

THE ZX SPECTRUM ON YOUR PC

*Emulators,
utilities and more*

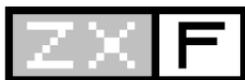


C. WOODCOCK

The ZX Spectrum on your PC

Emulators, utilities and more

C Woodcock



www.cwoodcock.co.uk/zxf

ZXF Magazine

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ZXF magazine delights in reporting on the achievements of the members of the Spectrum community and is indebted to them all for their efforts.

In particular, ZXF could not have achieved its current distribution without the hosting offered by Martijn van der Heide at www.worldofspectrum.org, whose own contribution to the Spectrum scene goes well beyond the easily measurable.

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for Jack

Preface

So you've finally realised. You think that new technology is great - of course you do - but ever since you packed away that old Spectrum in a box and taped up the lid something has most definitely been missing. At last you understand you were turning your back on more than just an obsolete computer. The good news is that you don't have to fish the box out from under the bed just yet (or lament its sale on ebay or at the local car boot): the Spectrum is one of the most emulated computers (if not *the* most emulated computer) on the planet and the quality of its emulation is just superb. Just about anything you used to do on your old Spectrum can now be done on a PC Spectrum emulator - *including* plugging in a cassette recorder to load your favourite games.

But where do you start? A search for "ZX Spectrum" on Google reveals well over a hundred thousand links, many of which - to even the most enthusiastic of returners - can appear to make absolutely no sense whatsoever. TZX? RZX? Snapshot? Chuntey? What's it all about?

Things have moved on since the days of "Start tape, then press any key." In this small book I hope to make these developments a little easier to digest. We'll start by assuming you to be completely new to the modern Spectrum scene and deal with the basics of emulation, then build things up from there. Although the book is written with complete beginners in mind I hope also that it will be useful to a variety of Spectrum

hobbyists at various stages of their ZX rehabilitation; if, like me, you've spent time lurking in the shadows of the *comp.sys.sinclair* newsgroup wondering whether your one little question will be screamed at for its ignorance/naivety/ten thousand references in the CSS FAQ, then I hope you'll find some answers here.

Have fun! That's what it's all about.

Colin Woodcock

Chapter One

Emulator basics

The aim of this chapter is to get you using an emulator to load and play games - just the way you used to on the real thing. So where do we start? There is an absolutely enormous number of emulators to choose from, the most complete list I know of being at www.worldofspectrum.org/emulators.html (currently I count well over 100 different emulators there across more than 20 different platforms).

Over the last few years we've seen PC Spectrum emulators make a very successful transition from DOS to Windows. 2002 to mid 2003 in particular was a fantastic period of both competition and collaboration between a number of the top emulator authors, during which standards were driven upwards a great deal in a very short space of time. Since I first wrote this introduction to Spectrum emulation in the summer of 2002 (as the first of a series of articles for ZXF magazine) there have been staggering improvements in many of the leading emulators. *Spectaculator*, for example, had only just added in support for the Spectrum 128 and +2 back then (versions 1 and 2 only emulated 48K Spectrums); *now* it supports the Spectrum +3 and +2A, the Russian *Pentagon* and *Scorpion* clones, emulation of ZX Microdrives, the ZX Printer, black and white TV screens (yes, really!) *and* it can now accept input from a cassette recorder plugged in to your PC's line-in socket in one direction and squirt out loading tones through the speaker socket to your genuine-article Spectrum in the other. And there's plenty more besides that as well!

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One consequence of this rate of change is that any attempt here to describe in too much detail the current state-of-the-art in emulation or to attach too much importance to the differences in existence between specific emulators today will render the book obsolete before the ink has had time to dry. The bells and whistles, and the drama of emulator development are, I'm sure, the details of the scene which you will delight in discovering all by yourself once you've got your head around the basics!

To make things simple therefore I'll concentrate on just two emulators for the most part of this book. Arguably the most comprehensive Windows Spectrum emulators about in any case, *Spectaculator* by Jonathan Needle and *SPIN* by Paul Dunn, Woody, Mark Boyd and Damien Guard were probably the two programs most responsible for a lot of the progress made in the period mentioned earlier. *Spectaculator* is shareware and a 30 day trial can be downloaded from www.spectaculator.com. *SPIN* is freeware and can be obtained from the WoS emulator page mentioned earlier on.

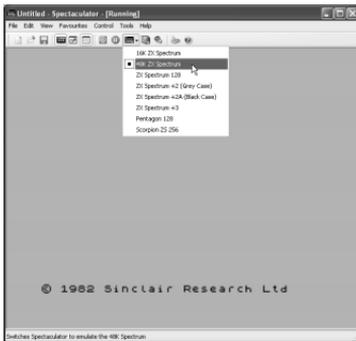
Virtual cassettes on your emulated Spectrum

Time to explain a bit about file formats. The Spectrum, of course, used cassette tape primarily as its storage medium. That's not to say that there weren't any other ways of saving and loading programs back then: the *Spectrum +3* had a built-in 3 inch disk drive, for example, and the original 48K Spectrum had a special *Microdrive* system developed for it by Sinclair Research. More on these later. There were also various add-on disk drive interfaces over the years that plugged in to the expansion connector on the back and allowed you to use standard 5.25 and 3.5 inch disk drives such as the *MGT Plus D* interface and the *Technology Research Ltd BETA* interface, and we'll look at these later on too. Despite these valiant attempts at bringing 'mass storage' to the Spectrum, however, cassette tape remained the firm favourite amongst Spectrum users, and this was the format that the vast majority of software for the machine was released on, right up to the last few commercial releases in 1993 (interestingly, a few new producers of commercial Spec-

Spectrum models (just in case you'd forgotten)

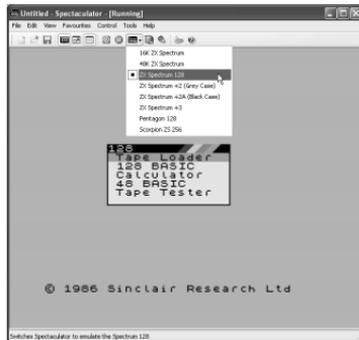
The original ZX Spectrum, with its quirky rubber keys, was released by *Sinclair Research Ltd* in 1982. This model initially came in two versions - one with 16K RAM and one with 48K RAM. The *Spectrum+*, which came out in 1984 was essentially the 48K machine with a slightly better keyboard and a redesigned case. The Spectrum and Spectrum+ are therefore identical as far as emulation is concerned and most emulators make no distinction between them - they're just referred to as 48K on the list of models to emulate.

The 16K and 48K Spectrums both display the famous "© 1982 Sinclair Research Ltd" message when switched on and both employ the single keystroke method of entering keywords in BASIC (for example, the letter J would display LOAD when pressed at the flashing K prompt).

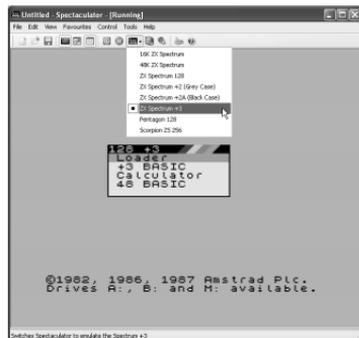


Shortly before its sale to *Amstrad Plc* in 1986, Sinclair released the *Spectrum+ 128*. Visually very similar to the Spectrum+ (Sinclair by this stage didn't have the money to develop a new case) this 128K RAM computer was distinguishable from its immediate predecessor by a black

metal heatsink down the right hand side which dissipated the heat generated by all the new memory chips. In addition to the extra memory, a 3 channel music chip was added in too. A simple menu system was introduced and the single keystroke system was abandoned in favour of a letter-by-letter approach.



The *Spectrum +2* was Amstrad's first 128K Spectrum and also released in 1986. A grey machine with a proper keyboard, this was the first Spectrum to incorporate a built-in tape deck. It was followed up in 1987 by the *Spectrum +3* - black, with a 3 inch disk drive built in, and the *Spectrum +2A* - a black version of the +2.



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trum software have sprung up in recent years and they too favour cassette tape, even now).

So most of your Spectrum memories are probably about games that you loaded from cassette: red, yellow and blue stripes, loading tones (some Spectrum users claim they can hear the tones even with the volume turned right down!) and - if you were unlucky - an 'R tape loading error' message. Any emulation of the 'Spectrum experience' just wouldn't be even approaching complete without including all of this palava!

Now here's the deal with cassettes: a Spectrum program stored on tape rarely consisted of a *single file*. Your typical Spectrum game, for example, would usually consist of *at least* three files: the BASIC loader would come first, followed by the loading screen usually and followed next by the main program code. So it's not just a question of loading individual files into your virtual Spectrum; the *whole tape* that contains the files has to be simulated if Spectrum emulators are to remain faithful to the original experience. This is where the file formats *.TZX* and *.TAP* come in (the former being a more recent formulation and more authentic than the latter). A TZX file is, effectively, a *virtual cassette* that contains all the individual files necessary for the game to run, and your emulated Spectrum accesses this in just the same way as your original Spectrum did, loading the BASIC loader first and so on. Most emulators now come with a 'virtual cassette player,' that allows you to play, stop and forward/rewind the virtual cassette; *Spectaculator* even includes a record button and the option to insert a 'blank tape' for your own programs to be recorded on.

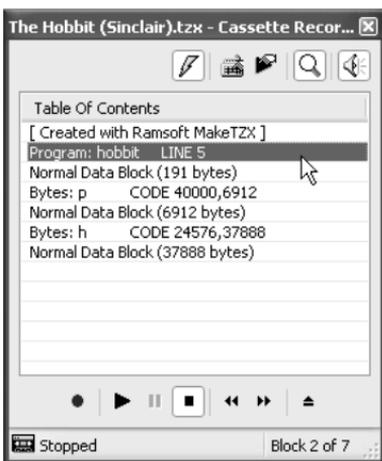
This book is primarily intended for people wanting to emulate their old Spectrum experiences on their Windows PC, but - as an aside - if you ever do decide to actually open that taped up old box in the attic and get out your *real* Spectrum to have a play on, you'll find yet another treat in store for you, courtesy of virtual cassette files and *Spectaculator*. Using the 'boost loading tones' option in the emulator and by running a lead from your PC's speaker out socket to your Spectrum's ear socket, you can load games from 'virtual' cassettes on your PC into your Spectrum just as though they were real cassettes - the Spectrum doesn't

The virtual Spectrum cassette

The BASIC loader. The purpose of this small BASIC program is to prepare the Spectrum for the files to follow. When you type LOAD "" (or select Tape Loader from a 128 menu) the Spectrum expects a BASIC program to load; most games, however, were written in machine code and machine code has to be loaded with a different set of commands altogether (LOAD "filename" CODE start address, file length, for example, or LOAD "filename" CODE followed by PRINT USR start address). The BASIC loader, therefore, is a BASIC program that loads in and executes the remaining files for you (effectively entering these more complex commands on your behalf and saving you the hassle) - first the loading screen and next the main program code. The arrival of the BASIC loader would be announced by "Program: hobbit" (or whatever your game was called) in the top-left hand corner of the screen.

The loading screen. The loading screen was a code file loaded to the Spectrum's screen memory at machine code address 16384. If you didn't black out the screen first it would appear in a rather odd, line-by-line fashion (it's rather hard to describe).

The program code. The example to the right is about as simple as they come; as games got larger and more complicated, the number of program files on a cassette grew rapidly and its actually quite rare for cassettes to have as few as three files in total (take multiloader games, for example).



