy game and an impressive shoot 'em up all rolled into one. The strength of the Impresario and well thought out package is that it's enjoyable to play on all three levels and accommodates both the fast-paced action as well as the more relaxed simulation.

At the beginning of each workout, get your flying skills tuned up by using the practice mode, or if you want to get straight into actual island play the extended practice mode which gives you practice runs in both birds.

[illegible]

As you would expect the game is best played using a joystick, but you'll also be finding fun use of the keyboard which is often filled single key commands for weapon systems, target systems and other

[illegible]

Once you have acquainted yourself with the current and upcoming changes you can then attempt to initiate. There are three levels of skill to choose from. First Commander and Ace. The upper levels tend to be out of the ordinary, making you the one to ask people things and often more can write instructions, etc. to support.

The mission is to destroy the enemy's headquarters, 250 miles away, and the action takes place near a mountain range with which you're already familiar, including over 100 mountains, 1000 tunnels to go inside and over, and a thousand huts. First you must fly a reconnaissance mission over the area and, with your detector

[illegible]

An information-packed comprehensive 28-page manual comes with the package and all the basic illustrations and diagrams you'll need to maintain your car with confidence. It comes with the car, but it's not just for the car. It's also a great guide to the car's engine and the bodywork. It's also a great guide to the car's engine and the bodywork. It's also a great guide to the car's engine and the bodywork.

On the other hand, the new hardware designed to use the pathologic conditions and will probably exceed your expectations of a solution of this kind.



REPORT

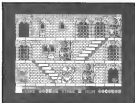
Oil and Gas

create the whispering line
and the main line, ingesting
possible picture this
programme is a gem

It's a "turn-of-the-century" horror-mystery, so called the publisher and takes them to the first great type of game in the computer revolution you have to collect a single item per screen and take it to Jason or go close to where the last is that she can make it better to make them friendly ghost available. Once the ghost is rendered invisible then he can come on. On the Java version, particularly of the same, what is it to make it to the all of a kind of political and social

So what you say surely it's just another marketing exercise? I have to agree, but the animation and backgrounds are nothing less than superb and this film is a genuine triumph. The animation of your central character is brilliant (I love it). Now with a superb quality set and the story's end superb routines are creating and more, really.

Efforts to do so have been hampered by the lack of a coordinated, comprehensive approach.



with a few sports encounters, but considering the detail of the background and the change in the crowd, could have been much

So-called "slender" wood screws are made by the same mills with standard recognized inchness of shank and the occasional squarer on the shaft.

Control is a simple matter of left sight and jump and there are eight screens to complete per game. Each screen that takes place contains a 10-screen

time and you ride the coast these trees. All in all this is the kind of game which gives a good name to Twisted

1991



Johnny Reb II

1. **Introduction**

This is an American Civil war situation that is both easy to grasp and difficult to let go of. The story is a masterpiece.

It is at one or two places, games that century up in the infinitely important bridge. You gain up to control the superior. Correspondence focuses trying to capture the bridge as the the smallest bridge from completely. Review, as evidence. 2)

Although by the standard of some real games the design might be quite small, the emphasis in the game is instead on effective monitoring of your forces and the scenarios often more than enough opportunity to show your leadership skills or alternatively show up the lack of them.

A major feature that makes this a response you will want to play again and again is that the focus of the game can be changed from the start of a new campaign. Landscape features such as houses, fences and walls can be placed anywhere you wish them and this type of freedom of your forces can be enjoyed. The units can

GAMES



choice to head coach can also be changed depending on the strength weapons and represent your tactics.

There are three levels, level 1 is your first year, 2 is 30 years (game) and 3 is 100 years (game) when you play a two player game that is you can win (for the opposing forces) when they come into winning range (level 1 and 2 is 100 35 and 40 turns respectively).

Having orders to your units is easy using a cursor and then command. And other type options such as advance, dig

in, charge or fire. As you are carefully running around the battlefield with your troops you can watch the progress of your units. Defeating with or enemy will not respond to your control. The message "broken" - control only "leaves" up to time. However, morale may be broken and they can be broken back into the fray. The "broken" message is "broken" - broken. Johnny and it is a way to play and the very unit graphics allow you to keep in touch on exactly what is happening.

Johnny and it is the sort of game that may persuade those who up till now have been into sold by the idea of computers to think again. For those who are already old veterans this one is a must.

GREAT



Video Poker

Magnum 65.50

What you think of this game will depend very much on your skill and attitude playing solitary card games. Personally I've always felt that playing card games (or board games) on a computer with a poor opponent is playing against a fool opponent. This is especially true of a game like poker where the element of bluff is such an important part of the game.

The presentation of the game is quite good. The screen displays a replica of the video poker machine complete with the five cards in the top left of the screen and the "hold" button. Betting instructions and your money displayed beneath that. The cards slide into the screen from above, and there's even a small effect that gives the impression of the cards being turned over.

The info gives details of all the different types of winning hand and these are arranged in order of betting odds that can be pulled up.

The weakness of the game is that you're really just playing on your own. All the computer does is to deal the cards and keep track of your money. Sure it's no offense to use the computer as any sort of intelligent opponent is your reduced to full-decked-wash-cards-to-look-on-to. You can't



bluff your opponent because there's no opponent to bluff (there goes the Cool Hand Luke impersonation) and as you make your card hold just before you see any of the cards you can't even risk losing your shirt on an inspired (or inspired) bet of "all-in" and "all-in".

There are two still levels provided, but the only effect their teeth to show is to load the pack (a point you wish is very easy only around the need to provide a computerized opponent).

Usually this is one of the better implementations of a card game that I've seen on the Spectrum, but unless someone can program the machine to play poker like Howard Stern it is not in the real thing.



GRIM

Headcoach

Activision Games 55.50

A superb game from the company famous for and in the same style as their football Manager game.

The objective is to win the tournament. To do this you must win enough games in the tournament to reach a place in the playoffs and then to fight your way through the final round in the championship and finally the Super Bowl.

The game starts with you entering your team's season number and then selecting your team. You then play 2 weeks in a winter season to build up your team. Although the graphics are two dimensional you have real control over your players unlike other football manager type games. Indeed it is only a game of strategy but this is a game of strategy.

After the first game that I played I was blown away by a great aspect of all the other teams. Computerized news bulletins give an efficient recap of my team's team manager. I was also convinced me and reader service after and readers to live with or play my program. The number of options detailed instructions and other

information of planning the season makes it a game that I would recommend to anyone, even if they didn't know about American Football. I particularly liked the instructions which are both informative and educational. The game is well worth the money and is a great introduction to this type of strategy and simulation game.

GREAT



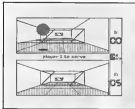
Room Ten

Orb 12.50

The game, glowingly described on the info as being "the stunning game of the future" could more accurately be summed up as being "inspired". There is a sophisticated 3D screen display with 3-D graphics but with only a few elements on screen (I suppose that the ghost of King has returned).

The date of the game has been given as it is to get your feet in the way of the new game. But don't let it back up about there is the only thing of yesterday as how you've got it

▶ ▶ ▶



good sized ball which you can move around in space. One innovation is that you can stick on the back wall and the main challenge of the game is adjusting to the weight of the ball on a bounce off the wall - it's pretty poor you your opponent scores five goals and the first one to reach 25 wins.

There's an adequate variety of game options, with ten speed settings and a computer opponent who can play in three levels of skill. Playing the computer is okay (it's very sluggish on the low setting and very frustrating at the top level) but this is the sort of game, like the original Pong which is best played against a human opponent. Pong ten has very delivery opponent to create with the infinitely adaptable computer five games, and as an update

of Pong it suffers, it would have been nice though to have seen a new challenge in the rules and gameplay to make it more interesting and the full centre, although necessary, gives the game a two-dimensional character that could become tiring after a few games.

It's one chance you must put on the simple pleasures of Pong as well as realistic realism in a 2D world you must be to create Pong ten, but it's worth something more than following the bouncing ball, go elsewhere.



equipment that's needed and work out how best to use all these things. Arnold can come up to the objects at a time and there's a transport system that can be used to move around the station quickly if you can work out the polystyrene required to activate it.

Along the way there are lots of interesting devices which you can use to do and dig. ARNOLD's energy supply. You can survive using devices with these before using it in the which point you have to a pile of dust and can keep away with a brush. You can use your own energy of these devices to enter to get them out of the way through your supply of energy to it's best to get used to controlling ARNOLD's rotating style of movement in order to avoid collisions.

The more challenge is the game is exploration and finding objects, but as there isn't much in the way of obstacles or problem-solving to deal with and to land a ball 20 miles to the business of exploration Bomb scare is unlikely to offer the same challenge over a period of time that Alien 8 might. On the other hand, Bomb scare only costs about a fifth of what Alien 8 would cost you but it's still good enough to keep you occupied for a few evenings now that winter is in way.



Football Manager

Activision Games
£19.95

The erstwhile Football Manager hit hasn't needed to yet another season and it is as compelling as when it did for the most part many years ago. There must be a version of this game to just about every club on the planet (and I can even remember it in 1988 version).

The game is essentially a test game of strategy and planning, leaving setting transfers and selecting players to get your team strength as high as possible in five areas: defence, attack, defence, resistance and others before playing a match. Full league tables, promotion and relegation, in Cup and the option to save or load a game is provided.

The graphics are a little high-tech in an interactive way of adding realism to displaying the results, better than a simple points and you can really get into it. I actually cheered or groaned at goals were scored for or against us.

This is the ultimate computer and this is probably one of the best strategy and simulation programs on the

market, there has not aged it at all.

An important consideration with this kind of game is the ease with which you can give the computer and the player all options during play. The clear, well designed screen display makes it simple to read and understand, even without resorting to the detailed instructions supplied, and the options are plenty, including the occasional 'best of random standard' if you are keen on this sort of program. Then Football Manager is an absolute must and if you are not sure if this type of game is your forte then this is the one to try. You'll soon be hooked.



Bomb Scare

Activision
£19.95

Just lately I've been deriding the arrival of what new game in the limited budget range because they are come up with some right crap recently. The last two I saw and now Bomb Scare. Bomb Scare can't be sold here based on quality alone without getting too big

headed, since Masterpiece are not out in force when it comes to budget games.

Bomb Scare is a sort of budget version of Alien 8, employing the Ultimate style of 2D graphics but just about everything using three dots. You control a bomb disposal robot called ARNOLD in an attempt to defuse the time bomb placed on a space station in orbit around the planet Neptune. In order you'll have to search the station for the tools and

The sacred armour of

ANTIRAD

Noble savagery meets
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adventure.

**The Sacred Armour of
Antirad**
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For all in the future the earth is transformed into an irradiated wasteland by nuclear war. Over the centuries a new race of primitive humans emerged. They preferred a peaceful life but it did not last for long. Alien invaders conquered earth and put the tribe into slavery. The ruling aliens created a stronghold deep inside an extinct volcano. Fearless to fight the invaders' advanced weapons the tribesmen seem doomed but the elders recall the legend of "a sacred armour" that could enable a man to withstand the radiation levels of the volcano and destroy the alien's citadel. At last, the strongest warrior is selected by the elders to attempt this last quest: what to save the people from slavery



This scenario is brought to life by the inclusion of a 16 page comic book drawn by the games designer Ben Motters. It makes a nice change from wading through grandiose prose that usually accompanies similar games and means that you have a clear idea of what you, as Tai, are out to accomplish.

The comic book also creates an atmosphere before you enter the game itself. This atmosphere is enhanced by the graphics which are among the most effective and detailed to be seen on the Spectrum to date. Tai himself is a large figure, convincingly athletic and certainly not lacking in the jump department. His first objective is

to locate the Antirad suit and he can pick up an endless supply of rods to help him knock out the robots who stand in his way. The throwing action takes a bit of getting used to — that's because it's lifelike. Rods are hurled not in a straight line but in an arc which makes pin point accuracy essential.

Among the early contenders to whittle down your lives are hanging clothes who are deadly if they catch you, flying insects with "delayed intelligence" (ie they will give you a few seconds before they home in on you) and acid rain drops which are instantly lethal.

Once you have located the suit you can activate it simply by standing in front of it. Activating



the suit brings the display panel of the foot of the screen floating into action. The panel includes indicators for armour, energy levels and left stamina, gives counter-killshot messages, read out, and component indicator. The last indicator shows you are four components short of using the suit to accomplish the mission.

So you have to leave the vicinity of the suit in order to find the 'gray code' that sets the line in turbo-charged footwear will enable you to get into the suit and get airborne. Although you can hover quite effectively in the suit in order to pick up essential objects such as a portable megaton pulse beam and the implication mine to blow up the alien nest, you need to get out of the suit again from time to time. This results in plenty of heart pounding in and out of the second dimension. One problem to avoid is parking your

suit on a level to which you can't return. To alleviate this problem there is a transporter concealed in the forest, which will return you to the suit whenever you lose it.

As you progress through the game the obstacles of course become more difficult. A particularly tricky sequence involves running the gauntlet through a series of firebreathing dragon obstacles. The flames look very convincing and of course have a toll on your energy. The radiation rises to deadly levels the more you get to your objective and it's a real race against time to plot the best route before you succumb to the game's rays. One moment of hesitancy, one false move and it's game over.

Antikid is extremely pleasurable to play and the difficulty level has been pitched just about right. Palace's previous games *Goldtron* and *Goldron*

it certainly gave no quarter as for as difficulty is concerned and it may be that the aspects of stumped *Goldtron* players have persuaded Palace to make Antikid just a shade easier. Most games players will however find that Antikid is a real bit of fun.

Overall Antikid is an excellent package that has been presented with an expert eye for detail. The post-holocaust scenario is hardly new to computer games but with Antikid's attractive looks and touches have been added to make it stand above the crowd.



HARDBALL

Hard hitting action on the baseball diamond

HARDBALL
Advance Software
\$8.95

With Channel 4 hoping to turn the nation into baseball fanatics by showing the World Series for the first time, this is a timely release for those who want a taste of the simulated action.

Originally marketed on the Commodore 64 by US Gold, *Hardball* was considered too complex for conversion to the Spectrum and the rights passed to a new company, Advance Software, who have proved it could be done successfully.

Hardball can be played against the computer or as a two player game (keyboard & joystick) and Remington, Interlogix & last three joystick are supported. There are three screens and the first to confront you is the Manager's Decision screen which allows you to choose if you bat/defend from you can make changes and substitutions throughout the match too. Perhaps realising that baseball players who are legends in the States are



unknown in Britain you can pick a team of colourful names such as (Brotein, Unakot and Ainsow).

Alternatively you can hold off from interfering with the team and get straight on with the game. Pressing the Play Ball option transfers you to the pitcher/batter screen. A state of play display hangs over the batsman and both he and the pitcher are large, impressively animated figures. In the right hand bottom corner of the screen is a small map of the diamond which indicates how many batting players are on the bases.

Pitching offers plenty of varieties. You select from no less than eight types of delivery from the Fourball (straight and very fast) to the Slider (a curving ball that veers at the last moment). The actual target area you select is cleverly indicated by the batsman's moving glove.

Pitching success relies entirely on timing and in general it seems that a good deal is made by hitting the ball a split second after you think you should.

Once a ball is hit the outfield screen comes up. This shows the diamond and outfielders. The batter has the option to get his players running round the bases while the fielder can move his receiving fielder (the one who is finishing on and off to catch or return the ball he can then throw it to any of the bases and get a running batter out.

The flurry of activity as batter and fielder take appropriate action is exciting but, unfortunately a lot of hits are set back, either being caught where the ball is knocked out of the ground or going straight to fielders for an easy catch. It's a small point but the game would have benefited from a greater proportion of action dealing with hitting and running decisions.

Despite this *Hardball* offers sports simulation for a whole new ballgame - its addictive, well presented, contains a lot of variation and is an excellent two player game. Playing against the computer is fun too. I lost the first series by an embarrassing margin but now it can give it a competitive game. The computer sometimes even takes pity on you and gives something irrational like send a player off on run to a base with no chance of making it.

Overall *Hardball* can be highly recommended as good value entertainment and will undoubtedly convince a lot more people that *Baseball* is not just a game of rounds played on the other side of the Atlantic.



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quartet on a gritty
excursion to save the
planet from nuclear
devastation.

STRIKE FORCE COBRA
Piranha Software
£9.95

■ If this were a film instead of a computer game, it'd be one of those cheap British adventure films like the *Wild Geese* or *Penguins*, or something like that, in which a group of British commando types and a few minor international stars get together to form an elite fighting squad and carry out a desperate mission against insuperable odds in some oddly named third world nation.

In this case the fighting force is known as Strike Force Cobra, and the mission involves penetrating the fortress headquarters of a man known only as the Enemy. Obviously gifted with a bit for the *Mad Max*atics, the Enemy is threatening the world with nuclear blackmail and only the Cobra team can stop him. By locating the captured scientists who have the codes to the control computer room, the team can then get to the computer and destroy both it and the Enemy's plans.

Like a cheapo adventure film, the game begins with a sequence where the team members are installed. You have a choice of eight possible characters, out of which you have to assemble a team of four

I chose Kowalski, McWatt, Downes and Stern, who in the film would be played by Ernest Borgnine, Jeff Bridges with a head of gold, Richard Burton (the leader — cool, unflappable, with some tragic past in his past), Richard Harris (just alcoholic, but the best explosives man around), and some European sex kitten or other (French resistance — beautiful but too) as *Hot!*

The four team members split up and enter the fortress at different points, gradually regrouping as they round up the captives and fight their way down through the fortress's four levels. You control one character at a time and have to coordinate their movements. There are a number of lifts and doorways which are controlled from points elsewhere in the complex, so you'll have to do a bit of mapping and work out how best to move the team so that they can help each other get past these obstacles.

The rooms and corridors of the fortress are heavily defended by electronic traps, automatic rifles, armed soldiers and various other devices. At the end which put out the middle part hour of adventure films, there's a lot of leaping through windows, sliding down doors, hurling grenades and spraying everything in sight with machine gun fire. All this is well presented

graphically and the animation is very good — a bit like a 3D version of *Impossible Mission* — although it does tend to slow down dramatically if there's a lot of movement on screen.

The instructions could be a little clearer on some points, such as how to activate the lift and door switches, but if you stick with it you should soon see what you're trying to do. The game is a combination of *George Gorton* (in the combat side of things) and strategy (in avoiding the traps and working your way through the fortress). And although these two parts of the game get well balanced, and the game is well presented, the pace of the game isn't down a bit. Even though you are working against a time limit there's not that much sense of urgency about the game play (what we need is a few close-ups of Richard Burton glancing at his watch and saying "Kowalski! Look, damn time!")

Even so, *Strike Force Cobra* is still worth having a look at. It does have its moments, even if it doesn't quite achieve its full potential, and along with *Trap Door* is helping the new Piranha label to get off to a good start.

GREAT 



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DRUID

Firebird don their habits for a bit of mythical mayhem.

Druid
Firebird
\$7.95

It is told by those in the habit of frequenting such places that Druid is based on that decade game of the moment, Gauntlet (though the official version of Gauntlet is being produced by US Gold). I've not played Gauntlet myself, but I did find Druid enjoyable. It's a little nurturing.

In the game you control the figure of a plump little Druid (who obviously spends too much time lying around between sessions) who has been saddled with the task of destroying four skulls, created by the Princess of Darkness and hidden in the depths of a dismal tower. The tower is guarded, as towers tend to be, by all manner of ghosts and water beetles (??).

Your druid has a number of spells at his command, and different spells are effective against each of the monsters that will come at you in hordes and try to drain your life energy. The main offensive spells are Fire, Water and Electricity, though there are also spells for opening doors and invisibility. You only have a limited number of spells and of the energy, but if you can find the magical seeds and pentagrams that are scattered around each level you can recharge your supplies.

On each level there is a set of stairs leading up/down to the next level, and the skulls that you are looking for are hidden away in the lower part of the

towers eight levels, so you can get a lot of monster-blasting in one.

One of the more interesting spells that you can cast upon is the Golem spell. When cast you suddenly find that you're accompanied by the lumbering figure of a golem, whose movement can be controlled either by the druid or by a second player (special guest appearance by John Smith from next door). The golem acts as a sort of mystical quarterback, raising his defenses and generally scaring the opposition before they can drain your druid, but his own energy is also limited so he has a limited lifetime and then you're on your

own again.

You are given an overhead view of each level and the screen switches rapidly from section to section of the maze as you move around. Being set in a maze, it's the kind of game that lends itself to large block graphics and these have been done quite well, though they're not particularly spectacular.

The animation is smooth, despite the rather lumpy sprites, which is important because the game is basically a testicles shoot 'em up. There is some element of judgement involved in your choice of spells and the way you make use of the golem, but underneath the druid's habit suits a medieval commando, despatching ghosts and ghoules with all the gusto of a Rambo.

It's quite good fun, and the exploration of the levels in search of spells and skulls adds a bit of variety to the mythical mayhem. I liked that the ghosts seemed tended to get drained a bit too quickly, leading to a lot of not terribly long games, but though it's reasonably addictive I don't see rushing to the arcade to join the rest of the Gauntleters.



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Gargoyle Games' new arcade label gets off to a flying start with Light Force.

Light Force
FIL
£7.95

■ I took me about thirty seconds to become addicted to Light Force and the joystick and trigger finger haven't been the same since.

Light Force is the first game to be released on Gargoyle's new Poster than Light arcade label, and the first to feature their new 'laserisation' graphics techniques. The game itself is very simple. It's a straightforward 'blast everything in sight' shoot-'em-up, along the lines of *Galaxians* but with a few added touches.

You control the Light Force fighter craft, the sole space ship in the vicinity of the target planet in the *Regulus* system which has just been overrun by a vast alien force. Each planet is defended by waves of enemy spacecraft, and, in true shoot-'em-up tradition, you've got to avoid their attacks and blast them all out of the sky if you can. In addition, there are numbers of control centres

based on both the surface of each planet and on spacestations in the asteroid-clustered void between each planet. If you can destroy enough of these control centres you gain extra lives, so obviously their destruction becomes your main aim. The tricky bit is in concentrating your fire on these centres at the same time as dodging asteroids and enemy craft and also trying to destroy as many of these as you can in order to rack up a high score (I took two days before I finally managed to creep onto the hi-score table at no. 14).

Some of the attack waves are really vicious, coming at you in different formations, sweeping across the screen, dropping bombs and generally giving your trigger finger a hard time. It's this multiplicity of targets that makes Light Force so addictive. It's not enough just to stay alive and zap a few spacecraft, you've got to coordinate your attack so that you can handle the waves of attacking aliens at the same time as trying to get the control centres. To make things harder the control centres explode about three direct hits before they're totally destroyed, and the whole thing results in me frantically pounding away at the joystick's fire button, racing madly from side to side as I try to zoom all over the screen without losing my steady grip on the joystick. Is that kind of game

Laserisation

The graphics in Light Force have been programmed using Gargoyle's new 'laserisation' technique which, instead of mirrors, actually seems to get around the Spectrum's artefact problems. The result is a fast paced game with lots of large, detailed, and pleasing coloured sprites. It does make a difference to the game to have the improved use of colour that 'laserisation' makes possible, and it also gives the sprites a more solid, almost 'look that's quite nice'.