Above: Spectaculator's cassette recorder window lists each of the three files on the cassette for *The Hobbit*: the BASIC loader (called 'hobbit'), the loading screen (called 'p') and the main program code (called 'h')

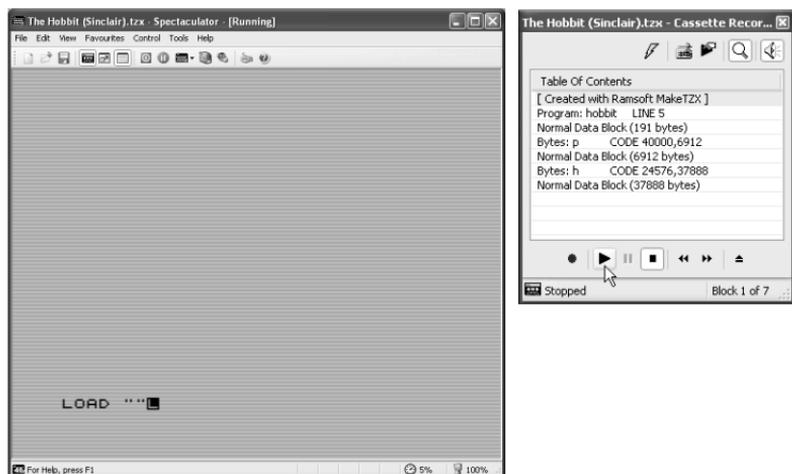
Below: Here is the BASIC loader listing for *The Hobbit*. Line 5 clears out the memory to make way for what's coming, lines 10 and 20 black out the screen and prevent naughty hackers from BREAKING into the program, line 30 loads the loading screen into the screen memory and line 50 loads the main program code. Line 60 runs the main code (from address 27648) once it's loaded.

```

5 CLEAR 24576
10 BORDER 0: PAPER 0: INK 0: C
LS
20 POKE 23659,0: PRINT AT 22,0
;
30 LOAD "p"CODE 16384
40 POKE 23659,0: PRINT AT 22,0
;
50 LOAD "h"CODE
60 PRINT USR 27648

```

Working with cassette images: loading (48K mode)

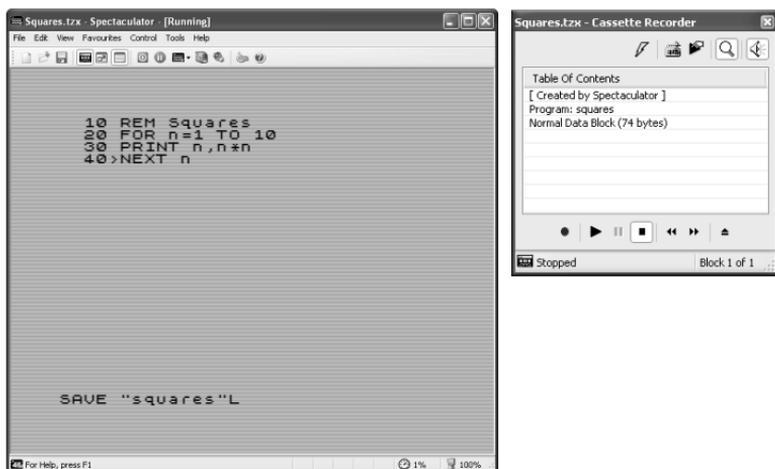


Spectaculator: Select a cassette file to load into your virtual cassette recorder (don't forget to open the cassette recorder window first using *View > Cassette Recorder*) via *File > Open* (a cassette file will end in either .TAP or .TZX). On your emulated Spectrum type LOAD "" (the J key for LOAD, don't forget, and the " symbol is obtained with a right shift and P) and ENTER. Click play on the tape recorder. Depending on whether you've selected flashloading or not (the little lightning symbol), the game will either instantly appear or load in 'real time,' loading tones, stripes and all.

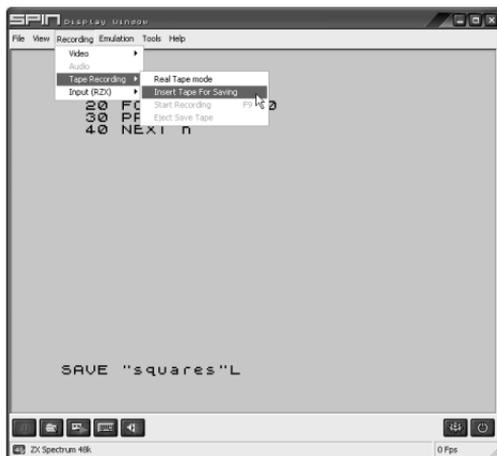


SPIN: To select a cassette file on SPIN use *File > Insert Tape*; to open the cassette recorder window select *Tools > Tape Options > Open Tape Browser*. Apart from that it's the same deal, although the " symbol on SPIN is obtained this time with Ctrl P. Additionally, loading speed is set in *Tools > Options > Images*.

Working with cassette images: saving (48K mode)



Spectaculator: Saving to tape in Spectaculator is simple. To create a new, blank tape and insert it in the cassette recorder, all you have to do is select *File > New > Audio cassette file* and give your new tape file a name. In it goes. In the main emulation window now type `SAVE "gamename"` (SAVE resides on the S key) and press ENTER. Up comes the message "Start tape, then press any key." - press record on the cassette recorder (the circle) then *click on the main emulator window* and press any key. Done.



SPIN: To create your blank tape in SPIN, select *Recording > Tape Recording > Insert Tape For Saving* and give your tape file a name. SPIN is a little confusing in that this new tape doesn't now appear in your on-screen tape recorder (it's a bit like having a second (invisible) tape recorder, just for saving on). But everything else is the same: `SAVE "gamename"` and ENTER; hit a key at the "Start tape..." message.

know the difference at all! Which means that most of the several thousand odd Spectrum titles to be found on the internet (more on this in chapter two) can be used directly on your real Spectrum as well as your emulator. How cool is that?

Snapshot files

Before virtual cassette files (or 'Cassette images,' as they're sometimes called) were sorted out, the mainstay of the spectrum emulator was the 'snapshot file'. A snapshot file is essentially a memory dump (or 'snapshot') of the Spectrum's memory at any given point - most game snapshot files that you can download from the Internet have been saved (or 'snapped') just at the point at which they've loaded. The origins of this file format go back to the days of the original Spectrum hardware: with all these add on disk drive devices (and eventually the +3 three inch drive) a way had to be thought of for transferring existing software owned by an individual from tape to disk (where was the point in owning a posh new disk drive if you couldn't use it to speed up the loading of all your favourite games?) Most games protected their BASIC loader from easy hacking, hiding the listing (and therefore the start addresses) through special tricks that left a blank screen and perhaps a copyright message, so it wasn't just a matter of loading the file into memory and then saving it back onto disk with a new BASIC loader modified as appropriate. Disk drive interfaces such as the MGT Plus D, therefore, sported a little snap button which you pressed once your game had loaded from tape; at this point the game would freeze and you were able to save it - as it was, at that precise moment - to disk.

So a snapshot file - in contrast to a virtual cassette file - really is just *one file*. You don't get the BASIC loader or the loading screen with this sort of file; when you load it back in you just go straight back to the point at which you saved the file, be that at the start of a game or somewhere in the middle (at the end of a level, for example, so you don't have to play the game right from the beginning next time). Snapshot files were great at the time - a convenient way of loading a favourite game quickly - but as emulators developed and the pangs of nostalgia for the good old

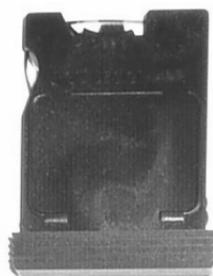
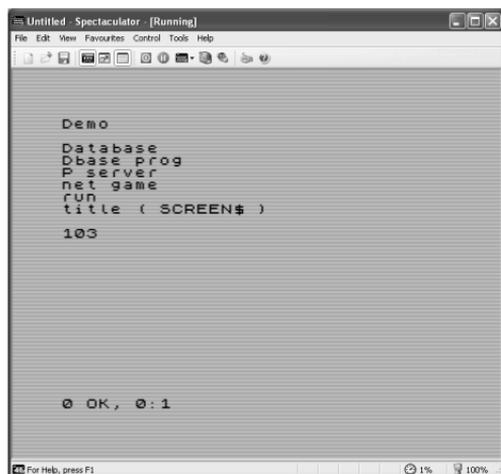
days grew, something more authentic was required; also snapshots were no good for multi-load games (where each level in a game had to be loaded separately from tape). These days, therefore, the preferred format for distributing Spectrum software in is cassette format; snapshot files are mainly used for saving your progress in a game (although a particularly innovative use for snapshot files has been implemented at www.thespian.demon.co.uk/congrat/index.htm, otherwise known as '*The Congratulations Archive*,' where you can download snapshots of games at their point of completion to find out what happens at the end).

The two main snapshot formats - both of which have been around for years - are *.SNA* and *.Z80*; both are supported by the vast majority of emulators (and both support also 48k and 128k snapshots). More recently, however, Jonathan Needle has developed a new snapshot format called *.SZX* for his emulator *Spectaculator*. SZX files include *hardware state* information and this is a reflection of sorts of just how far emulation has come since the formulation of *.SNA* and *.Z80*. An SZX file, therefore, doesn't just save the state of your Spectrum at the point of snapping, but also the state of any peripherals - most importantly the cassette recorder and any disk drives. So say, for example, that you load up a multiloader game from cassette into an emulated Spectrum +2 and make it to the end of level two of the game before SZX snapshotting it; the next time you load that SZX file into *Spectaculator* the emulator will switch to +2 mode, load in your game at the point at which it was snapped and insert the relevant cassette into the cassette recorder (in the position it was in when the save took place).

Disk/cartridge images

And so to 'mass media'. There were two 'official' mass media formats for the Spectrum: Sinclair's own *Microdrive* system for the Spectrum, Spectrum+ and Spectrum 128 (microdrives - of which you could attach eight - plugged into the Sinclair *Interface 1*); and the 3 inch disk drive built into the Spectrum +3. Both systems are supported by both *SPIN* and *Spectaculator*.

Working with microdrive cartridges



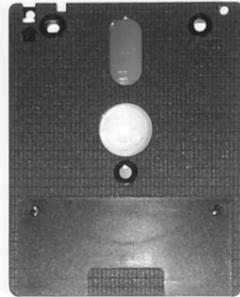
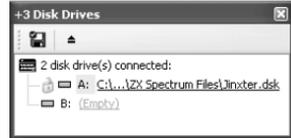
The **microdrive** was one of three expansion possibilities to the Spectrum offered by the ZX Interface 1, the other two being the local area network (you could connect up to 64 Spectrums) and the RS232 serial port. Sinclair wanted to keep the basic syntax for all three of these the same and the result was not for the faint hearted. When entering a LOAD/SAVE/FORMAT, etc command you not only had to identify the destination of the data (ie, microdrive, network or RS232), but the number of the drive or station too. So:

- | | |
|-----------------------|---|
| LOAD* "m";2;"Squares" | would load the program "Squares" from <u>m</u> icrodrive 2 but; |
| LOAD* "n";5 | would load a program from <u>n</u> etwork station 5 and; |
| SAVE* "b" | would send your program to the RS232 port ('b' is for binary as opposed to 't' for text). |

Not only does **Spectaculator** offer support for microdrives (you can have up to 8, just like the real thing) and RS232, it also emulates the microdrive's motor sound! For both emulators, IF 1 is enabled via *Tools > Options > Hardware*. *View > Microdrives* brings up the microdrive panel in *Spectaculator*; *File > Microdrives* does the same in *SPIN*.