My only minor niggle about the game is that you have to shoot most of the asteroids and spacestation absolutely dead centre in order to destroy them, as that quite often when it looks like you've scored a hit you can still get pulverised by an asteroid that refuses to blow up and get away. And of course the asteroids and alien craft only have to make a glancing blow to set off your hurt and get rid of one of your lives. But that doesn't stop Light Force from being the most addictive shoot-'em-up I've played in months.



ACROSS THE PCND



With Amstrad now in charge, will Sinclair machines finally break into the American market? Mark Fendrick gives us the view from the U.S.

As we end 1986, we take a quick look back and then a peek at what the future may bring to Sinclair users here in the States.

Of course the big story this year which shocked all Sinclair users everywhere was the sale of Sinclair Research Limited's computer business to Amstrad. Computer historians fight on the heels of this announcement came a similar blockbuster of a move for all here — the purchase of Sinclair's UK inventory by UK Computer Response. Truly mixed signals for the American Sinclair user, encouraging all of the worse time. A-1 was going to market the QL as Sinclair (and Texas) had never marketed it; products in the past, promised to fully support it; newly established network of authorized dealers and integrators is set up to support it.

For a long time the QL remained at the 1985-86 level which had been established by Sinclair when introducing the QL at £499.95, but as this year goes to press, dealers are reducing the cost of a complete QL, including the 4.5Mn application programs and User's Manual to \$399.95. This is in response to the release of a QL all be A-1 Computer Response for \$199.95. This is a simple to assemble kit, but does not come with the software or manual. It is also available from authorized QL dealers.

But how did the Amstrad buy out company affect us here in the United States? Not very much. Actually in fact, the Amstrad

name is probably less familiar to Americans than the hardly known (even given Sinclair nameplate) brand may have been the second largest in the British home computer market, DAF was, and is, virtually unheard of here. An early offshoot of a Z80 based computer (the CMC 486) failed without anybody even knowing it existed. I myself must confess that the only reason I had ever heard of the company was because I regularly read UK Computing and saw mention of the brand in software ads.

No reply

Amstrad's current "beast" in North America is its Personal Word Processor. It is marketed by Seas World Trade Inc., a division of Seins, the largest North American department store. So it has been carried in Seins stores both in the United States and Canada. Seas World Trade claimed on marketing it in department stores, and computer related electronics stores and selected Seins stores.

The Amstrad Personal Word Processor in the middle ground takes care on disks to typewriter and a (optional) computer. Selling for a list price of \$399.95, it consists of a keyboard, monitor, printer and word processing program. Utilizing 5 1/4 inch drives, with CDS available. It is in fact a true personal computer, although Amstrad is not promoting it as such. Those of you with good memories will immediately associate this description with Commodore's Market Adam. The main difference is attention to detail. Commodore attempted to attract both the games playing veterans as well as the students interested in a word processing system. The Adam, originally targeted at the same audience as the Amstrad system, looks a lot like it, while the Amstrad looks like a professional set-up. While Adam opted for a very unattractive beige stripe system, Amstrad has gone with the up and coming sleek disc drive. Although the supply of these discs is still

somewhat uncertain and expensive, the fact that there are more systems are being built around the format will alleviate both of these factors.

But the marriage between Amstrad and Seas World Trade has not been what either side had expected. So far the company who has emerged as the largest supplier of home computers in Europe has produced a very disappointing showing in North America. Based upon the successful penetration of Amstrad into the British market it was expected that Seas World Trade would purchase 100,000 units. So far the actual number is closer to only 70,000 systems.

Whither the Plus 2?

But what about Amstrad's newly acquired Sinclair line of computers? Will we be seeing the new versions of our favorite computer finally showing up on the counters of U.S. computer shops? Don't count on it.

Although Amstrad has now released its first new computer under the Sinclair banner, we do not expect to see it in the future. First of all, any computer going onto the market in the U.S. would have to meet some very strict standards as set forth by the Federal Communications Commission (FCC). Not only would Amstrad have to make some modifications to meet these standards (as well as adapt to the North American power system and VHS broadcast standards) but those seeking FCC certification must pay for those tests as well. No doubt Amstrad would proceed along that route if there was a market for Sinclair computers, but it just does not exist in the numbers to justify the time and expense. It is the general consensus that Amstrad will simply concentrate the Sinclair name in the markets where it is already a force and not try to create one where it does not exist.

As for Amstrad's future in this country it is well to be seen, but as of today it is an uphill climb. Despite the introduction of Amstrad's new line of IBM compatible computers will start that climb. Hoping to bring these computers to the American market sometime in 1987, they will concentrate on integrating alternatives to the current crop of IBM compatibles. They are being introduced in Britain with a price range starting at \$594.00 and topping off at \$1,799.00. To sell in America you need to be IBM compatible, and at those prices Amstrad may finally make its name known here.

MIND PLAY



The winter chill has really set in now and the dungeon is deathly cold as well as damp and depressing. My only heat is from the polished Spectrum powerpack that I use for my work. Does your heart not bleed for me? Oh alright, be like that then.

Winter of the nuclear kind is a distinct possibility if you don't solve the latest Interceptor game. Afterhack, reviewed this month, some people have expressed doubt about the advisability of releasing a game about nuclear reactors post-Chernobyl. But to be honest, the game deals with the after effects of an earthquake rather than a nuclear explosion. Also this month, I can say hi to and reintroduce to investigate The Vera Cruz Affair.

A number of helpfile requests arrived recently for a game I'd never played, Sirocco and the Golden Ship from Mastertronic. This was not reviewed by anyone when it was released — earlier in the year I think — and I don't know why, because having actually bought a copy, it turns out to be pretty good. Based on the various Arabian Nights and legends, its split screen, not guided, and written by Roy Cornall (remember The Black Crystal all those years back?). An entertaining theme that has been well used. The graphics

and text are variable, some attractive, some below average, but generally acceptable. Sirocco is sluggish, but generally this is an enjoyable game and well worth £2. I'd give a "Great" rating if this was a full review.

Nice to see a few good cheapo games coming through, but I'm still waiting for something really shinning in the lower price ranges. And I hope to see some more full-price releases in the run up to Christmas: only two mainstream adventures came in for review this month. Still, promised products — such as Darnark's James Bond adventure, Live and Let Die, and Delta's adaptation of the comedy book The Colour of Magic — will hopefully arrive in time to fill any stockings, as should Dodge Gerson, the comedy author copied from Melbourne House, written by Lezer and Jones, the outlaws of Hamletford and Serenadines. All that has materialised of this so far, however, is the "song" that will be given away on the outside flipside. This, really, is boring; it makes no attempt to be literally funny and while musically appealing it is not inspiring enough to be funny. A waste of time and effort, but I have higher hopes for the game. Whatever happened to giveaway songs that were worth listening to like Pinhead? All together now "Go

easy with the rubber duck! Make the most of your park pie.

What do you mean, you can't remember that for back? Huh, on with the reviews!

L'AFFAIRE VERA CRUZ

Interceptor
Level 1

You play what Inspector Cruz, who would sell an Officer of pleasure, down in Jefferson. Our following US trade import nation, French without those inspectors are trying to break the US market.

The Vera is less than forthcoming when you follow her out last because she is dead, and slumped miserably across the floor of her apartment. It is a simple case of suicide as her male on her table would force you to confess. Fortunately not, as the game would be somewhat pointless. As a more complicated head of the St. Bernard Crime Squad, you must find the truth.

The game is in two parts. In the first, an excellent graphical representation of the scene of the crime is portrayed complete with central objects. By moving a "viewfinder" window with the cursor to give close-ups of certain objects, you must col-

[illegible]

AFTERSHOCK

The economy is increasingly
oriented toward personal and cor-
porate health care, a growing trend
that has produced a demand for
just as many CNA professionals has
been overlooked by the massive
doctor fill. This opportunity dis-
cusses the Graduate Program, the
top system of the health business
instructor as it begins to research
how — a national solution to
this — must stop it doing so.

The good news is you
will stop it doing so
if you can afford it.

Unhelpful standard grant messages make the job worse. As a result, West Coast business is increasingly difficult, and pro-

GREAT 

and, graphically, looks up to much memory, the game has an extremely busy (occasional) flow over. Not only is there a lot of graphical (no CRT) use required to enter deliciously specific information such as **SPACE SHIPS WITH BEAM** (a must for those exact words) (see **SPACE SHIPS WITH BEAM**), but the programming is also, I believe, generally un-

Answer: *penicillae*. Your sense of humor may tell you that too soon if they are only 15 years of age. The right word combination, then, is that that needs to be, though. There is a good deal to be said. Perhaps the author should have had less questions, and more problems with a larger vocabulary. The last sentence would be more memory. I suspect this might be a good question.

Generade Afterhook is a welcome improvement to a tool that previously suffered from a number of cultural and technical problems. It is a good example of a well-designed and well-implemented tool that is easy to use and that is well-suited to the needs of the community.



H E L P L I N E

Seibert's entertaining **Isobots** (being) has proved popular on the desktop this month. As Lucasfilm from Bostonmouth is having difficulty travelling by tube from the station, you must **ENTER CAR**, **ENTER WIL**, **ENTER CARD**, **ENTERIN BILL**, **ENTER CAR**, **AM** (lawyer from the H&M Neptune wants to take the hen you need to **CHW** the **GLM** item, when in the same room as the last **BOW BUBBL** the **YLF**, gassy gum is also used to **BRCK** **SUTTON** in the 1st allowing you to reach the third level (which you need to do). This should help Daniel Wedgester, who also asks how to keep the sliding doors open after shouting in the misophonia. In fact, you need to play **Music** into it, using the tape recorder the cassette is north from the TV camera, which you must (dis)able in ordinary time.

Rob has even **Ontario** (yes, the one in Canada) cannot leave the ship in **Marchadow**. If you think only **April** when you try to go south inside **ELL**, **MAN**, **DAR** to the **CAPTAIN**, take the **control** from the boat, examine the **stick** then **CUT CHAIN WITH** **CLAWER**, to finally escape. **WALK** **PLANK** and head east. **Moie** (are you have the shell into the beach as you'll need it in part two).

G. Booth is also having several problems in **Mastermarch** **Isobots** and the **Golden Ship**. How does he go from the vessel to the island? Will having sailed east from the port until you can go no further. **Dirt** of the side (and **SWIM** **LAST** to shore. In the same game, **Carston** **Abled** from **South** **Stomorgan** is being prevented from crossing the **desert** by a dragon. The **concern** it is **HT** **GONG** **WITH** **AXE** then **HT** **CHAIN** **WITH** **AXE**. The **axe** is useful throughout your voyages. **Neil** **Talbot** is stranded

later in the game. In answer to his questions, to defeat the **game** **HT** **LAAR** **WITH** — what a surprise — **AXE**. **HT** **WOLF** (the one you should have found right at the start) to the **jetter** **torque** and **PULL** **ROPE** to find a **gem**. **WOLF** **ROPE** again, because you need it to **LAISSE** the white horse. Then you can **HT** **and** **EXAMINE** said **creature**.

The **buggy** has caused many griefs in **Isobots** through the **game** this month. **Koulen** **Gernbach** from **West** **Germany**, **Anten** **Proder** and **Anthony** **Dunn** get some of the people who cannot open the door of the **start** even though some of them have found the **diary** by **climbing** into the **start**. I **linked** at this last time, but the **month** the **exact** solution **TYPE** **22485** **Proder** **Anten**. Then all back and watch the **key**. In part 2, **Duncan** **North** cannot escape the **Golden** **Dungeon**. **Tim** **LAG** **SHAG** is **discover** the **trapdoor**, which is opened in **Isobots** **Isobots**. **EXAMINE** the **ROCK** which you'll find and **ENTER** **ENTRIN** to leave. **THROW** **ROPE** until it catches on the window then **PULL** **ROPE**.

Duncan **North** is also finding the **SA** is **superhero** **bug**, in the **budget** **re-release** of **Isobots**. **Adams** **governance** **Hulk** to **control** high **gravity** you must **ENTER** **SUTTON** **Drop** **BILL** **UP** and you'll become of **green** **skin**, and, although you're told the **skin** **skin** will **gas**, you do not immediately **revert** to **being** **Bruce** **Banner**. Before this **revert** does happen, just **GO** **OUT**. And in **level** **Q** **Despite** the **black** **rod** is inside the **door** of **Beepin**. **Wear** the **goggles** and take the **rod**. The **yellow** **rod** is inside the **door** of **Hope**, examine the **rod** above your **ears**, then take the **rod**.

Christopher **Seibert** asks, from **deeper** **Claverton**, some questions about **Interceptor's** **Heroes** of **Rage** (how excellent value of £199). The **people** is **tired** with a **dagger**. When you

have found the **foison**, you can **type** **ENTER** **ELL**, **BAI** **WITH** **RELOOM**. Switch the **spider** to **sleep** by getting **Reid** the **mineral** to play the **lane** to it.

Morou **Rear** wants to murder the **girl** at the bar in **Voltaire** 17 without being killed off. **Mineral** **You** must buy her a drink with the change from paying your **bar**. She will then go to powder her nose, and if you follow her to the privacy of the ladies' room, you can dispose of her without interruption. Her **handbag** is worth further investigation.

Write to me

Life is full of problems, isn't it? Physics homework. British Soil, milk cartons that won't open without spouting oil over the kitchen floor. **Isobots** **Isobots**. Then, doing some **computer** **programmer** and creates even more problems for you. **Isobots** **Isobots** and that keep you awake at night. So you become even less able to do the **Physics**, you miss your **Isobots**, you cut up yourself instead of the milk cartons, and **Isobots** **Isobots** becomes even more annoying. Well, let me — kind, unselfish (and sometimes—) tell you that I can — relieve your **Isobots**. Write your **Isobots** **Isobots** difficulty on the coupon you'll see here and send it to **Ministry** **Isobots**, 2X Computing, No. 1 Golden Square, London W1K 1LL. Then, with that problem solved, maybe you'll also be able to understand **Newton's** **Law**, **HT** **Isobots**, milk carton instructions and... well, I can't do anything about the **rod**, but you wouldn't want a perfect life, anyway, would you?

A few rules. **British** **correspondents**, please enclose a stamped, addressed envelope if you want a personal reply rather than wait for the magazine to come out. If you are writing from abroad, just enclose an envelope — I'll add the postage. I try to respond within two months but I can take longer for the other hand, you might receive an immediate reply. I **ONLY** **DEAL** **WITH** **ADVERTISERS** **not** **create** **games**, **not** **technical** **problems** (write to **Games** **about** those). I'm not too hot on **adventures** these days (**Isobots** **games** included). Finally please write the name of the game you're writing about on the back of the envelope.

Enough for this month, the **game** is getting later and the **shopping** **days** left in you know what dwindling (not that I'll be allowed out to buy anything) so I'll leave you to the mercy of the endless adventures (being stuck in a dungeon has its advantages sometimes) and hope you'll join me again, belly-aching, next month.

Title.....

Company.....

Problem.....

I can help solve.....

Name.....

Address.....



the war of the shires



Welcome to the second installment of "War of the Shires" by Alan Davis. Sharpen your sword, polish your shield, and let's enter the fray.

In this article we'll be laying the programming foundations for our "fantasy epic," namely, Listing 1. It's a rather lengthy dailog of program to type in, but you can take comfort from the fact that the bulk of the game's mechanics and data are contained here. The consequence is that next month you'll be able to get the full game up and running pretty quickly, with relatively little wear and tear on the old fingers. Once you've typed in Listing 1, I strongly recommend that you

save a master copy of it without any edit, and set that aside until next month when we'll make the necessary additions. However, you do need to try out what you have so far — so here's what you should do to make a temporary "test" version.

With Listing 1 being in memory, enter **CLEAR SCREEN** and then load in the two code blocks and the map data from the first section: **LOAD "PANEL" CODE, LOAD "BOARD" CODE, LOAD "MAP" DATA** in (L) Next type **GO200 9999**, and all the necessary bits and pieces will be saved to tape for you in the correct order. Rewind the tape, and load in the whole thing three scratch. There will be a delay of some seconds after everything has loaded while the extensive initialization routines perform their appointed task — on completion of which you'll be invited to press a key in order to get things started in earnest.



the war of the shires



Figure 3

string at, and then letting machine code handle the word-wrapping and printing (see the subroutine of line 30, which ensures heavy use by the program). Now it's possible to achieve this entirely in BASIC, in fact, though the result is rather "jerky" or "lumpy" printing. This not only slows down the gameplay to some degree, but also looks polish in presentation, and this is one of those situations where just a dash of machine code makes a world of difference to the flow and smoothness of a game. Another example of how presentation can be improved at little cost is seen in the subroutine of line 43. The program uses this to

"decode" page files using the SPC corresponding to the current map location. This not only produces pleasant variety in visual impact as the game progresses, but also adds atmosphere in its own right. Simple, but effective — by leaving it out, and see for yourself what you lose.

The program

As you saw in Figure 3, the program so far consists of only a

few routines and the BASIC should help you find your way about, together with the following notes on each section.

1) Main character selection menu (lines 5000-5050). Line 5010 says (better you or little, the checks each character to see if all his army has been destroyed or which side has been declared dead, but of course since there are no battles yet this could hardly occur).

2) Character description and options (lines 500-600). Notice that since all characters stay at their respective keeps unless you move them, the "move" option is only available if the current location is a keep (GOTO 140 on the right and if the potential recruit hasn't already been depicted (line 540).

3) Search location (lines 1000 onwards). We'll be adding more

routines to this real time. The only line of note here concerns what happens when other characters are present at the current location, where the necessary sorting of output to be printed is done in lines 1010-1020. It's a little more complex than you might expect because we must allow for the possible circumstance whereby lots of characters are gathered at the same location — the problem being that the best printing routine can cope only if Lst of is less than 255, the difficulty is overcome by printing up to in two parts if more than two characters are present. Movement (lines 400-490). The temporary variables used by are used to check conditions of movement, with the appropriate entries for movement to a new location being made in the array at only when the movement is deemed "legal". This routine would have been much simpler had I not decided to incorporate ships into the game, and indeed apart from line 490 (which prevents movement if a mountain blocks the way, or if an army is exhausted) most of the condition tests here concern the business of sailing. That you can't move across water unless you're on a ship (line 480), you can't board a ship which is already full (line 485), and if a ship is moved, the ship must be changed to leave water in the old location and the ship in the new location (line 488). Line 490 causes the moving ship to fly by an amount appropriate to the terrain at the current location. The subroutines for printing the map (lines 600-650) and displaying armies (lines 650-680) are, I hope, fairly straightforward. Don't worry if the line numbering seems odd, by the way, just enter the line numbers as they are given so that we can make the necessary intertextual read month.

the war of the shires

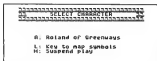


Figure 1



Figure 2

Main menu

The first thing to greet you is the main character selection menu, as in Figure 1. Your choice is pretty limited at this stage, but things will improve! You can try out the option to display the map symbols useful to a player until he becomes familiar with them, but of course the "suspend play" option will select yet another option! However, calls up something rather more interesting — as shown in Figure 2. This is essentially a description of Roland of Greenways, who is the only controllable character at present, and provides information about where he is, the size and state of his army and the options available. You can try out the "SELECT" option — though it won't be terribly informative yet — and indeed the only option of real interest is "view map or move", which puts the program into "Map" mode. The world map will be displayed, with Roland's position indicated by a bright cursor. All movement in the game takes place in "Map" mode, and the relevant keypresses are indicated at the bottom of the screen.

You can move Roland and his men in one one of four directions using keys 6, 8, 7 and

8 — and at any time you can quit "Map" mode by pressing key "0", which will return you to "character description" mode. It's worth doing this at intervals during movement in order to see how the army has doing a long march! There's one other important option in "Map" mode: pressing key "F" will cause all army positions to be shown on the map with enemy armies given in black ink on white paper, and ally armies in black ink on bright white paper. Don't be alarmed by the fact that you see only ally enemy army symbol — this is because all enemy armies are in the same place (the Keep of Darkness) and they'll stay there until next month. It's quite safe to explore!

We'll have more to say about "Map" mode next time, but for now just press a key to return to simple "Map" mode, and try moving Roland to one of the other keeps. When you arrive, leave "Map" mode — whereupon you'll find a new option presents itself so that you can greet another character, and you'll find from this point onwards that you can switch between characters using the "Change character" option. Incidentally, you'll find that searching a location is a little

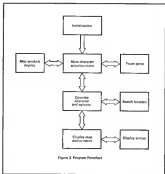


Figure 3 Program flowchart

Figure 4



more interesting when another character and his army are present — though it will offer a great deal more in due course. You're now in a position to wonder about (a) *if*, meeting, greeting, and then (b) *if* you wish controlling all the three leaders.

D.I.Y.

As I told in last month's article, my aim in this series has mainly to offer you a game to play, but to provide you with a program base to which you can add developments of your own. So it's important that you understand exactly what each stage of the program is doing in relation to what you see on the screen. You can get a useful overall view of the structure from the "flow chart" I've given in Figure 3, which shows how the various sections of the program are related by the menu selections. Armed with this, let's take a closer look at listing 1 — starting at the most logical place with the initialisation sequence from line 1000 onwards. After the loading instructions for the code blocks and map array, we find at line 1005 a range of string and numeric arrays being dimensioned. Let's examine the meaning of the string arrays first.

1) *HN(20)* holds the names of the characters followed immediately by the names of the places they lead.
2) *aS(10,20)* holds the descriptions of landscape features.
3) *vS(10,2)* holds the descriptions of army strength and morale (the descriptions for strength, and five for morale).

Information is extracted from these arrays using defined functions (see the first few lines of listing 1) in a way which will be familiar to those of you who read my earlier "Principles of Interpolated" series; the method gives you an immensely powerful system of generating text in games like this, and the relevant functions are as follows:

1) *FN rS()* requires the shortened name of the "rs" character. Thus *FN rS(r)* gives "Isoland".
2) *FN rL()* returns the full title of the "rl" character. Thus *FN rL(r)* gives "Isoland of Greenway".
3) *FN rA()* returns the name of the "ra" place — so that *FN rA(r)* is "Greenway".
4) *FN rAa()* returns a location description corresponding to the contents of the map array at the current location. Thus *FN rAa(r)* returns "open rolling downs".
5) *FN rAaL()* returns the more name of a landscape feature. Thus *FN rAaL(r)* gives "rolling downs".

We need to look at the numeric arrays next. These are used to store important parameters concerning the characters and their armies (many of which change as the game progresses). The most important — and the most complex — is *a(10,5)*. Each of its twelve rows corresponds to one of the characters, and each of the five columns gives a particular parameter for that character as shown in Figure 4. Initial values for the array are established in line 1050. Note that the DATA statements used here (see line 1100) contain the (x,y) coordinates of the maps, where each character is

placed. In the map coordinates of the maps, spaces are allocated at random. In the way so that the overall strategy of the enemy will vary from one game to another. This means that each new game presents a fresh challenge to the player: there are two arrays that I haven't mentioned yet; *ES(20)* is used to keep track of the total number of enemy warriors at each location. The need for this will become apparent next month, when we'll (a) examine the purpose of *ES(20)* which for the present must remain a mystery.