Working with +3 disks

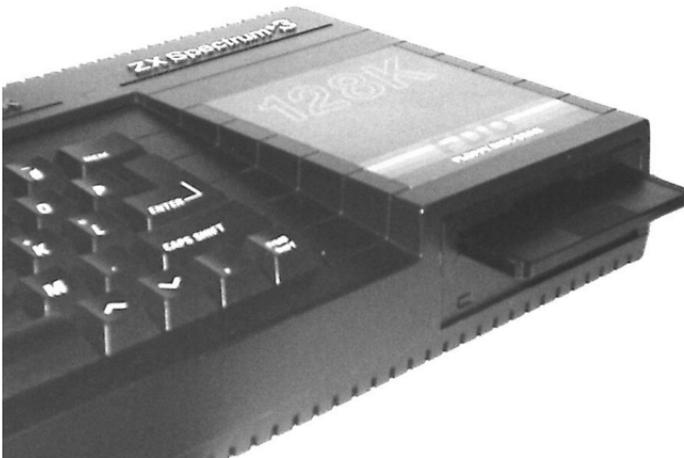


Amstrad's +3 disk system was much simpler to use than microdrives were. Essentially you just used the same old commands you were used to using with tape:

LOAD "squares" SAVE "squares" LINE 1 VERIFY "squares"

And so on. You could change back to tape by typing in SAVE "t:" before any save commands or LOAD "t:" before any loads (to switch to disk again type LOAD/SAVE "a:")

To insert a blank disk in *Spectaculator* choose *File > New > Blank +3 Disk*; in *SPIN* choose *File > Insert Disk > Create New*. The standard +3 disk was a 360K 3" CF2 disk (180K per side), but you could also plug in a standard 3.5" 720K disk drive via the computer's Drive B port; both emulators will allow you to create either disk image.



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So, in the same way that cassette file formats such as .TAP and .TZX work as 'virtual cassettes,' so disk file formats work as 'virtual disks' or 'disk images'. Pop the image file into its drive via the appropriate emulator tool and then access it from within your emulated Spectrum in exactly the way you would have done on the real thing. For +3 disk images the standard file format is .DSK and for microdrive cartridge images the standard file format is .MDR.

Of course, there were plenty of other add-on disk drive devices for the Spectrum in its time; we'll have a closer look at some of these later in the book.

The keyboard

By now you should pretty much know all you need in order to get back to playing those favourite games from your more youthful times - the next chapter will tell you where to get the games themselves from, and you might just decide at that point you need read no further. It's worth paying brief attention, however, to the business of the Spectrum keyboard before pushing on, even if it's just to remind yourself which key the quotation marks are on.

Of course, from the Spectrum 128 onwards there was no need to type anything into your Spectrum at all to load a game - just hit enter at the main menu to go into the 'Tape Loader' and then press play on your cassette deck. Regardless, just as we often seem to forget that not all Spectrums had rubber keys, still we mostly associate playing games in those days with having to type LOAD "" first! And let's be honest - no matter how much of a die-hard gamer you were or still are, it's nice to be able to dip back into ZX BASIC every now and again. The problem that emulation brings to this, however, is that our PC keyboards lack those essential keywords, and all the symbols are in the wrong places! How do we get around this? Well, there are a few ways.

One of the things that distinguishes *Spectaculator* from other emulators is its great help system. Pretty much a reference document in its own right, the help menu also includes a

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SPIN's authors have taken a different approach with their fantastic keyboard helper. Regular readers of *ZXF* will know that I'm a great fan of this feature, essentially a virtual 48K keyboard with keys you can click on with your mouse - all combinations allowed! The keyboard helper has two other modes too - one that allows you to select individual commands and send them straight to the Spectrum and another that allows you to type whole lines of BASIC straight into a text box that can then be checked for errors and sent to the Spectrum at the click of a button.

One final way around the 48K keyboard problem is to use a customised ROM that allows keywords to be entered on a letter-by-letter basis (just like the 128 did), rather than using the single keystroke approach (PRINT on P, LOAD on J, etc). The 48K Spectrum had a 16K ROM (Read Only Memory) and a number of alternatives to it have been designed within the Spectrum community over the years. The most useful for our purposes here is undoubtedly a ROM by *Geoff Wearmouth* called 'Gosh Wonderful.' The *Gosh Wonderful* ROM allows you to type keywords letter-by-letter whilst maintaining compatibility with most existing Spectrum software. It makes the business of typing on an emulated 48K a great deal easier - so much so that I pretty much use it as my default ROM for 16/48K emulation on *Spectaculator*. You can download the *Gosh Wonderful* ROM from Philip Kendall's *Spectrum ROMs collection* at www.srcf.ucam.org/~pak21/spectrum/roms.pl. To install it, it's a simple matter of selecting *Tools* from *Spectaculator's* menu bar, and then *Options > Advanced*; click on the (None) next to '16K/48K Spectrum' in the *Custom ROMs* section; locate the GW ROM and select it: you're away. On *SPIN*, select *Tools > Options > Hardware* and locate the GW ROM from the 'Using ROM image file' box.

Oh and by the way, the quotation marks are on the P key ;)

Chapter Two

Finding Files

So where do we get these games and other files from? This part is *really* simple.

The Spectrum community is blessed by the work of a chap called *Martijn van der Heide*; his site - *World of Spectrum* (www.worldofspectrum.org) - contains the biggest archive of Spectrum files on the planet - over 11,000 titles at present. There's not an emulation site that I know of - Spectrum or otherwise - that comes even remotely close to this sort of content - and it's all completely free.

WoS was started in November 1995 by Martijn, initially as a web page to host his Spectrum games database program, *SGD*. In January 1997 the site started hosting games downloads (opening with some three-and-a-half thousand titles) and it's been updated pretty much on a weekly basis ever since.

If you can't get hold of the title you're after amongst the thousands at WoS, it's probably either 'missing in action' (also known as 'MIA,' these missing files are listed at WoS and it's always worth checking any old tapes you have - or any you pick up at the local car boot sale - against this, just in case you've got something that's needed) or it's distribution has been denied by the original copyright owner. Martijn has been working tirelessly over the last few years to contact a huge number of game authors and publishers in order to establish whether or not they mind their work being distributed for free via WoS; a small number have told him that in fact they *do* mind (for example,

Ultimate and *Code Masters*, both successful companies today) and in these cases the relevant titles are immediately withdrawn from the site. WoS is one of the very few (if not the only) emulation sites on the web that goes about pro-actively seeking



distribution permission in this way, and the approach has won it a lot of friends and a great deal of respect (authors approached hardly ever say no).

It's not just games you can download from WoS either. Aiming to bring you pretty much "anything and everything from the Spectrum era," the site also hosts inlay card scans, instructions for games, complete magazine scans and a whole host of modern software downloads: emulators, utilities and more. There's also an enormous range of documentation available, from the original Spectrum introduction booklet and other manuals to circuit diagrams, schematics and servicing information. And there's a discussion forum. And there's a chat room.

WoS will probably be the only site you'll ever need to visit for

Spectrum files if you're just looking for old favourites to play again. After a while of playing around with these, however, you *might* just start feeling the need to explore some of the more recent software releases for the Spectrum. *People are still making new games for the Spectrum?* Oh yes.

For starters there's www.cronosoft.co.uk. A UK software label operating since early 2003, Cronosoft have been producing software for a number of 8 bit formats, but the most so far have been for the Spectrum. Cronosoft titles can either be bought as .TAP files (for between 99p and £1.99) or as real, honest-to-goodness cassettes (these cost an extra pound on top of the .TAP price plus a small charge for postage and packing). I wholeheartedly recommend *Fun Park*, a 16K game developed by Jonathan Cauldwell from his original 4K entry in the 2003 *Minigame* coding competition.

Then there's *Weird Science Software*. A Hungarian development team, WSS have produced a couple of astounding titles over the last few years, including one which uses the Spectrum's border as part of the playing area (you remember the border - where you weren't supposed to be able to print anything, right?). WSS operate from www.c-system.hu/edy/weirdsciencesoftware/ where you can either download the games for free in .TZX format or order them on cassette.

At <http://tcg.speccy.cz/> you'll find an amazing adaptation of a PlayStation game called *Abe's Mission - Escape* to download for free as a .TAP file. It's a beautifully illustrated and animated game.

And at www.n-discovery.narod.ru/games.htm you'll find the fantastic *Fire and Ice* puzzle game, one of the best produced pieces of Spectrum software I've seen for a long time. This is also a free download, but you'll need an emulator that emulates Russian Spectrum clones for it to work (more on these later).

Finally, if you're a Manic Miner or Jet Set Willy fan, you could do a lot worse than head over to the dedicated Yahoo! group at <http://games.groups.yahoo.com/group/manicminerandjetsetwilly/> for a whole host of sequels and remakes, all free.

18 *The ZX Spectrum on your PC*

I say 'finally,' but the reality is I've only scratched the surface; there is *loads* more to discover. For the moment, however, it's time to learn a little more about emulators.

Chapter Three

Peripherals

So far we've looked at the two parts of the Spectrum experience you couldn't avoid, even if you only ever used the computer for games playing: using the keyboard and loading a program in from your storage device. Of course, if you *were* a die-hard games fan, it's likely there was a further piece of hardware you were used to interacting with on a regular basis - a joystick.

There were lots of different joysticks made during the Spectrum's era; you plugged them into the Spectrum via joystick interfaces, each of which worked according to one of a small number of interface standards. The *Kempston* standard configured the interface as part of the Z80 Input/Output map, whilst the *Cursor* standard simply linked the joystick's movements to the cursor keys 5 to 8 (the keys with the little arrows on them) with 0 as fire; the *Sinclair* standard took the same approach as *Cursor*, using instead the keys 6 to 9 with 0 again as fire (the *Sinclair* standard supported two joysticks and keys 1 to 5 were used for joystick two). Selecting *Cursor* or *Sinclair* (the *Sinclair* standard was also sometimes referred to as *Interface 2*, since it was introduced through Sinclair's *ZX Interface 2* - an interface that plugged into the back of your Spectrum and allowed you to plug in two joysticks and ROM cartridges that loaded instantly) control for a game, therefore, would allow you to use the keyboard if you wanted (ie, keys 5 to 8 for *Cursor*; 6 to 9 for *Sinclair*); selecting *Kempston* would not.

Having three different standards for joystick interfaces created a

bit of a problem, since not all games produced gave you all three options on their control menus (and they generally didn't say on the box which standards they *did* support). If you used a *Cursor* interface, for example, and bought a copy of *Exolon* (which supports only *Kempston* and *Sinclair*), your joystick would be staying in its box whilst that game was on. The way around all of this was to shell out for one of the more expensive interfaces that had three joystick sockets on them - one for each standard.

The good news is you don't really have to worry about any of this with emulators, since all three standards are supported. All you need is a PC joystick or control pad plugged in to your usual game port; selecting which standard you want is simplicity itself: for *Spectaculator* just select *Control > Joystick* and then the standard of your choice. For *SPIN* select *Tools > Options > Control* and in the drop-down box for 'PC Joystick Emulates' click on the standard you're after. Don't forget you'll have to select that standard from within the game itself also. *Kempston* is probably the best-supported standard generally, so selecting this in your emulator set-up will probably mean less fiddling in the future.