We're now in a position to examine the remaining defined

a(10,5)	
Column	Parameter
1	Size of army
2	Strength of men (0-240)
3	Morale of men (0-240)
4 & 5	(x,y) coordinates of current position on map.
6	"Recruitment" flag (1 if required, 0 if not)
7 & 8	(x,y) coordinates of keep owned by character
9	Positions available (0 at start of game).

a(10,4)	
Column	Parameter
1	Size of army
2	Strength of warriors (starts at 200)
3	"Larger" character
4 & 5	(x,y) coordinates of current position on map.

Figure 4. Parameters held in the arrays *a(10,5)* and *a(10,4)*.

positioned at the start. Now you know why I asked you to be careful when positioning the keeps on your map last month! Those array elements not defined here start off, of course, at zero — with the exception of *a(1,4)* which is set to 1 in line 1045 (Isoland being the only "recruited" or comparable character of the start).

The second most important array is *a(7)* which performs the similar, though simpler task of data storage for the 70 enemy armies. Each row corresponds to one of those armies, while each column corresponds to one of five parameters (see Figure 4).

Targets

A word of explanation is needed about the 3rd parameter. The enemy armies are going to be "intelligent": it is assumed that each one will be allocated a specific job — that of visiting and/or attacking a specific character (the "target"). Parameter 3 is the code of a given army's "target" — so that if Isoland is the target, this parameter will take a value of 1. Initial values for the array are set in line 1070. Note that since all enemy armies start off at the keep of Isoland, parameters 4 and 5 are the same in each

function. *FN rA()* and *FN rAa()* return a number between 1 and 5 related to the strength and morale respectively of the army led by character "r". *FN vS()* and *FN rS()* use these numbers to generate an appropriate text description of strength and morale, extracted from the array *vS()*. *FN rA()* returns a random integer between 1 and 5. *FN rAa()* returns the RGB colour appropriate for a particular D66 (*CHRS a*) so that individual map-graphic symbols can be printed up from BASIC; it necessarily the rather lengthy function *FN rAa()* is used to divide the whole world up into tiles, returning for a given pair of map coordinates the number corresponding to a particular area (1=Isoland, 2=Despencro, etc.) (see shown in Figure 3 how this division occurs, so that you can relate the various divisions in the function) to the actual divisions on the map. Finally *FN p()* is a handy little function for centralising things like files on screens — see the little subroutines of line 40 for an example of its use.

Before we move on to look at the rest of the program subroutines, a few general points, largely concerned with presentation, are worth making. The bulk of the text display is obtained by first building up the text in the



Some advice for QL programmers from Melvin MacKaron

In the last installment on error-trapping with the QL, we discussed the undocumented keywords **WHEN ERROR** — (**END WHEN**). We looked at four different levels of error-trapping, beginning with a "magician-level" segment which stopped the program's execution when an error occurred and progressed to a more sophisticated segment which identified the error number and then took appropriate action. The keyword which lets us re-evaluate a command is **RETRY**.

It is imperative when we use the **WHEN ERROR** construct that we do not exit from it by using **GOTO**. This may be tempting (and it is used on other computers with the **ON** (**END** — **GOTO**) construct), but if a number of errors occur, the program counter (PC) which keeps track of the line being executed will become "confused" and we will end up in a situation where the computer's book gets one more too many. One extra error will generate more errors, and this only way to escape will be to reset the QL.

The question then becomes, "Can we simulate a **GOTO** without corrupting the PC stack?" Can we "kick" the computer into finishing the error occurred elsewhere and force it to exit the **WHEN ERROR** block of code at a point of our choosing? We may use the programmer's old technique of redirection in **FORN** on error address onto the PC stack and then **RETRY** from a different location in the program. The QL technical guide gives a variable, **IV_CHLMD** with a vector of 256 (164 in decimal) which is described as: "line to CHLMD from" to **FORN** a value into the correct address, we reset the locale **IV_CHLMD**. We add

its vector (offset) to the length of the job header of **IV_CHLMD** (the bottom of SuperMAGC), getting the number 250. Our code becomes:

```
FORN IV_CHLMD, (IV_CHLMD + 250), (non location 250). It is a "long word".
IV_CHLMD is a word, and this is the line from which we wish to proceed. The decomposing listing demonstrates in detail of our error processing.
```

Code

Let's take a look at the listing. As you can see, our **WHEN ERROR** — (**END WHEN**) section of code goes at the beginning of the program. This means that you will most probably need to write the body of your masterpiece first so that you will know in advance the lines to re-enter from. Also, I have used a procedure, **carry-on**, to allow the end user to watch each step of the program's progress. This is a useful tool in debugging, too.

The main program begins at line 290, to generate an error in this section, when you are prompted for a division, enter 0. This will generate an error. I chose to return from the **WHEN ERROR** section at line 290 so that you're not left "garbage" on the screen when you continue (**NOT**). An alternative to **WHEN ERROR** in this section could be to set in line 325 **IF division=0 GOTO 10325**.

To advance to the next block of code when you are returned to the main program, use a legal character.

Next, we shall do a carriage format. If you are using disk drives, substitute the appropriate messages and code into the program. When you run this the first time, leave the interactive empty. This will cause an error. We shall **RETRY** from line 330 (again clearing the screen first). You may either elect to format a carriage or answer "N" to end the program.

As an additional programming note, you will see

ERROR TRAPPING

the use of precedence in this program. On most other micro-computers, I would have had to use **IF** **OK** = "Y" or **and** = "Y" to check for input in lower-case letters (or ask you to use only upper or lower in your programs). However, SuperMAGC allows you to simply end shorter this code by using two "inquiry" symbols to show that we are obtaining the equivalent letters. The coding can be significant. In a 52K+ program, I was able to save over 2K by using this technique.

Error-1

The examples I have used in this article are quite simple. In your own programs, you would probably only use in direction of the program lines if there are the essence of the same error occurring in more than one place. This could happen, for example, with error —to (load or changed) medium, which may occur with either a (LOAD or a SAVE). But the key idea is that you can now trap for critical any error without entering to machine language. As I stated last month, the only "error" which you cannot trap by using **WHEN ERROR** is **BREAK** (**END SPACE**). You could also a person from interrupting **REDOING** the program flow by writing a machine language routine to disable **BREAK**. But you don't need to. I wrote a program suite, **Nucleon**, has a nice little routine to do this for you. They also have a number of other goodies designed to give your programs a nice polish. No, I do not work for Intel, and this is not an advertisement.

With practice (and a little imagination), you should soon find yourself controlling the flow of your programs quite nicely. It's very easy once you know how.

If you have any questions about error-trapping on the QL (or other aspects of programming this machine), please write to ZX Computing Monthly. If you need a personal response, enclose a SAE.

Listing

Error-Trapping Demonstration

```

10 REMARK Advanced Error-Trapping
20 REMARK This program module demonstrates use of strategic POKes
30 REMARK to control the exit (and re-entry) points of a program
40 REMARK from a WHEN ERROR routine.
50 REMARK
60 MODE 0 : PAPER 0 : LNK 7 : CLS : REMARK Set Display
70 WHEN ERROR
80     BEEP 2000,12 : PAUSE 5
90     BEEP 2000,8 : PAUSE 5
100    BEEP 2000,7 : PAUSE 5 : REMARK attention-getting tones
110    error# = PEEK_L(PEEK_L(16383)) + 255
120    SELECT ON error#
130        = -10
140            PRINT 'Error! You have attempted to divide by zero.'
150            carry_on
160            POKe_w(PEEK_L(16383)) + 255,270
170            RETRY
180        = -14
190            PRINT 'Format FAILED!'
200            carry_on
210            POKe_w(PEEK_L(16383)) + 255,270
220            RETRY
230    END SELECT
240 END WHEN
250 DEFINE PROCEDURE carry_on : REMARK A Simple Wait Routine
260     PRINT 'Press any key to continue...'
270     PAUSE : REMARK infinite wait
280 END DEFINE carry_on
290 CLS
300 PRINT 'Error in Division Demonstration'
310 PRINT
320 INPUT 'Enter Divisor: 'divisor
330 INPUT 'Enter Dividend: 'dividend
340 quotient = dividend / divisor
350 PRINT 'The result is 'quotient
360 carry_on
370 CLS : PRINT 'Failed Format Demonstration'
380 PRINT : PRINT 'This next section recovers from a failed
    format.'
390 PRINT 'If you see this section in earnest, you will need a'
400 PRINT 'blank micro-cartridge (or diskette).'
410 PRINT
420 PRINT 'Do you wish to format a cartridge? (y/n)'
430 REPEAT choice
440     a$ = INKEY$
450     IF a$ == 'y'
460         PRINT 'Place a blank cartridge in adv1_' : REMARK for
            fip1_
470         carry_on
480         FORMAT adv1_teststart : REMARK for FORMAT fip1_
490     END IF
500     IF a$ == 'n' : EXIT choice
510 END REPEAT choice
520 CLS
530 PRINT 'Congratulations! You are now a Master Error-Trapper.'
540 PRINT 'We are declaring "open season" on wild errors, so'
550 PRINT 'go trap as many as you can.'
560 STOP

```



anta's Dilemma



David Nowotnik
presents ZX's special
Christmas game which
can be played on any
model of the Spectrum
or a QL.

Santa Claus is just about to leave his Grotto on Christmas Eve to deliver Christmas presents when, to his horror, he finds that someone has left open the gates to his reindeer pen. All the reindeer have got out, and escaped into the forest. He has to recover six of them to enable him to get underway to deliver his presents.

Using the cursor keys (5,6,7,8 on the Spectrum) you have to guide Santa around the forest. Reindeer are quite timid beasts, and they will move away from Santa when he stands next to them. In this way he must guide them one at a time to the entrance of the reindeer pen. At the base of the screen is a counter which tells you the number of presents which Santa has time to deliver. Naturally this is your 'score' the more you get, the more children will receive their presents, and the better you'll feel!

Fig 1 contains the listing for the Spectrum, and Fig 2 has the listing for the QL. The two programs are strictly identical in operation, so anyone keen to compare Spectrum and QL styles should find this a good example. The QL program will ask you if you want a different game at the end, but with the Spectrum version you have to quit again in a repeat game.

UDGs:

Both programs use user defined graphics. On the Spectrum, you'll have to be careful to enter certain characters in graphics mode to provide you with the correct UDGs. These characters should appear

slightly darker in the listing, to show they aren't too clear; these characters appear in lines 520,560,570,580,590, and 1870. QL users need not be so cautious, as there are no similar traps. If you haven't met UDGs on the QL before, then glance at lines 250 to 380, where they are created and installed.

There are 16 reindeer altogether, so you have a reasonable chance of retrieving the most accessible

reindeer if you want to make the game easier, or more difficult. You change the number of reindeer or trees in lines 1420 and 1620 of the Spectrum listing, or 1660 and 1760 of the QL listing.

To accompany the game, there is a seasonal tune, which shows what can be done with the limited BEP command. It also expresses a seasonal greeting from everyone at ZX Computing Monthly to all our readers.