If you don't have a joystick, by the way, you can still map your keyboard's arrow keys onto one of the standards. For *SPIN* follow the same process described above, but select the standard you're after in the drop-down box titled 'Cursor keys emulate!'; for *Spectaculator* go for *Control > Keyboard Joystick* (Tab or right Alt acts as the fire button).

Printers

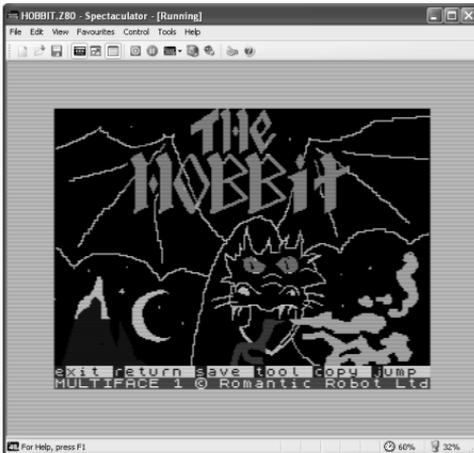
After joystick interfaces, the next most common category of hardware to have been plugged into the Spectrum is probably printers. There were a number of ways of achieving this: for 48K Spectrums it had to be via an interface plugged into the machine's edge connector, of course; for the 128 and Amstrad's follow-up +2 a BT-style RS232 socket built-in could connect to standard serial printers of the day; and the +3 and +2A featured a Centronics port that could connect to standard parallel printers.

Working with the ZX Printer



Both **SPIN** and **Spectaculator** offer support for the ZX Printer, displaying its output in a separate ZX Printer window. *Spectaculator* offers a direct print button (ie, it sends the ZX Printer's output straight to your actual printer), whilst *SPIN* offers ZX Printer support through all Spectrum models (although the ZX Printer only works in 48K mode, it will actually work with any Spectrum - even the +3). For *Spectaculator* the printer must first be enabled from the main Options area.

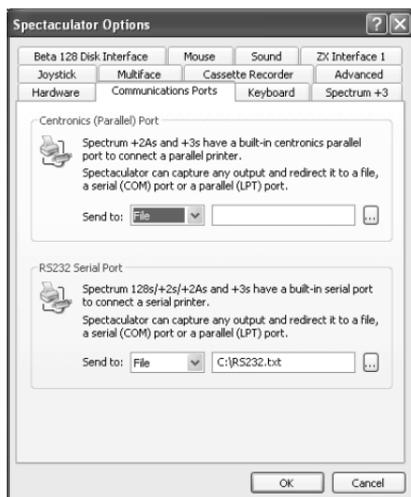
The printer is accessed from BASIC via the commands LPRINT, LLIST and COPY (the L stands for 'Line'). Each time you send something to the printer, the Spectrum just sticks it straight underneath whatever was there before. Neither *SPIN* nor *Spectaculator* support the little form feed button as yet (*vbSpec*, an emulator written entirely in Visual BASIC, does, however), so you'll have to send blank lines until they do.



To copy protected loading screens, try using the *Multiface 1* interface (*Tools > Options > Multiface* to enable it in *Spectaculator*, then Ctrl-M to activate it). Pressing 'c' on the Multiface menu will send whatever image is on the screen straight to the printer. Don't forget, the printer interprets any INK colour as black and any PAPER colour as white, so what you see on the screen isn't always what you get on paper.

Walk-through: Converting a Tasword file

- Let's suppose you have some old Tasword files on cassette you want to convert to a standard text file for editing in your favourite Windows word processor. The first thing we need to do is configure *Spectaculator* so that it re-directs printer output to a named text file. We'll be using a 128K version of Tasword to do the printing since the 48K version only supports the *ZX Printer* or other printers via a plug-in interface (not supported by *Spectaculator*); Tasword 128, however, sends its output by default to the RS232 port (which is supported). You can get hold of Tasword 128, of course, from www.worldofspectrum.org - look for it in the *Utilities* section of the Archive.



Before you load Tasword 128, go to the main Options box (*Tools > Options*) and select *Communications Ports*.

In the *RS232 Serial Port* section select 'File' for *Send to* and then enter a filename in the text box beside this. I've chosen 'RS232.txt' and, for simplicity's sake, saved it in the root directory on C drive.

Now load up Tasword 128 in the usual way: insert the tape image into the virtual cassette recorder, select *Tape Loader* from the 128's main menu and press play. When Tasword has loaded, eject the cassette.

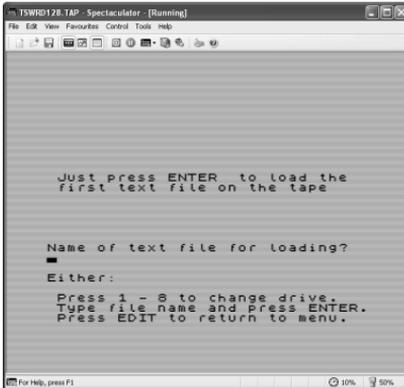
- Now that Tasword has loaded, we need to tell *Spectaculator* to expect its next input from a real, rather than virtual cassette.



From the *Tools* menu, select *Load from Audio Source*; this option will now have a tick next to it.

Spectaculator is now expecting audio input from your PC's Line-in socket. Connect this socket to your cassette recorder's EAR socket. *Spectaculator* recommends a mono to stereo lead for this, although I've personally found a standard Spectrum mono cable to work fine. You might need to experiment.

- 3 In Tasword, go to the main menu by pressing SymbolShift-A (right-shift and A on *Spectaculator*). Press L to load a file and ENTER to confirm.



If you know the name of your file, type it now, otherwise just press enter and Tasword will load the first file it finds on the tape.

Remember - you're loading from tape now; an emulated Spectrum on a PC is no better at reading tape data than the real thing, so you might well need to fiddle about with the volume settings to get a successful load.

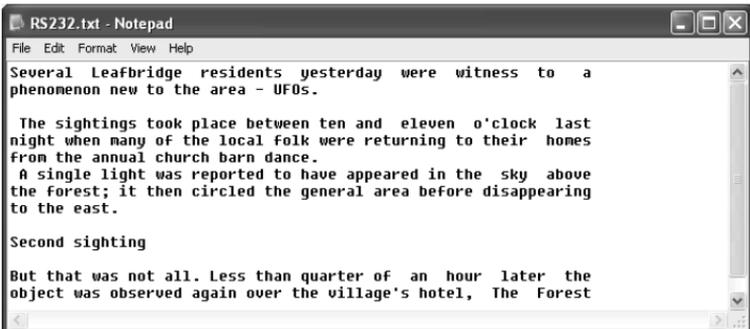


As soon as the file's loaded successfully, Tasword brings it up on the screen.

Press SymbolShift-A to go back to the main menu, P for print and then ENTER to confirm.

On the next screen, press ENTER several times to get to the bottom of the list and then one final time to proceed. Tasword should display a brief printing message and then return to the main editing screen with your text loaded.

- 4 To check that the process has worked, open up Notepad and navigate to your text file (C:\RS232.txt in this case). Now you're ready to start editing.



Believe it or not, Sinclair had his own printing solution for the Spectrum on the market *before* the Spectrum. The *ZX Printer* was actually designed for the Spectrum's predecessor, the *ZX81*, but was just as happy hanging off the back of a Spectrum (happier, since the Spectrum could power the printer without the need for the separate power supply required by the *ZX81*).

But the *ZX Printer* was never intended as a way of printing out CVs, essays or your letters of complaint to the BBC; the little, silver 'toilet rolls' weren't exactly the most attractive presentation of text on paper and were seen as a cheap way of creating hard copies of program listings, nothing more. Printer resolution matched exactly the screen resolution, restricting you to the same 32 columns of text you got on the telly, all in the glorious Sinclair typeface. You could also do screendumps of whatever was on the Spectrum's screen (although, of course, all of the colour information would be lost). The *ZX Printer* worked by passing an electric current across the aluminium coating on the paper, effectively burning the surface to create the black 'ink.' It was a rather noisy process; a much quieter option was the *Alphacom 32* printer (known in the US as the *Timex Sinclair 2040*), a thermal printer that gave exactly the same output as the *ZX Printer*, but which used white paper that turned black (or blue, depending on the paper) when exposed to the heat.

So serious word processing programs for the Spectrum, such as *Tasword*, didn't really expect you to be printing your literary creation off on the *ZX Printer*. These, in fact, were assuming a much more standard printer to be attached via an interface or - for later software - via the RS232 or Centronics ports: a dot matrix printer, for example, of the sort ordinarily attached to an office computer. Spectrum emulators aren't able to emulate these specific printers in the way they are able to pretend to be a *ZX Printer*, of course, however they *can* intercept the printer output sent by the emulated Spectrum and redirect it to a text file which you can then load into a normal Windows word processor. Just think - all those teenage masterpieces you created might not be lost for good after all! How you set up their retrieval will depend on the model of Spectrum you are emulating plus the way the Spectrum software you want to print from is configured;

have a look at the walk-through for a guided example.

Other peripherals

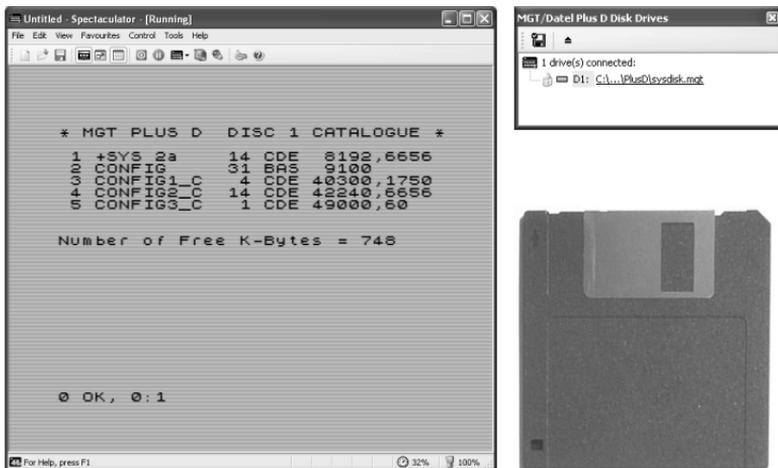
Other than printers and joystick interfaces, there were many other peripherals designed for the Spectrum, an increasing number of which are supported by emulators today. Both *SPIN* and *Spectaculator*, for example, support the *Kempston* mouse interface (yes, Kempston again; confusing, I know) - although the number of actual Spectrum programs which support this is fairly small, since not many people used mice with their Spectrums back in the 80s. *Tools > Options* gets you to the main Options panel for both emulators; that's where you configure the mouse settings. Once enabled, your PC mouse takes control of the Spectrum mouse in programs designed for this.

SPIN also supports the *Magnum Lightgun* via your PC's mouse. This was a peripheral produced by Amstrad that plugged into a BT-style socket on the back of the +2A and +3; a very small number of games supported it. Enabling the lightgun in *SPIN* allows your mouse to take control of the crosshairs on these games - it's not quite the same as the feel of the gun in your hands, but it's certainly a great deal more accurate!

Did you ever fancy playing around with the little speech synthesizer box that plugged into the back of the Spectrum? Now you can: both *SPIN* and *Spectaculator* support the *Currah μ Speech* (and you can download the manual from WoS), a device which allowed you to run together allophones (speech sounds) and give your Spectrum a voice. Something in the region of 50 games actually supported the *μ Speech*, including such classics as *Jetman*, but we all know that no game could possibly come close to the joy of achieving the best pronunciation of a swear word in Spectrum BASIC. Well what else was there to do with your evenings back then?

And so on. There are still more for you to explore - the *Multiface* interfaces, for example, and the *SpecDrum*. The *Plus D* interface is examined in the next walkthrough box. There is one more interface which we will examine more closely - the *Beta Disk Interface* - but we'll come to that later.

Working with the MGT Plus D disk interface



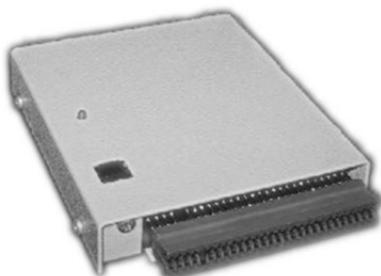
Released in 1988 by **Miles Gordon Technology (MGT)**, the Plus D was a disk interface that allowed you to connect to your Spectrum pretty much any of the standard disk drives of the day. The interface was the successor by about two years to MGT's **Disciple** interface (a rival to the **Sinclair Interface 1**) and included also a 'magic' snapshot button and a parallel printer interface.

The Plus D uses a very straightforward syntax; the main thing to remember is that **LOAD** and **SAVE** commands are suffixed by either d1 or d2 depending on which drive you are accessing (the Plus D can support two). Thus:

LOAD d1 "squares" SAVE d2 "squares" LINE 10 VERIFY d2 "squares"
 'CAT 1' lists disk contents as in the screenshot above. And snapshot files were denoted by an 'S' suffix for a 48K snapshot and a 'K' for a 128K snapshot, ie:

LOAD D1 "squares" S LOAD D1 "squares128" K

To enable the Plus D interface in *Spectaculator* select **Tools > Options > Hardware** and check the MGT/Datel Plus D Disk Interface box. To insert a blank disk choose **File > New > Plus D disk image**. You'll need to create a system disk first using the *Plus D System Tape* (available from the WoS website).



The Plus D interface is also supported by *Ramssoft's RealSpectrum* emulator. Here the Plus D is enabled in the hardware options box available via F3 (press TAB to move from the Spectrum models to the disk interfaces supported and select using the left and right arrow keys). Both *RealSpectrum* and *Spectaculator* support the two file formats developed for Plus D and Disciple disks - .IMG and .MGT.

Chapter Four

Emulator Extras

So far we've looked at emulation from the point of view of how all the stuff you used to do is implemented in 'virtual' terms. But many emulators also have additional features - they offer you tools which are in addition to the hardware and software features being emulated (so you can do things now which you couldn't do then).

Let's start with Pokes. Although, strictly speaking, of course, POKEing an address, for example to give you infinite lives in a game, *was* something you could do on your old hardware, but often not without going to an awful lot of trouble. It's much simpler on Spectrum emulators, which offer the direct entry of a POKE into the game currently running via an option from one of the main menus. Ctrl+P brings up the POKE box on *Spectaculator*, whilst *SPIN's* 'POKEs and Tips' box (*Tools > Pokes and Tips*) allows you build up a little database for POKEs and tips as well as being able to input them directly; you can also apply BASIC hacks from here.

Where do you get all this information from in the first place? Visit *The Tipshop* (www.the-tipshop.co.uk), the largest on-line collection of hints, POKEs and tips for Spectrum games (maintained by Gerard Sweeney and Nick Humphries). You can also search this website direct from the *SPIN* 'POKEs and Tips' box.

Input recording

Of course written hints and tips on how to get through games are

a poor substitute for actually seeing it done. Previously this involved finding a suitably skilled friend and peering over his/her (ok - let's be honest - probably *his*) shoulder.

The modern equivalent of this is *input recording*, the function of which is to record all the things you do whilst using your emulated Spectrum for future playback (key presses and joystick waggles, that is; they don't record brewing a cup of tea whilst waiting for a game to load or cheering on the little matchstick men in *Football Manager*). When you do play back the recording, the emulated Spectrum will appear to work all by itself - as though instructed by an invisible user - replicating your every move in the game you recorded. In this way a personal best performance can be kept for posterity and shared around for others to learn from.

Apart from self-admiration and helping out a friend in need, input recording is used on an annual basis for the *Speccy Games Tournament*, in which ZX enthusiasts compete against each other for the highest score on a selected range of titles. Usually an 'official' snapshot file of each of the games is prepared by the competition administrator and distributed to all participants, who then play the games and submit the input recordings they made whilst doing so; it's a fair, reasonably non-corruptable, way of ensuring everybody is competing on a level playing field and that nobody can pass off grossly exaggerated figures as their own high score. It also allows players to learn from others' successes.

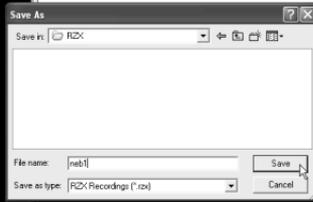
The two main input recording file formats are .AIR and .RZX, with the latter introduced as the successor to the former. The problem with AIR files was that they could only be played back on the specific emulator that created them: this meant in the past that all competitors in games tournaments had to use the same emulator (usually *RealSpectrum*); even if your own preferred emulator supported AIR file recording, one created by another emulator would not work. RZX, on the other hand, works *across* emulators, so all emulators which support this format should be able to run any RZX file created by any emulator - even an emulator running on a different platform.

Working with RZX files

Recording an RZX file is very simple. Here we'll record on *SPIN* and play back on *Spectaculator*. Start by loading up a game of your choice (I've chosen *Nebulus*).



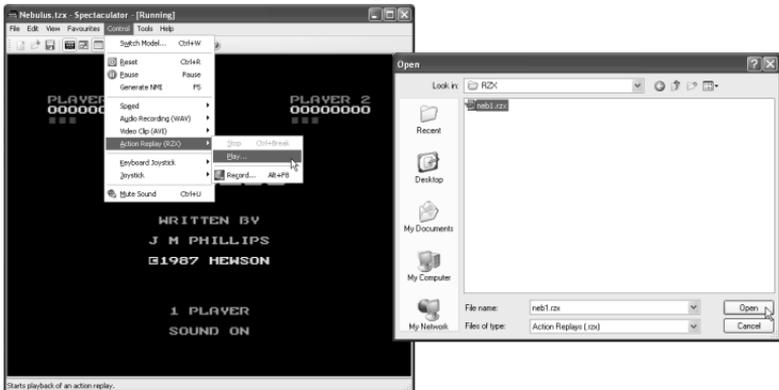
Now select **Recording > Input (RZX) > Record RZX File**. Give the file you're about to create a name.



SPIN is now recording your every move. It's play time! When you don't want to record any more select **Recording > Stop Recording**.



To play back the file in *Spectaculator*, first load the original game file in the usual way. Now select **Control > Action Replay (RZX) > Play...** and select the file you recorded earlier. Sit back and enjoy the replay of your greatest triumph... or disaster!



Both *Spectaculator* and *SPIN* support RZX recording. AIR is now considered an obsolete format and is only supported by older emulators.

Audio/Video

Input recording is fine if you want to show off to friends with a Spectrum emulator installed on their computer, but it is just possible, of course, that you might want something more portable that can play on a computer *without* such software installed. .AVI and .WAV files are - as you are no doubt already aware - standard Windows formats for video and audio respectively, and both are supported by *Spectaculator*. They're certainly not the most efficient of file formats for these purposes, but an advantage of recording in these formats is that the files created will play on much older PCs than the current 'standard.' And you could always use additional tools to convert them into - say - MPG/MP3 files; conceivably you could even encode and burn video onto a DVD if you so desired and watch it on your TV (there's full circle for you) - so then the recipient of your recording wouldn't even have to own a computer, let alone a Spectrum emulator.

Audio and video recording are both located on *Spectaculator's* 'Control' menu.



Graphics

If all that sounds a bit too exotic for your needs and you just want to capture a screen or two to put on a web page or email to a friend, there are, of course, options on most emulators to create standard Windows graphics files. Quite a number allow you to save screenshots as .BMP (Windows bitmap) files for editing in a standard graphics package and just recently BMP export has also been created for the *ZX Printer*, so you can now print from your emulated Spectrum to an emulated ZX Printer and save the printer's output as a BMP file.

And what about doing it the other way around - wouldn't it be cool to turn a Windows BMP into a Spectrum screen? *Z80*, the shareware Spectrum emulator by *Gerton Lunter*, has offered a BMP import feature for several years now, although the control this option offers you is quite limited. A much better way is to use an external program to turn your graphic into a Spectrum screen. The common file format developed for Spectrum screens is the .SCR format - drop an SCR into either *Spectaculator* or *SPIN* and the Spectrum screen created appears straight away (you could then save it out as a SCREEN\$ to a cassette file). SCRs cannot be edited by standard Windows graphics packages, but there are a whole host of freeware programs that can. And that brings us nicely to the next part of this book: the many PC utilities in existence to support and enhance your Spectrum experience. That's what we'll explore in the next chapter.

Chapter Five

Utilities

So far our focus has been mostly on emulation. This will be the starting point for many of you returning to the Spectrum scene, and for many nothing further will be required. Fair enough. Many - not all - of the increasing number of PC utilities available for the Spectrum are targeted at the more serious Spectrum hobbyist - in particular those wanting more powerful tools with which to develop new Spectrum software than the Spectrum itself is able to provide; that's not the sort of thing likely to appeal to everyone. But this is not to say that this corner of the community is all about ultra-serious coding; far from it. Plenty of users like to use these programs just to help them create, for example, an entry for the annual *Crap Games Competition* organised by the members of the *comp.sys.sinclair* newsgroup (a competition inspired originally by the now infamous *Cascade Cassette 50* compilation of 50 quite appalling games). Programming, after all, was part of what the Spectrum was meant to be about, and an important aspect of its appeal today is the ease with which it's possible to create new programs compared to the complexity of creating programs on the PC. In this chapter, therefore, we'll take a brief look at the sorts of utility available to you should you start becoming interested in this sort of thing; I will be mentioning utilities by name, but I won't be getting too specific about the precise details of any particular utility - the nature of the scene is that these often tend to be developed very rapidly and then left for quite long periods before another burst of rapid development. Getting too specific here,

therefore, will render the chapter out-of-date very quickly. Also, don't assume that the titles mentioned here are the *only* programs available - there are many that won't be mentioned simply because there are too many to go into, and it's also very likely that programs not conceived of at the time of writing will be taking the scene by storm by the time you read this. I won't be giving out URLs either. Other than, of course, www.worldofspectrum.org/utilities.html. Every utility mentioned here will be available from that page.

Since we concluded the last chapter looking at graphics, this seems like a good place to start in our exploration of PC utilities. In the last chapter we looked very briefly at the SCR file format as a means of storing Spectrum screens on your PC and there are plenty of utilities to help you work with these without having to go anywhere near an emulator. Of course Windows doesn't recognise SCR files as a valid graphics format (it wasn't written with Spectrum emulation in mind), so don't expect *Windows Explorer* to display these as pretty little thumbnails. The very first thing you'll need therefore if you have more than a couple of SCRs in a folder is a viewer program. These won't allow you to manipulate your graphics much, but they will let you look at them. A good example of such a program is *ZX Screens* by Pavel Pliva, a very simple screen viewer which will display a whole directory of SCR files one screen after another using the Slide Show option. Pavel, by the way, has a particular interest in grabbing Spectrum screens for the purpose of creating game maps and has produced other PC software dedicated to this purpose (*ZX Maps Creator*) as well as a website at which completed maps can be displayed (www.zx-maps.wz.cz).