Fig. 1 Spectrum Listing

```

100 REM ***** Christmas *****
110 REM BY DAVID NOWOTNIK
120 REM December 1986
130 REM
140 REM *****
150 REM *****
160 REM *****
170 REM *****
180 REM *****
190 REM *****
200 REM *****
210 REM *****
220 REM *****
230 REM *****
240 REM *****
250 REM *****
260 REM *****
270 REM *****
280 REM *****
290 REM *****
300 REM *****
310 REM *****
320 REM *****
330 REM *****
340 REM *****
350 REM *****
360 REM *****
370 REM *****
380 REM *****
390 REM *****
400 REM *****
410 REM *****
420 REM *****
430 REM *****
440 REM *****
450 REM *****
460 REM *****
470 REM *****
480 REM *****
490 REM *****
500 REM *****
510 REM *****
520 REM *****
530 REM *****
540 REM *****
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560 REM *****
570 REM *****
580 REM *****
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610 REM *****
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660 REM *****
670 REM *****
680 REM *****
690 REM *****
700 REM *****
710 REM *****
720 REM *****
730 REM *****
740 REM *****
750 REM *****
760 REM *****
770 REM *****
780 REM *****
790 REM *****
800 REM *****
810 REM *****
820 REM *****
830 REM *****
840 REM *****
850 REM *****
860 REM *****
870 REM *****
880 REM *****
890 REM *****
900 REM *****
910 REM *****
920 REM *****
930 REM *****
940 REM *****
950 REM *****
960 REM *****
970 REM *****
980 REM *****
990 REM *****
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QL COLUMN

Brian Beckett looks for signs of life in the QL at the recent ZX Microfair.

Well, we've finally had another ZX Microfair and there were a lot more QLs in sight than there were at the PCW show. Looking around the various exhibit rooms (there held 9 in Westminster, Central Hall this time), the place was a honeycomb of little rooms filled with crowds of news-hungry Sinclair lovers who wouldn't have known that the QL is officially dead unless you dug deep and asked the right questions.

All our old favourite suppliers were there and a couple of new ones to boot. But underneath all the bustle and good cheer, nobody had an optimistic word to say about the QL's long-term future and it was a bit like having polite sociability around the bedside of a terminally ill patient who has just been given a revised estimate by his medical staff.

The French software house Pyramide was there and exhibited some interesting looking products. I got a QL cryptographic package Pyramid has just released for £12 but there seems to be a tricky feature which exposes the program every time I try to encrypt anything. I suspect that I was the lucky one who drew the buggy microcassette but maybe it's really an ultra-security feature in the program which just won't let the user encrypt anything and thereby achieve the world's first, absolutely unbreakable cipher system.

Those crafty West Germans I mentioned last month have fooled me and got Digital Precision to handle their QL, mouse and desktop software and thereby confounded my prediction that their admittedly excellent package wouldn't be much of a challenge to Intimate my own, home-grown Silensoft mouse and ICE software. Now it looks like a definite two-horse race and it's difficult to pick the winner. The German package

includes Giga-MISC which includes some mouse functions and adds over 70 commands to Superbasic including graphical, print-out menus, multi-tasking and game functions. The whole package costs around £95 and looks well worth considering if you happen to want a nice WIMP environment to give your QL for Christmas.

As for Silensoft itself, they've put themselves into CDT's new, open QL. Their \$400 megaword is a big way and are distributing the machine and its best genuine business software. Their computers were displayed all over the place and (according to company spokesmen) orders are flowing in at a rate heretofore unknown in the recorded history of man. Forgetting all the hype talk, the machine does look to be doing reasonably well and rather better than GBT did expected but Anstet may yet jump in and try to stop GBT from marketing what is actually a QL circuit board in a new box with loads of added IBM-like features designed to make you think you're a "real" PC owner. It's a good looking machine but very expensive for those of us who grew up on Sinclair price lists and nobody — least of all GBT — seems to know what's going to happen when that old supply of QL boards runs out.

Sandy are promoting a new QL-compatible board due for launch sometime soon after or maybe a bit later. The Specs look good with at least 128K RAM and at least one (but maybe two) 5.5 disc drive and lots of other goodies. Tony Tobby and Gump are still working on the design so the QL (supposedly standing for "Quality" and not "QL" but I think the initials are just a little more than coincidence) won't be around for a while and the price isn't certain. About £300 is the current guess for 128K and one disc drive with all the expansions costing as yet undetermined amounts on top. On paper it looks pretty good and will certainly give the liver a run for its money but,

pragmatically speaking, the fact is that right now and that's a pretty good sales edge to go with.

Saga Systems has dropped its plans for a stylish QL keyboard on the lines of what the company produces for the Spectrum. This is a real pity as the keyboard was elegant and really gave Sinclair's old black boxes a professional feel, even though the company's best range might be a shade pricier for the average home computer buyer.

The company has had a lot of queries about their QL board (largely due to your friend, correspondent's column in this even-so-readable mag) and I got the feeling that a few more columns might just make Saga try for a small run. Otherwise the attitude is an obvious reaction to the QL's recent demise and marketing a new keyboard for a "dead" computer didn't seem to make a lot of business sense. Give Saga a ring if you have an extra £150 to spend on a keyboard and you might just add enough weight to a small supply coming on-stream after all.

There's some good news for QL games players. Microdeal (who brought you that last month night newsletter) has got at least one more QL game in its stable which should be coming out around Christmas. There's a business strategy game available but as yet not fully marketed from Alexander Wayne of Quanta. It's called Ambition and is for up to four players and you can get information from Quanta or Core Electronics. A stack of nine plans to have been it on the list go but he's always been known to exaggerate and, from what I've seen, Ambition is well worth looking at. Besides my note may be as, as yet undiscovered, commercial genius. However this would not seem to be affected in his bare balance and we shouldn't rely on his word alone. The QL has always needed high quality games and I think it's a shame that something like Ambition didn't come along earlier.

THE SPECTRUM'S SECRET CODES

BY CHARLES BARNON



■ If you own both a Spectrum and a printer, especially a dot-matrix printer, you may well be tempted to try something more exciting than using the printer for listings. On the other hand, getting it to produce its range of variations (italics, double width, condensed, subscript, underlining and all the rest) might seem like a lot of fuss and

bother. All those italicize codes to be fed in, the problems of remembering which codes do what and which need to be preceded by the ESC code and what on earth is an ESC code anyway?

Well, it may not be such a problem as it seems at first because the Spectrum does in fact have built-in single key commands for a great many printer functions — though you won't find this mentioned in the Spectrum manual or indeed in any of the printer manuals that I have seen.

Codes

To understand how it comes about that these codes are available it is necessary to understand a little about how the computer communicates with a full-size printer. When you press, for example, the key marked "a", the message that this sends to the printer is, of course, intelligible. In decimal,

the code for "a" is 97, and if you enter PRINT CHR\$ 97 at the keyboard the screen will show the letter "a".

Your printer, by good fortune, or foresight, also recognises code 97 as a request for the letter "a". Dot-matrix machines will obediently arrange their little pins into the shape of an "a" and dot-matrix machines will decide their wheels until "a" is under the hammer. Unless there were some agreement about a standard set of codes, we should always have to use a printer of the same make as our computer. Fortunately,

manufacturers have agreed on standard codes for most of the alphanumeric characters we need; you may have seen references to the ASCII character set. This has come to be accepted as the international standard but it covers only the codes from 32 to 127. The available range on the Spectrum is from 0 to 255 and it uses almost all of these for one purpose or another. So, possibly, does your printer (but they may not agree about the meaning of the codes outside the ASCII range. This is where confusion begins — but if you know what you're doing you can take advantage of it).

ESC

For example, you may have found difficulty in printing the symbol "£" on a full-size printer. This is because the "£" in ASCII stands for American, so there is a standard code for the American dollar sign, but not for the pound sign. The Spectrum uses code 93 for the pound, that means something different to most printers. On the common machines, letters and figures, for example, if coming out as a single inverted comma, to print "£", therefore, you have to find out what code your printer uses for it. On a British it is code 120, on French it is code 93. Your printer manual should have a list of all the codes it uses and what it uses them for. The Spectrum's vocabulary of codes is printed out in full in Appendix A of the manual.

Interfaces

Before we continue a word about Spectrum interfaces. The Spectrum uses codes to represent keywords and nearly

TABLE 1

KEYCODE	CODE	Result on the Spectrum screen	Result on normal code on the screen	Result to interface code on screen
Backspace key	128	DEL		1
1	129	1		2
2	130	2		3
3	131	3		4
4	132	4		5
5	133	5		6
6	134	6		7
7	135	DEL		8
8	136	BACKSPACE	DEL	9
9	137	BACKSPACE	BACKSPACE	10
10	138	NEW LINE	NEW LINE	11
11	139	VERTICAL TAB	VERTICAL TAB	12
12	140	FORM FEED	FORM FEED	13
13	141	CONDENSED PRINT	CONDENSED PRINT	14
14	142	DOUBLE WIDTH	DOUBLE WIDTH	15
15	143	DOUBLE WIDTH	DOUBLE WIDTH	16
16	144	ITALICISE PRINT	ITALICISE PRINT	17
17	145			18
18	146	ESC code	ESC code	19
19	147			20
20	148			21
21	149			22
22	150			23
23	151			24
24	152			25
25	153			26
26	154			27
27	155			28
28	156	ESC control code	ESC control code	29
29	157			30
30	158			31
31	159			32
32	160	SPACE	SPACE	33
33	161			34
34	162			35
35	163			36
36	164			37



FIGURE 2 Useful built-in codes.

SESSION GRAPHICS MODE.

SHIFTED GRAPHICS KEY	4	■
	3	■
	2	■
	1	■
	0	■
LOG LETTER	A	◊
	B	◊
	C	◊
	D	◊
	E	◊
	F	◊
	G	◊

all interfaces include software to decode and print these by intercepting them before they get to the printer.

Some interfaces also allow an option to ignore this decoding system to allow control codes to be sent. Make sure that you set up the interface to operate in this manner (eg. **PRINT CHRS 5** **DISPATCH** Centronics E, use **COPY REM CHRS 5** interface **MSX2**, use **FORMAT** **TP** Teletype). Or **POST** software so that the Sinclair tokens are OFF (see individual instructions) or else the following will not work.

So far so good. We can now **PRINT "I"** by sending **CHRS 129** to a printer or **CHRS 35** to an Epson. Instead of the keyboard's **I** sign (You will, of course, have to go outside the inserted commas to do so) but — hang on a minute. The printer uses these codes to print the **I** sign, but the Spectrum uses them as well, as a glance at the manual reveals. It uses code 129 for the graphics symbol on key 1, and it uses code 35 for the hash sign. So you can avoid coming out of inserted commas when you need the pound sign by sending instead either graphics key 1 or hash, whichever suits your printer.

Now a whole new world opens up. All those graphics keys on the Spectrum, which we know control send the block graphics to a printer, are hiding commands which the printer will understand but for a different set of purposes. And there are a lot of them: eight graphics keys unshifted, the same eight shifted, and the LOG letters, or to be remember that the printer not only translates codes into letters and figures or symbols, it also uses them as commands for all its functions such as carriage return, new line, condensed

print, italics, alternative fonts and whatever else your particular printer may offer. If it can do it, there must be a code to tell it to do it. For all the printers of the Spectrum almost all of the functions can be called from the Spectrum's graphics keys and this represents a very real convenience — as well as saving a lot of wear and tear on your typing finger tips.



To type a word in italics usually requires something like this:

PRINT "This is an " CHRS 27; CHRS 10; "Italics "; CHRS 27; CHRS 10; "word".

But using the hidden codes is much easier. Graphics 1 is the ESC code key — equivalent to **CHRS 27**. This reduces the action to:

PRINT "This is an g 4 Italics g 5 word".

No need to interrupt the sentence flow by coming out of inserted commas. Needless to say, the printer doesn't print anything for the graphics keys nor for the ordinary numbers 4 and 5 which are the equivalent of **CHRS 27** and **CHRS 35** in the last example.

Sinclair codes

You may have to do a little work to compare your printer codes

with the Sinclair codes to find out what will be useful. There are 27 readable codes on the keyboard but not all of them are useful. In fact the most efficient way of getting a space, for example, however, some are interesting, some are fun, and some are very useful indeed. You can probably get a solid black square, for instance, and many printers include a heart, club, diamond and spade or characters just waiting to be used.

Fig 1 shows all the Sinclair codes and what they mean to two typical dot-matrix printers. Fig 2 lists those I find most useful, and I have these on an overlay for my own keyboard. Fig 3 is the listing for a short program that will find out what your printer use of the codes is if your manual keeps it a secret or has been eaten by the cat.

Owners of Epson printers will find that they have a choice of two sets of reactions to the 'insert' codes. In normal mode they will carry out control functions on codes 128-143, 146 and 148 with ESC code on 155 (which is still **I**), but in GDS mode for operating under command **I** the Epson have a range of graphics symbols which are called by the graphics keys. These are shown in Fig 1. These are so useful that they ought to be written on a keyboard overlay.

The Minerva does not have a choice of modes in this way, instead it gives a mixture of controls and symbols in response to the graphics keys (codes 128-144).

Daisy, daisy

But what of dot-matrix printers? Most of the information has been relevant to dot matrix machines, naturally enough, since they offer the widest range of functions, allowing you to select numerous text-face styles as well as graphics symbols. These are not possible on the dot-matrix printer limited to one typeface at a time but these printers do respond to the same kinds of codes for the functions that they do have. All will give line feed and form feed, for example, and most have other formatting functions such as left, back space, margin set and line down.

Some of the dot-matrix printers also have useful instructions for bold type, shadow type and, of course, graphics underlining. Check the printer manual for the codes which have these effects and, again, like the owners of dot-matrix printers, you should be able to send commands embedded in text with the use of graphics characters. Do not despair just because the printer

```

CODE NO. 142 has this 0 to say for itself.
CODE NO. 143 has this 1 to say for itself.
CODE NO. 144 has this 2 to say for itself.
CODE NO. 145 has this 3 to say for itself.
CODE NO. 146 has this 4 to say for itself.
CODE NO. 147 has this 5 to say for itself.
CODE NO. 148 has this 6 to say for itself.
CODE NO. 149 has this 7 to say for itself.
CODE NO. 150 has this 8 to say for itself.
CODE NO. 151 has this 9 to say for itself.
CODE NO. 152 has this + to say for itself.
CODE NO. 153 has this = to say for itself.
CODE NO. 154 has this - to say for itself.
CODE NO. 155 has this * to say for itself.
CODE NO. 156 has this / to say for itself.
CODE NO. 157 has this % to say for itself.
CODE NO. 158 has this ^ to say for itself.
CODE NO. 159 has this & to say for itself.
CODE NO. 160 has this ' to say for itself.
CODE NO. 161 has this " to say for itself.
CODE NO. 162 has this # to say for itself.
CODE NO. 163 has this $ to say for itself.
CODE NO. 164 has this % to say for itself.

```



Fig. 3. SHIMM printer.

manual has no information — or even if the manual gives the useful codes as very few ones, such as 10 or 11. Normally you can add 128 on to these codes, bringing them within the range used by the Spectrum for its graphics and these should still work, even though not mentioned in the manual. In other words, code 12 will give the Line Feed command but you cannot expect that it will add 128, that gives code 128 which is also a Line Feed command accepted by most printers and so the Spectrum if it is supplied by graphics shifted 1.

If the command reads ESC, fine, then that can be suggested for dot-matrix printers, too by typing graphics on, followed by the appropriate code letter or number. This should open up a whole gamut of commands for your printer — changing pitch, changing vertical movement, size, font, vertical and horizontal, margin position and whatever else your machine is capable of. If the printer manual isn't helpful, even if the program that accompanies this article, you may discover something useful and at least you'll do no harm to your printer or to the

Spectrum.

Of course it may well be that you do most of your printing through the medium of a word-processing package such as the superb **MSWORD TWO** which provides keyboard selection of most of the functions we've been speaking about. But there will be times when a package like this cannot cope with your printing needs and the Spectrum's secret codes will come into their own. For example, **MSWORD** can't print a 1 sign with my printer and it can't give a printout of more than 40 characters per line. It can't drop into dot graphics. It can't use tab positions, backspace, overprint or accept a loop instruction to print out several copies. All of these can be provided by the Spectrum/printer combination without word-processing software. There is a disadvantage — your screen gives you little idea of what the printer will do. When do you reach the end of a line, for example? Fig 4 provides a very basic program which overcomes the problem. It allows you to select the length of line you need and it will then provide a New Line command

whenever necessary with the added bonus that it won't put a word in two. If the last word in the line is too long the program will shift it to the next line instead. All the "secret" codes are profitable, including Line Feed if you want to override the program.

Finally, if you have tried all these suggestions and are still making no progress, try using all the **ASCII** and **ISO** keywords on the keyboard as printer commands. Most of them will have some effect, often duplicating other functions. Try this.

PRINT

Yes, that's all no invested command or anything. You'll probably be quite surprised — and we all will at first or 10. And if you all need a 1 sign to operate on **MSWORD** you could register one of the graphics key, as **MSWORD** allows you to do under option G, with code 129 or code 35. Of course, you'll lose the function already provided by that key, but decide which one you can best do without.

Abstract

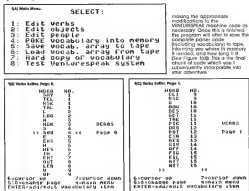
[illegible][illegible][illegible]

quite irrelevant. I should also point out that any observation you'd like the paper to accept (such as "H" for "H₂O") must be entered separately as a synonym in its own right — there are plenty of examples of this in Boxes 9(d) and 10(c).

the authors are becoming used to the return to the main point, particularly in the concluding sections 2 and 3. You find that this method of ordering entries to the "people" and "places" vocabulary list is just the same. It's coming out only first for the word, then for the number whenever you press ENTER. You don't have to worry about making illegal entries by mistake - the editor is very extensively error-checked and it should be virtually impossible to crash it by accident.

What about those other options on the main menu? Option 4 (FOOL vocabulary) does require a little explanation for you, in one of the 3 "dail" modes. If you're actually doing is manipulating the contents of a temporary file — in fact it's a BASIC program! When you're happy that all the vocabulary you need has been added, selecting option 4 copies the entire FOOL word vocabulary into memory space BASIC.

Figure 1 - sample screens from the editor.



making the appropriate modifications to the Venturespeak response code as necessary. Once this is finished, the program will offer to save the complete parser code (including vocabulary) to tape, informing you where in memory it's saved, and how long it'll live (see Figure 10b). This is the final chunk of code which you'll subsequently incorporate into your adventure.

POKEing vocabulary bytes

61354 255

Vocabulary stored from
61150 to 61354 inclusive

PRESS "Q" TO RETURN TO MENU OR
ANY OTHER KEY TO SAVE COMPLETE
PARSER PLUS VOCABULARY
(1355 bytes starting at 60000)

Files

Options 5 and 6 on the main menu improve the flexibility of the editor program, allowing you to save and load the temporary vocabulary file V60 to and from tape. Suppose, for example, that you've just spent a session entering vocables, but wish to stop and continue some other time. All you need to do is save what you've done so far using option 5 and then load it back into the editor at the start of your next session, using option 6. Actually, I strongly recommend that you save the temporary file as well as the completed code even when you think you're finished, just as a matter of course. The reason for this is that when you come to play-test your adventure game eventually, you'll almost certain to want to make additions or modifications to the vocabulary at some stage — and there's no way of modifying the code itself from within the editor. However, if you've saved the temporary array there's no problem. Just load it into the editor using option 6, make your amendments, and then generate a fresh batch of code using option 4 to replace the old one. Of the other options on the



Rory Elder presents a complete game plus news from the last bastion of the ZX81.

This month we have a couple of contacts for all of you who are holding fast to the joys of Z80ing, and the first is from that established and trusted company Andon Computer Ventures who are probably best known by their MATHS, H12 and Dissembler programs.

They sent us a four page typed 'catalogue' of their wares which includes the aforementioned page plus a copy of their double game tape called *Therion, Junior & Helmut* at £4.99.

I had a look at it and although looking in sophistication when compared with the state of the art games around for other machines it nevertheless proved to be an enjoyable and very playable game for the old Sinclair Dinosaurs.

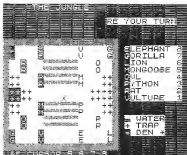
ACV also run a Z801 club called ALC (Andon Z801 Users Club) which is good news for one of you deprived Z801s. To obtain more details, contact them at 1 Foxwell Avenue, Southfields, Northampton, NN6 5AT.

And theres more...

Two enterprising shops from Scotland have produced two games for the old Z1, both featuring the Hellen type screens that had been starting to appear before most companies deserted to the Speccy.

Death Crush and *Dark Beverage* are both coverdcollect and dodge games and are very similar all round, the programming is cheap but the games themselves are quite enjoyable. At the height of the Z801's life they would have rated as average but now in the present climate of total decline they are unique.

Recommended to all Z801s and it may be worth sending any possible games for



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1190 GOTO 8800
1200 GOTO 8800
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marketing to these folks to encourage them to keep going. Available from Scott Colton & Steven McDonald, 22 Moyland Place, Manselburgh, E. Lothian, Scotland EH21 4JG.

Not only but also

Brian Hawley of 24 Beddons View Rd, Cloven, Newcastle, Seacroft, SAS, RU writes to:

Inform us of their club for life called the Computer Games Club and are offering a free games tape to new members.

We know nothing about them except for the label which says as it was produced on a ZX printer by a floppy running forward 3, and that they intend to keep users updated with the programs available, so drop em a line.

And finally

This month's program is a rather long (for our page) wholeboard game which should keep your fingers busy as you type it in until next month. It was programmed by Kevin Wright of Alexander and full instructions are included in the 1981

If watching the
televised Baseball
World Series has
whetted your appetite
for the real thing here's
your chance to win the
essential hardware.

COMPETITION

In conjunction with Advance Software ZX is giving five readers the opportunity to get equipped for baseball action. There are five sets of a baseball bat, pitcher's glove and hardball up for grabs in this competition that should prove a pinch for baseball aficionados.

All you have to do is answer the three questions below and fill out the coupon on this page. Please remember to put our address on the outside of your envelope, but if the idea of all this strenuous exercise (playing baseball, not filling in the coupon) doesn't appeal, there is always Advance Software's Master Hit styled Baseball simulation. Hardball for armchair athletes.

STRIKE LUCKY



The Questions

- 1) New York has two famous baseball teams. One is the New York Mets. Can you name the other one?
- 2) Which two teams contested the 1968 Baseball World Series?
- 3) How old Marlin Marace married a legendary American baseball player. Can you name him?

The competition is open to all readers of ZX except employees of Argus Specialist Publications, Advance Software and Choice City. The editor's decision is final and no correspondence can be entered into.

Send your entries to: **Baseball Competition, ZX Computing Monthly, No 1 Golden Square, London W1R 3AB.** The closing date is January 9th 1987.

Baseball Competition The answers to the questions are

1. The New York Yankees
2. The Boston Red Sox and the St. Louis Cardinals
3. 1962. He married the legendary American baseball player, Tom Seaver.

Name: _____

Address: _____

Send to: **Baseball Competition, ZX Computing Monthly, No 1 Golden Square, London W1R 3AB.**



Welcome to

With so many games now being created by teams, the solo programmer is becoming a rarity. ZX sought out Pete Cooke, author of *Tou Get!*, who is now working in splendid isolation on the sequel to be called *Academy*.

Peterson: Nobody knew more about the risks of the computer games market than the professional programmer who works entirely alone. For Pete Cooke, writing *Academy* the follow up to *Tou Get!* has represented five months of sustained effort and he won't know whether it's all been worthwhile until the game playing public has decided its commercial fate.

Worse still perhaps is the prospect of finding that even after months of programming, a game may be simply unplayable.

"You have to be extremely careful as a freelance programmer" said Pete. "If



you've taken months to produce a game and it doesn't work then you are simply not going to be able to sell. I've never had a project that has crashed on me but it must be a devastating experience to find all that time has been eaten up for nothing."

Despite the risks Pete prefers working on his own. Being in total control has its complications. "I've always worked on my own and I like it that way. You can work your own hours and there are no distractions. I

can't imagine working in the same room as a group of programmers. I'd find it impossible to concentrate."

Formerly a maths teacher, Pete got into programming via a terrorist route. "When the *20th Century* said I knew I had to get one so I answered one of those tiny adverts. The first one I got didn't work but the second one did and things took off from there."

After writing several games including a couple of adventures Pete attracted attention with the critically acclaimed *Tou Get! Academy* is a game in that same vein but could be considered as a 'sequel' rather than a sequel.

Skimming

"In *Academy* you are training to be a skimmer pilot and undertake missions similar to that of *Tou Get!*. In order to pass your training you must complete 20 different missions. These will be located in blocks of four. The missions rise in difficulty the further you progress and you control different planetary conditions and various enemies on each outing. Really it's like training 20 games in one."

Each mission may require a different kind of skimmer so apart from three skimmers which are equipped and ready to go there are three additional ships which can be designed to your



the Academy

specifications, as well as choosing which equipment you want there is also a schematic ship designer so that using a cursor and pull-down menu's you can place all the instruments as you want them in the cockpit console.

As soon as your mission has been completed you are presented with your table of scores and you need an average score of 70% to progress to the next level. There are two levels and since you've completed the last there's the chance to go back to the first level and increase your average score.

"One idea for the future is to select a master designer or perhaps produce a batch of relations that can be incorporated into the game."

Field expertise has progressed since Lou Cell and there are a number of subdisciplines:

"There's a lot more to do, it's faster and the graphics include a lot more shading. In *Low Carb* there were two shades; now there are four of which these don't see used at only one time so everything is more detailed. There is more tilt to how objects are sketched and of course now you can design your own. The program can deal with a lot more missions than before and there are a lot more objects and movement in the planet itself." *continued*

Preparing a game as complex as *Age of Empires* presents its own special problems. "The most difficult thing is keeping the whole structure together so that everything interlocks properly. There are dozens of logs and each shape has 50 bits of information attached to it and you have to keep track of it all and make sure it all interlocks!"

Abstract

When designing a game, designers all with either a technical problem to solve or an object of a system bridge the words to create.

"You felt evolved from wanting to create abstract objects and shapes. Once that had been established there were already limitations to work within. The techniques I wanted to try dictated that the game would have to be set on a planet surface."



Once the basic idea is set, the next major decision is the size of the display: "If you decide on a large screen display you are going to have to settle for slower processing as there is a larger overhead for each screen copy. If you look at something games for instance they have a smaller screen to prevent taking up too much time with processing."

"With the screen display all you can think about how much memory you have to play around with presentation. It's only at this stage that you can assess whether you can go for fancy menus and pointers."

Arguing strands of rope is not a skill recent without dedication and Fife has this. Others, not so much.

programmers. "Get some good books on programming, other than the WPI perseverance. My bible was Rodney Johnson's book, *Programming the 286*. Had almost any book on 286 assembly will be of benefit. To get to grips with handling inputs & outputs you have to see the documentation — you can't do that just by looking at someone else's program."

Games by Kate Cooke
Invisible Island
Urban Sports
Intern
Up a Gumtree
Isi Star
Augment
Isi Star
Isi Star





After this has been set up either in a program or by running it, you enable the screen to flash by typing or using RANDOZMI. Use G0000 using it a second time reveals the screen to normal.

Next is a short routine to enable someone to enter a word without it being displayed, useful for entering a password or for two player games when the entry needs to be secret.

**POKE 23409,255: POKE 23454,0:
INPUT @: POKE 23449,@:
GOTO 7**

If you require a different border colour during input then change the POKE 23454,0 to POKE 23454,colour required, and alter the BORDER colour

Screen suite

David Knight is another regular code suite, and has supplied us with a suite of, not one, but eight useful routines for screen manipulation.

These are all stored in the printer buffer and are set up as user defined functions in lines 1 to 8. Then the program asks for 0, if all is well then asks if what the program prompts you and delete lines 40 to 160 before saving the PM lines 1 to 8.

To use it in your own programs, LOAD in the code and merge in the PM lines by including a line **LOAD "PM CODE"CODE:MERGE** the two sets of code must of course be on the tape after the main

program, but what do they do? 1 PM plot — This function gives the address of any pixel currently accessible by the BASIC ROM; connected, it returns a number between 0 and 7.

2 PM up — To call use RANDOZMI PM up, and this command is used to wipe only the characters with the current colour without affecting the rest of the screen.

3 PM up — A rather more complex routine and only of use to those who are experienced programmers, it swaps between four banks of ROM previously set up by the user. Called by RANDOZMI PM up, it represents the UDG bank number from 1 to 4.

4 PM upaddress — This function reflects the characters pointed to by the address, i.e. to reflect UDG graphic R use RANDOZMI PM upaddress.

5 (M address) — Reflect horizontally.

6 (M address) — Reflect vertically.

7 (M address) — Reflect antidiagonally.

8 (M address) — Insert character.

When I'm 64

Ian Stragrod from Manchester presents a simple way of producing 64 characters to a line type in the listing and SAVE the code to tape when prompted. The code is completely reconfigurable and can be added to a program by including the line **CALL address—LOAD " " G0000 address**.

The code is 164 bytes long and uses the UDG character U to give it the variable it is reserved and should be set in the first line of our program to the maximum length of the message you will send (255).

by a GIM statement. This is because it must be the first in the variables area of the computer (i.e. line 1 GIM 1627).

Before calling the 64 print code you have to set up all by filling it with the data required in the format **LET x=CHEE** **x=CHEE** y="text" is the printed (GHEE) 038.

x is a value between 0 and 63 and is the horizontal coordinate. y is a value between 0 and 24 and is the vertical coordinate.

Finally you include a line **PRINT AT 0,0,64 anyvariable** address to print it.