In so far as actual manipulation is concerned, there are many titles to choose from. One of my personal favourites is *SevenUP* - put simply, a *Windows Paint* type application that produces SCRs rather than bitmaps. This program by Jamie Tejedor Gomez is a touch on the slow side - even on fast machines - but what it lacks in speed it more than makes up for in features and usability, such as straightforward buttons for changing INK and PAPER colours (and turning on/off FLASH and BRIGHT) and a very useful zoom facility (which adds in a pixel and character

grid on high zoom levels - invaluable for pixel-perfect placement and avoiding colour clash).

Tony Thompson's Tommy Gun suite of Spectrum graphics utilities also includes an extremely competent screen editor, as does *BMP2SCR* by *LCD*. The latter utility's distinctiveness lies in its ability also to convert bitmap images into SCR files, allowing you effectively to take any image from your hard drive and turn it into a Spectrum screen. There are in fact a number of programs that do this (including the aforementioned *ZX Screens*), but *BMP2SCR* employs by far the largest number of conversion techniques to explore, each giving different results. One such approach, for example, is the black and white dithering of a colour bitmap. This has been explored also in Derek Jolly's *YASPIC* (Yet another Spectrum Image Converter), which allows you to dither an image and then colour it in. Both *BMP2SCR* and *YASPIC* allow you to save your output as either an SCR graphics file or TAP cassette file.

Programming

Quite simply, Spectrum programming has never been easier than it is now, and this is due in no small part to the emergence of new utilities designed to help this process. Machine code programmers, for example, are now able to develop their code in their favourite text editor, assemble this directly to a TAP file and test it there and then on an emulator, thanks to a new generation of cross assemblers, such as *Pasmo* by Julián Albo. And many emulators (*SPIN* and *Spectaculator* included) have in-built debuggers for tracking down errors in the code being tested too. The most recent version of *SPIN*, in fact, even features its very own in-built assembler, so you need never leave the emulator if you don't want to.

For these particular tools to make any sense you'll still need to know assembly language, of course, and that's an elite club probably most of us don't belong to (myself included). But you can still achieve a great deal in the Spectrum's own BASIC - and don't forget that BASIC can be compiled into machine code by dedicated software such as the *Hi-Soft* BASIC compiler. If your

problem now becomes how to write better BASIC, therefore, then you have a treat in store: Paul Dunn's BASIC development tool *BASin* has been bringing Spectrum users back to programming in their droves (compare the 70-odd entries to the 2003 *Crap Games Competition* to the 21 of the 2002 contest), because it makes the whole process of developing a BASIC program just so much easier than it used to be. Paul Dunn is actually one of the key authors behind the *SPIN* emulator; in fact *BASin* started out life with the name 'SPIN Light' and visually resembled an emulator very closely. Now, however, this tool has evolved beyond all recognition from its early versions, incorporating a whole host of additional features, such as a UDG (User Defined Graphics - do you remember those?) editor that allows you to create your UDGs by clicking on an 8x8 grid which then sends the code as line-by-line decimal entries to your BASIC listing. *BASin* is one of the most innovative new PC applications to hit the Spectrum scene in a long time and its development looks set to be very exciting indeed.

Music

The Spectrum beeper was so famously bad that many seem to recall it as a feature of all Spectrums, rather than just the original Spectrum and the Spectrum plus. Of course with the Spectrum 128 came our very own three Channel AY chip and with it a whole new level of musical possibilities was added to the Spectrum scene. To listen to an AY tune you would ordinarily, of course, have to load up the game it was part of onto your emulator or real Spectrum. Now, however, you can listen to it independently using an independent AY player. *AY-3-8910/12 Emulator* by Sergey Bulba is particularly powerful because it not only allows you to play ready made AY files (you can download these, incidentally, from WoS), but also to rip them from snapshot or tape files yourself. It's not just Spectrum *games* that contain AY music, by the way; there is an ever-increasing number of demo soundtracks that you can also get hold of through WoS - and some of these are simply amazing.

One thing that does appear to be missing from the utility scene at the moment is an AY sequencing tool. A sequencer in the

Working with BASIN

```

BASIN Release 10 - fm1
File Edit View Search Run Tools Help
CLS:
PRINT "FOOTBALL MANAGER"
PAUSE 300
BORDER 7:
INK 0:
PAPER 7:
FLASH 0:
BRIGHT 0:
OVER 0:
INVERSE 0:
CLS:
INPUT "Type your name "; LINE M$:
LEN M$>20 THEN
PRINT "Name is too long (max 20 chars.)":
PAUSE 200:
GO TO 9:
10 GO SUB 9000:
90 DEF FN P (X)=INT ((P-1)/0+1)
99 DEF FN R (X)=INT (RND *X+1)
100 RANDOMIZE:
101 GO SUB 2000:
110 IF X$="KEEP" OR X$="KEEP" THEN
GO TO 800:
120 GO SUB 4000:
130 GO SUB 5000:
140 GO SUB 3100:
150 GO SUB 6700:
160 GO TO 100:
RESTORE 651
DATA 24,25,126,26,120,72,206,2,48,48,24,66
FOR I=0 TO 15:G-1
POKE USR "a"+I,I
NEXT I
RETURN
PRINT INK 6; AT K (2), K (1); K$ (K (3)):
LET K (3)=INT (1.5*K (3))+1
LET C3=(D (2)*K (2)+(D (4)*C0)-(D (2)*K (2)-C0)
PRINT INK 0; AT K (2)+C3, 23-K (2)+C3; K$ (K
LET K (2)=K$+C3:
LET K (1)=23-K (2):
RETURN
PRINT INK 6; AT K (2), K (1); K$ (K (3)):
LET K (3)=INT (1.5*K (3))+1
LET C3=(D (2)*K (2)+(D (4)*C0)-(D (2)*K (2)-C0)
PRINT INK 0; AT K (2)+C3, (K (2)+5+C3); K$ (K (3)
LET K (2)=K (2)+C3:
LET K (1)=K (2)+5:
RETURN
OVER 0
PRINT INK 6; PAPER 2; AT 0; "****"
FOR F=1 TO SAFN R (15):
BEEP .05, FN R (36):
NEXT F
GO SUB 1090
RETURN
BORDER 7:
BRIGHT 1:
INK 6:
PAPER 4:
LET W$="":
LET F$="":
LET D$="":
LET K$="K4":
LET K (3)=1:
CLS:
301 PLOT 73, 88:
DRAW -16, -8:
DRAW 24, -16:
DRAW 0, 0:
PLOT 8, 0:
DRAW 176, 176:

```

4 Kb available to BASIC (36 Kb Used)

The main programming window (left) can be used to enter code directly or you can cut and paste from a text editor. Don't be fooled by the 'Spectrum look,' by the way - this is not an emulator, it's a fully fledged editor that allows you to enter keywords letter-by-letter instead of having to remember all the awkward keyboard combinations (and, yes, the quotations mark is where it's printed on your keyboard, not somewhere on the P key). At the same time, however, it *does* check your code. A variety of debug windows accessible from the *View* menu will allow you to watch the antics of your variables as the program runs and you can renumber at any point in increments of your choice.

Below, the inspired UDG editor allows you to grab the UDGs from your BASIC listing, alter them and stuff them right back in. Or use it to create fresh UDGs from scratch - the editor creates all of the DATA statements for you at the click of a button.

UDG/Charset Editor

File Edit Grab Send

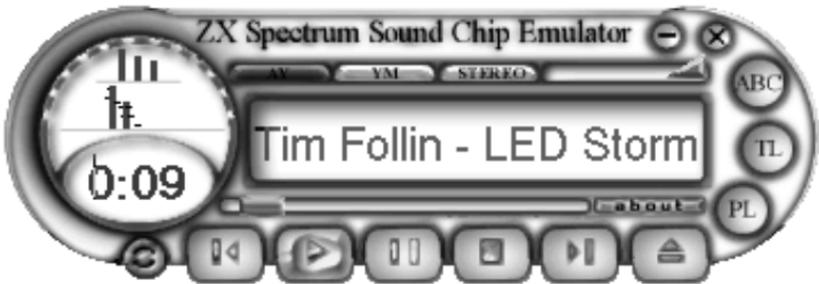
Number of Chars:

From Address:

Grab Now Send Close

Character list: P Q R S T U

piano roll style (used by PC midi sequencers such as *Cakewalk*) that generated AY output which could be saved either as an AY file or a TAP file would be really, really useful. Hint hint. As it is, there are plenty of tools with which to create AY music, but these are actual Spectrum programs, and most follow the *tracker* method of interface, which is a little complex, to say the least.



Using these tools, however, some fantastic tunes have been created over the last few years, and not just for games and demos either. Multi-national group *AY Riders* have so far released three whole albums of music using the Spectrum's AY chip (you can download the albums from their site - <http://ayriders.zxdemo.org> - for free and in MP3 format) - they've even gigged live in Poland in front of 200 odd people using real Spectrums (and lots of them).

Organising your games/research

As I said earlier, not all PC Spectrum utilities are about developing new Spectrum software. Some simply aim to help you organise the software you already have on your hard disk. Via the *World of Spectrum* website, after all, you now have access to literally thousands of Spectrum titles for your emulator (or real Spectrum) - more than you could ever have imagined yourself having back in the 80s - and sifting through even a small percentage of these on your PC can be an overwhelming process. You could sort all the games into folders by publisher - or author - but this would be a rather long and arduous process. *Spectaculator* offers a 'favourites' menu, which you can organise

just like your *Internet Explorer* favourites (so the files themselves can stay in a single folder), but this too has to be set up in the first place. Also, neither of these options gives you any additional information *about* the games (ie, author, publisher, year of release and so on).

There are now a number of games database programs you can use to help you sort all this out. Perhaps the most well-known of these within the Spectrum community is WoS maintainer *Martijn van der Heide's* 'Spectrum Games Database' (SGD). A DOS program now no longer maintained, SGD not only gives you information on your games (the database program itself is empty when you download it, but you can download pre-prepared database files from WoS along with the program), but also link to the actual files on your system, display their loading screens and allow you to launch them in an emulator of your choice. More recently, *Paul Thompson* has taken the universal emulator front-end *Gamebase* and customised it with a ready-made database of Spectrum titles (the database is far from complete, but updates are frequently released; Paul has started with the most popular titles and is working through the archive steadily). *Gamebase ZX*, then, performs the same sorts of task as SGD, but can also link to Inlay card scans and instructions text files. It's also a Windows program.

It's worth bearing in mind that - as a research tool - the WoS website itself is just as comprehensive as either of these utilities. Often the sheer size of the WoS archive eclipses the immense power of the internal database and search engine, custom-built for the site. Clicking on a game title will often throw up links to the game's inlay card, instructions, advertisements for the game, reviews of the game in any of the Spectrum magazines and hints/tips/pokes/maps for the game (linking into the *Tipshop's* database) as well as the actual game file itself. All titles within the archive can also be played on-line using the excellent *ZZ Spectrum* Java emulator (which runs in a web page, so you don't even have to have an emulator installed on your computer). Clicking on the title's author will usually throw up a list of other titles by the same author (each of which can be clicked and explored in the same way); clicking on the title's publisher will



usually throw up a list of other titles by the same publisher... and so on. A ratings system has been introduced for all titles and you are encouraged to contribute your own ratings so that an increasingly representative indication of how popular the title is can be developed. The complexity of the system (never mind the content) is mind-boggling, and it's unlikely that any off-line database will ever come close to matching it.

It's not just WoS that offers a lot of structured information either. Plenty more websites generate a great deal of information about various different aspects of the machine and its influence. As the amount of on-line, Spectrum related information continues to grow, it's becoming increasingly difficult to find any one particular

piece of information amongst it all. And that's why Gerard Sweeny invented the *Speccy Search Bar* for Internet Explorer and other web browsers. Install it and you get a little search box in your browser's tool bar that searches nearly all of the sites listed in Appendix I. A real time saver.

Tape utilities

One final category of utility worth looking at is utilities for working with and creating cassette files. As discussed earlier, a .TAP or .TZX file is actually an emulated cassette, if you will, containing any number of actual Spectrum files. Emulators like *SPIN* and *Spectaculator* that have a separate cassette recorder window list those files on the tape in the order that they come. Beyond looking at these files, however, there's not much more that you can do with them - other than load them, of course - and whilst that's fine in the vast majority of cases, there are occasions when being able to delete individual files from the tape or change the order that they play in could come in handy.

The undisputed king of cassette file manipulation was originally WoS maintainer *Martijn van der Heide's* 'Taper'. In addition to letting you play around with the individual files on a tape, *Taper* also lets you copy files between tapes, play tapes out to a real Spectrum and turn input from a cassette recorder plugged into your PC into a TZX file. *Taper* is still a powerful program to use, however - like *Martijn's Spectrum Games Database* - it's a DOS only program that can experience problems on modern PCs. It's a very great shame, but so far, there is no single Windows program that is able to do all the things that *Taper* can; happily, however, you *can* achieve most of the it's functions through a combination of other utilities.

Tape Explorer, for example, is a great little Windows program by *Dan Fry* that allows you to move and delete files on a Spectrum cassette in pretty much exactly the way I described earlier. This utility only works with TAP files, however. *Spectrum Tape Loader* by *Jocelyn Gibart* offers similar functionality with both TAP and TZX files, although this allows you to move *blocks* rather than whole files (a *block* is a part of a file; most files are

Walk-through: Converting a real cassette into a cassette image

Converting real cassettes into TZX files has been likened to a black art that some achieve with ridiculous ease whilst others fail miserably at. This is an approach to conversion that moved me from the latter to the former group. It might work for you too.

- 1 Connect your cassette recorder to your PC's Line-In socket. Fire up your favourite PC sound editor and set up a new file: make the file **8 bit mono** (not 16 bit). Press play on your cassette player and record on your sound editor. Save the resulting WAV file somewhere handy.



- 2 Load up *Ramsoft's 'MakeTZX'* and locate your WAV file. *MakeTZX* claims to be able to convert straight from your tape recorder using 'Direct Mode' (ie, no need to sample in a separate sound editor) but in practice this doesn't always work (probably a hardware issue). Enable the digital filter and press Start.

```

C:\Emulation\ZX Spectrum\Make TZX\maketz.exe

--[ MakeTZX v2.31 ]-- (C) 1998-2001 RAMSOFT, a ZX Spectrum demogroup.
■ Checking input file... ok!
■ RIFF Wave PCM (WAV), 15243592 samples.
■ Sampling rate: 44100 Hz <playing time: 05:45.659>
■ Digital filter: Butterworth band-pass 600-4100 Hz, order 2
Block 1 -> Program: ball           - Header: Length= 17, Pause=1003ms.
Block 2 -> -----                - Line= 22, Length=1051, Pause=1945ms.
Block 3 -> Bytes: title           - Header: Length= 17, Pause=983ms.
Block 4 -> -----                - Start=16384, Length= 6914, Pause=3508ms.
Block 5 -> Bytes: MC              - Header: Length= 17, Pause=1005ms.
Block 6 -> -----                - Start=65120, Length= 202, Pause=6905ms.
Block 7 -> Program: ballb         - Header: Length= 17, Pause=995ms.
Block 8 -> -----                - Line= 1212, Length=38331, Pause=7624ms.
Block 9 -> C.Array: deno          - Header: Length= 17, Pause=998ms.
Block 10 -> -----              - Start=52924, Length= 3707, Pause=16998ms.

Done!

*** Press any key to close the console box ***
  
```

- 3 Seconds later - if you're lucky - one TZX file to load into an emulator or submit to WoS for others to enjoy if it was Missing In Action.

made out of two blocks - the header [the bit that announces the name of the file] and the main code), making the process slightly more complex for the beginner. *Spectrum Tape Loader* also takes input from a real cassette being played in through your PC's sound card, which it can then turn into a TZX or TAP file. I must admit that I personally have not had much success in using this particular utility for this purpose, however, whilst I have managed it with *MakeTZX* by *Ramsoft* (see the walk-through).

You can, of course, make a new TZX file straight out of an emulator if you're creating programs of your own; TZX creation programs are aimed, of course, at the capture and preservation of *existing* games on cassette. Information stored on magnetic tape doesn't last forever, after all, so simply collecting the cassettes themselves isn't enough insofar as preservation is concerned. As the archive of games at WoS grows there are naturally less and less cassettes that haven't already been captured in this way, thanks to the extremely hard work of the few individuals who contribute to this project. But there are still some. And by 'some' I mean hundreds. These are the 'missing in action' titles that have yet to be found and converted. They turn up in charity shops and car boot sales, and it's our job to find them! You can check out the current list of *MIA* titles at www.worldofspectrum.org/mia.html and, if you find one of them and manage to TZX it, you can upload your work at www.worldofspectrum.org/upload.html.

Chapter Six

Russian Clones; TR-DOS

So far we've looked at emulation of the various ZX Spectrum computers made by *Sinclair* and *Amstrad*. In fact that's only a part of the Spectrum story overall. One of the reasons for the machine's longevity is actually that it's been cloned all over the world, most significantly in Eastern European countries. You thought the IBM PC was the only cloned computer? Think again.

Of greatest significance of all are the Russian Spectrum clones and their support for an English disk operating system called *TR-DOS*. Take a brief look at the WoS archive and you'll find that there are almost as many TR-DOS disk images listed as there are +3 disk images. Unlike the +3 disks, however, these are not games you can also get hold of on tape or in tape files (many of the +3 releases were actually available also on cassette, so the main advantage of obtaining a version on disk was often just faster loading times). The TR-DOS format is also very popular within the demo scene, with over 350 titles listed at *Demotopia* (www.zxdemo.org) at present. And you'll also find many, many TR-DOS downloads at such sites as *Power of Sound* (www.pos.fmshop.ru), and *Scenergy* (scenergy.natm.ru). Basically a whole new dimension to Spectrum computing, then. And quite a refreshing one too, because the ideas and presentation in these programs are often quite different from that of the western software with which we are familiar. The technical skill with which TR-DOS programs are put together is also often breathtaking.

In case you're unaware, the Russian clones evolved as a result of two main factors - price (an original Spectrum would have cost several years' salary in Russia) and the technology export controls of the Cold War. For all the restrictions, however, a few Spectrums *did* get across the Iron Curtain; once there they got reverse engineered so that functionally equivalent (but cheaper) machines could be built. The results were rarely visually attractive (many of the clones were produced as designs rather than actual computers you could buy off the shelf, so it was up to you what your completed *Pentagon* looked like, for example), but - and this is the ironic bit - they were often more powerful than the actual original Spectrum, particularly in terms of memory and storage features. One such feature was the *BETA Disk Interface* developed by *Technology Research Ltd.* An English company (based in Middlesex), Technology Research originally released the interface for the sum of £109 in 1985 (this was just for the interface - disk drives you had to buy separately). It wasn't a particular success in the UK (ever see one on *ebay*? thought not); but in *Russia* the interface (or rather - I presume - a *clone* of the interface) actually got built in to quite a number of the Spectrum clones, making the floppy disk a much more common form of program storage for the Spectrum than it ever became over here. And hence the large amount of software available for it.

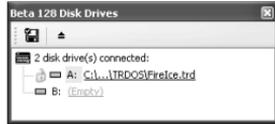
Support for Russian machines and TR-DOS, therefore, is a key feature of many emulators. The two most emulated clones are the *Pentagon* and the *Scorpion*. *Spectaculator* added in this support at version 6 whilst other emulators have featured support for a long time. The two main TR-DOS file formats that emulators use for TR-DOS disk images are .TRD and .SCL. TRD files are dumps of a whole disk image, empty spaces and all, whilst SCL files are only as big as the actual TR-DOS files they contain (although they still work just the same as TRD images). The capacity of an empty .TRD file is 640K (equating to a double sided, double density 3.5 inch floppy, although in fact the original Beta Disk interface was also designed to be used with a range of other drives, including 3 inch and 5.25 inch), so a .TRD file containing a 10K Spectrum program would still be 640K in size, whilst its .SCL equivalent would be just 10K.

Both the *Pentagon 128* and the *Scorpion 256* employ variants on the 128K Spectrum's menu system. For the *Pentagon* the layout of the main menu is identical to that of the original 128 except that in the place of the original 'Tape Tester' we now have a TR-DOS option. On the *Scorpion* there are two TR-DOS options - one for 48k and one for 128K. *Generally speaking*, you can make the expectation of most TR-DOS software that it will load in the *Pentagon's* TR-DOS mode (ie, this seems to be the default). Scroll down, hit ENTER and you are now at the main TR-DOS command line.

Then DOS commands themselves are very simple, although you'll need to know the keyboard whereabouts of Spectrum keywords as it uses the single keypress system of the 48K Spectrum. The CAT command, for example, reports on the contents of a disk, (CAT is SYMBOL SHIFT + 9 in extended mode). Selecting a particular file for loading is then a simple matter of LOAD "filename" - exactly as though you are dealing with a tape (compare this with Sinclair's own microdrive syntax: LOAD "*"m";1;"filename"). This is pretty much how it goes for all the other commands you are used to for dealing with tape - SAVE, MERGE and VERIFY all work in the usual way - a main addition is the RUN command, which you can use with a filename to LOAD and then RUN that program all in one.

Although the focus of this book so far has been on the features offered by *Spectaculator* and *SPIN*, it is worth mentioning one other key emulator at this point. *RealSpectrum*, which we'll look at in a little more detail in the next chapter, is a DOS emulator which has offered TR-DOS support for quite some time. Where the support that this emulator offers is (currently) unique is that it will actually read from and write to genuine TR-DOS formatted floppy disks through your regular PC floppy drive. This *Real/Disk Access* is not supported in the Windows build of *RealSpectrum* (the version specially compiled for Windows XP users, also known as *RS32*), but if you have an older PC capable of running DOS programs (the DOS build of *RealSpectrum* will run quite happily on Windows 95/98 systems) this is a real plus if you happen to have any old TR-DOS disks lying around that you want to convert into images. *RealSpectrum* is by *Ramsoft* and

Working with TR-DOS



Selecting **Pentagon mode** on *Spectaculator* is a simple matter of clicking on the mode selector icon (the little Spectrum picture) and choosing **Pentagon 128**. At the main Spectrum menu select **TR-DOS**.