```
10 LET A$="" : B$=0:FOR I=0 TO 255
20 FOR J=0 TO 255:PRINT A$;B$;:GOTO 30
30 PRINT A$;B$;:PRINT A$;B$;:GOTO 30
40 B$=A$+A$ : A$=B$+B$ : GOTO 30
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50 LET A$=A$+A$ : B$=B$+B$ : GOTO 30
60 A$=A$+A$ : B$=B$+B$ : GOTO 30
70 A$=A$+A$ : B$=B$+B$ : GOTO 30
80 A$=A$+A$ : B$=B$+B$ : GOTO 30
90 A$=A$+A$ : B$=B$+B$ : GOTO 30
100 A$=A$+A$ : B$=B$+B$ : GOTO 30
110 A$=A$+A$ : B$=B$+B$ : GOTO 30
120 A$=A$+A$ : B$=B$+B$ : GOTO 30
130 A$=A$+A$ : B$=B$+B$ : GOTO 30
140 A$=A$+A$ : B$=B$+B$ : GOTO 30
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160 A$=A$+A$ : B$=B$+B$ : GOTO 30
170 A$=A$+A$ : B$=B$+B$ : GOTO 30
180 A$=A$+A$ : B$=B$+B$ : GOTO 30
190 A$=A$+A$ : B$=B$+B$ : GOTO 30
200 A$=A$+A$ : B$=B$+B$ : GOTO 30
210 A$=A$+A$ : B$=B$+B$ : GOTO 30
220 A$=A$+A$ : B$=B$+B$ : GOTO 30
230 A$=A$+A$ : B$=B$+B$ : GOTO 30
240 A$=A$+A$ : B$=B$+B$ : GOTO 30
250 A$=A$+A$ : B$=B$+B$ : GOTO 30
260 A$=A$+A$ : B$=B$+B$ : GOTO 30
270 A$=A$+A$ : B$=B$+B$ : GOTO 30
280 A$=A$+A$ : B$=B$+B$ : GOTO 30
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990 LET A$=A$+A$ : B$=B$+B$ : GOTO 30
1000 LET A$=A$+A$ : B$=B$+B$ : GOTO 30
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41 LET A$=A$+A$ : B$=B$+B$ : GOTO 30
42 LET A$=A$+A$ : B$=B$+B$ : GOTO 30
43 FOR N=1 TO LEN A$ STEP 2
44 LET H=CODE A$(N) : GOTO 45 IF N=1
45 LET A$(N)=A$(N)+A$(N) : GOTO 46 IF N=1
46 LET A$(N)=A$(N)+A$(N) : GOTO 47 IF N=1
47 LET A$(N)=A$(N)+A$(N) : GOTO 48 IF N=1
48 LET A$(N)=A$(N)+A$(N) : GOTO 49 IF N=1
49 LET A$(N)=A$(N)+A$(N) : GOTO 50 IF N=1
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CROSSFIRE

Could this be the end of the Dot-Crawl? A potential solution plus much more in this month's postbag.

Opus Discovery/ Microdrive



I am afraid I cannot help your correspondent Post-Craig with his problems with *Opus* and *Opus*, but wonder whether anyone else can help me with similar problems? There must be a lot of us about I have often understood of programming and the revision of machine code makes me shudder!

My son is using *Opus* programs, but creating them and my time is money.

I have a need to store a large number of addresses, translated into only a few categories, and *Opus* Address Manager is like a glove especially on the parking space it can be translated to *Microdrive*. Is the *Opus* manual, until the loading and starting of files should be much easier than from tapes. Just the job I transferred to *Opus*, and set up a short dummy file to test *MS-DOS*. It flashes, but takes I not present! Is this the same problem occurs using *Opus* to transfer to *Opus* *MS-DOS*?

For some sort of problem occurs with data drive, which I was given as a present and which I have used on problems. Here I have accessed an apparently successful routine and added an extra line of data to add but leaving data from data results in an error message (*NO-FILE*).

The publisher of *Opus* (Opus) tell me the problem is a combination with *Microdrive* but not *Opus* and *Opus* but use it has something to do with *Opus* *Opus*. Now I can talk with the person.

Although these problems do not affect the result from the *Opus* discovery which I consider that great generally I am a little relieved that the device that *Opus* is supposed to cope with is not a problem. In reality there are many in the *Opus* system should be able to also in reality the same way (*Opus* manual/page 10) doesn't make up to expectations.

Can anyone out there help me to find?

IGNYON, Chester

Dot-Crawl



I have found a way of removing the dot-crawl signal which degraded the picture in my son's using a *Microdrive* TV or video. I had spent in a negative some time ago resolved that adding a capacitor to the *Opus* video circuitry would off the dot-crawl signal. I found that this gave a very noisy display.

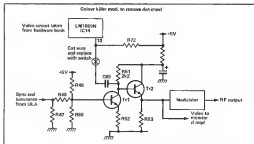
A better way is to simply disconnect the *Opus* video signal from the *Opus* main display. This can be done from the top of the *Opus* board (as you don't have to remove the board as yet as it is cutting in capacitor leg on the left hand side from display).

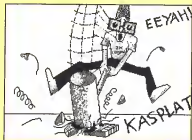
As the board is very close to the side of the case you can use a sub-miniature toggle switch (which has no long wires) to either you to switch the video signal on and off.

If you do this, you will find there is not the dot-crawl or shimmering whenever all motion appears in different shades of grey. It also removes the *Opus* video without cross cross pattern which seemed to be just visible when using a monitor.

RA. Tipping, Swindon

Colour-killer mod. to remove dot-crawl





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1984



Crime is a disease. He's the cure.

A full-page background image of Sylvester Stallone as James Braddock in the movie Cobra. He is wearing a black tactical shirt, blue aviator sunglasses, and a black leather glove on his right hand. He is holding a black assault rifle with a red laser sight. The background is a blurred red and orange.

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