To view the disk drive panel (above right) select **View > Disk Drives**. TR-DOS supports up to four disk drives, which you can configure from the **Beta 128 Disk Interface** tab on the main **Options** panel (**Tools > Options**). To select a particular disk image, click on the word 'Empty' next to a drive letter and find the image you're after on your hard drive.



At the TR-DOS command prompt, **CAT** (*symbol-shift 9* in extended mode - extended mode in *Spectaculator* is reached by pressing left and right shift on your keyboard together; *symbol-shift* is a right shift by itself) will list your disk's contents. TR-DOS works with drive A as its default; to change drive type **"*b:"** for drive B, **"*c:"** for C and **"*d:"** for D. Your commands after this are the usual **LOAD** "filename", **SAVE** "filename", etc that you're used to; an exception is the **RUN** command, which you can use to **LOAD** and **RUN** a BASIC program (ie, **RUN** "game"). To get out of the command prompt and back to the normal Spectrum menu type **RETURN** (just the Y key) and **ENTER**.



As with all other media on *Spectaculator*, creating a new TR-DOS disk image is simply a matter of selecting **File > New**; select either **Blank TR-DOS disk (.scf)** or **Blank TR-DOS disk (.trd)**.

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can be downloaded from www.ramsoft.bbk.org.

Chapter Seven

Other emulators

There have been so many Spectrum emulators developed for the PC and other platforms that it would be remiss of me to neglect to mention at least a few others. We've focused so far on *Spectaculator* and *SPIN* because these are arguably the most comprehensive Windows emulators about at present and they also present a very intuitive user interface; but that's not to say that other emulators have nothing further to offer. Far from it. In this final chapter, therefore, we'll take a brief look at some of the other PC emulators and their distinguishing features. I can't cover every single emulator about and so I apologise in advance for those in the know who feel I've omitted to mention a particular program they feel to be important. Suffice to say, they're *all* excellent and every single one of them contributes to the extremely high quality of the resources with which the community is blessed.

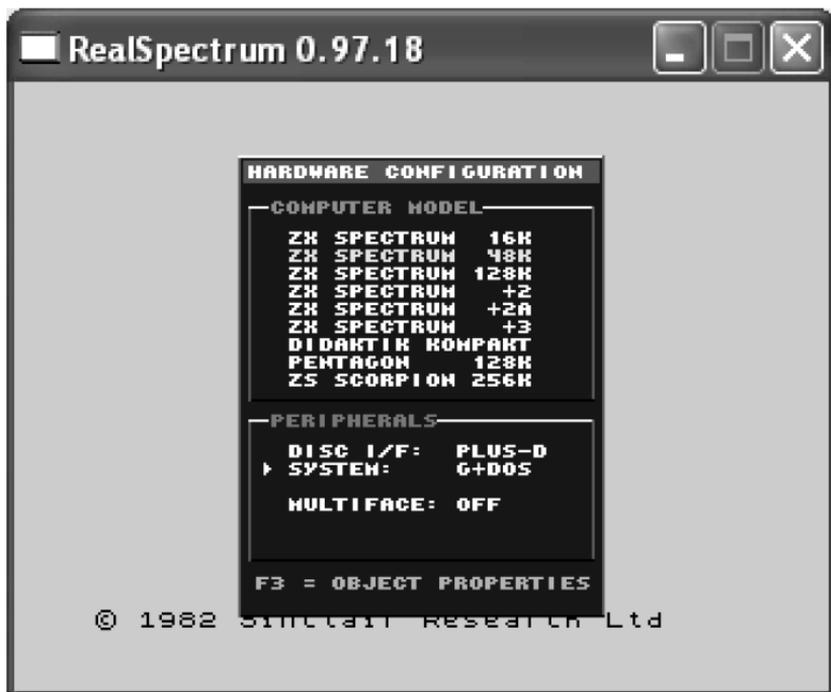
All of the emulators mentioned here can be obtained via the *WoS* website's emulators page. Best of all, they're all free.

RealSpectrum

For a long time, *Ramsoft's RealSpectrum* was the Spectrum emulator that stood head and shoulders above the rest. It is still an extremely comprehensive emulator and it continues to offer a significant number of features that other emulators don't. *RealSpectrum* is a DOS emulator, however, and, one-by-one, many of its features are starting to appear in other emulators.

RealSpectrum comes in two versions - the main DOS build (*RSDOS*) for MSDOS and Windows up to 98, and a version that will run on Windows XP (*RS32*). One of the key features of this emulator is its support for a very wide range of disk interfaces, including the *Beta 128* disk interface discussed in the last chapter, *MGT's Disciple* and *Plus D* interfaces and the *Opus Discovery* interface and drive. More impressive still is its *RealDisk* support for many of these formats which allows you to access or create actual floppy disks for the system via your PC drive (although this doesn't work for *RS32*). *RealSpectrum* also supports some of the more recent developments in the DIY hardware scene such as Garry Lancaster's +3e hard disk Interface and ROMs and Sami Vehmaa's *ZXCF* compact flash interface.

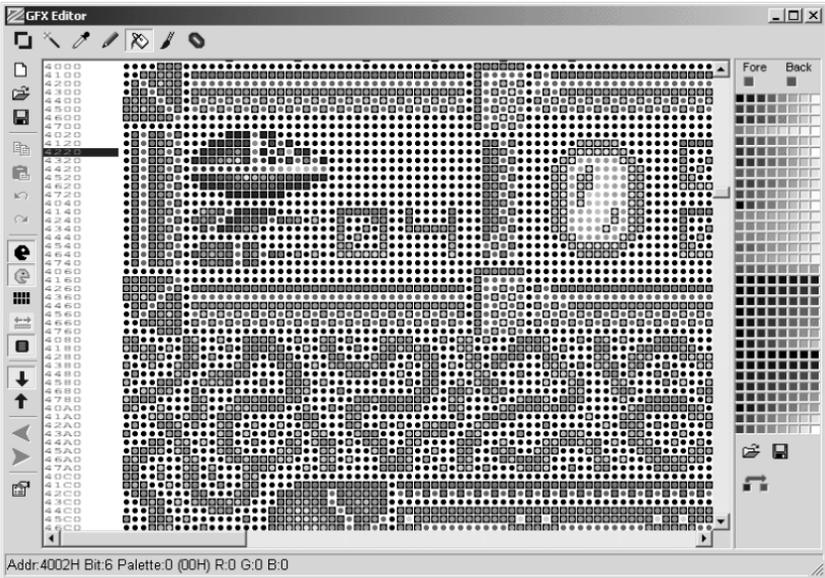
Ramsoft are currently focusing their efforts on a new, state-of-the-art program which they have promised will change Spectrum emulation completely. Currently named *RealX*, the new project is eagerly anticipated by the Spectrum community and might well



establish the *Ramsoft* team as the kings of Spectrum emulation once again.

EmuZWin

A relative newcomer to the emulation scene, *Vladimir Kladov's EmuZWin* has made its mark through its support for 256 colour games, a format first developed by *Iñigo Ayo* and *David Goti* for their own emulator *Spec256*. *Spec256* hasn't been developed

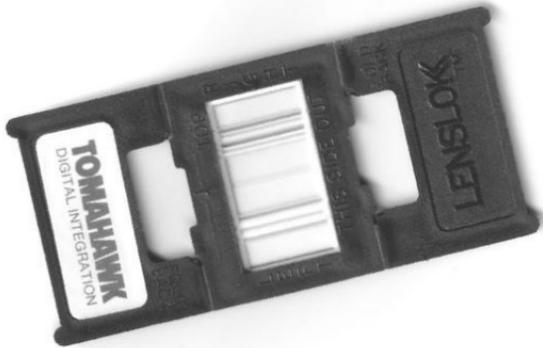


The EmuZWin GFX editor: a segment of a 256 colour rework of *Cybernoïd* is shown.

for five years now, due in part to the lack of interest in developing new 256 colour overlays (the idea is to take an existing game snapshot and then map onto it a 256 colour 'overlay' which is then substituted in for the game's original colours). *EmuZWin* has done a lot to change that, with its in-built 256 colour overlay editor; now creating new overlays is much more straightforward (in fact, a dedicated web page for 256 colour Spectrum games has been published at www.arjun.150m.com/ZX256games.html).

256 colour games is only one of *EmuZWin's* features, of course;

it also features an in-built map editor and a rather nifty menu link to an external program called *Lens Key* written by *Simon Owen*.



Lens Key is a tiny utility that decodes the optical scrambling of *Lenslok* protected games such as *Tomahawk* and *Elite*. The *Lenslok* itself was a little plastic window that was supposed to bend the jumble on screen into a legible code you then typed into the computer. *Lens Key* performs exactly the same function but, in contrast to *Lenslok*, it actually works. The utility will actually work with any emulator, but *EmuZWin* is the first to actually call it from within the emulator itself (you can pick up *Lens Key* at <http://homepage.ntlworld.com/simon.owen/lenskey/>).

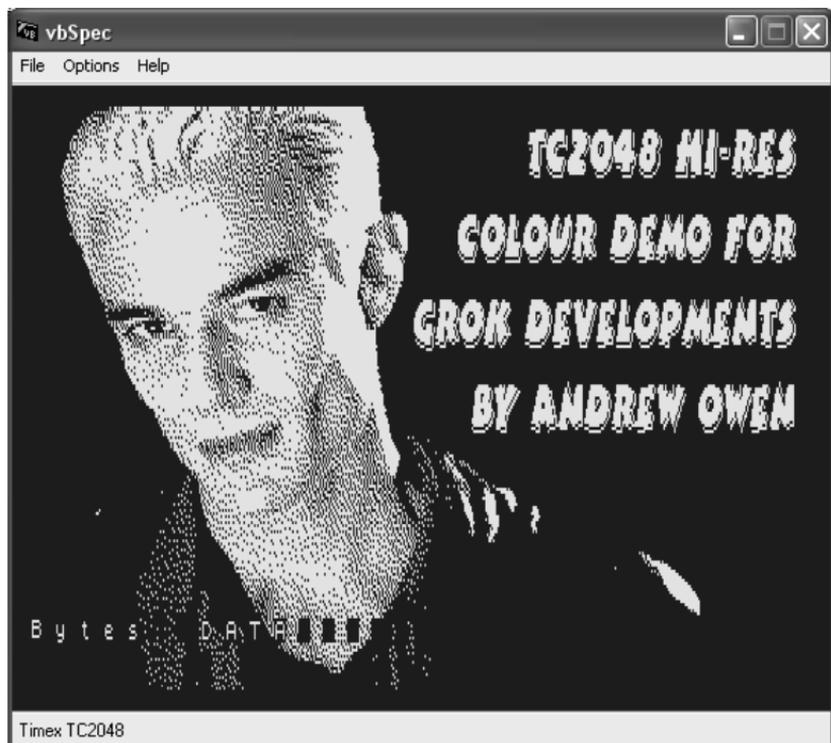
vbSpec

A lovely little emulator, *vbSpec* is the only dedicated Spectrum emulator that I know of to include support for the *Timex TC2048* alongside conventional Spectrum modes.

The what? A quick history lesson: the *Timex Sinclair* partnership was *Sinclair's* way of getting into the American market and resulted in the *TS* range of computers - the *TS1000* and *TS1500* being American versions of the *ZX81* and the *TS2068* being the American version of the *ZX Spectrum*. In fact the *TS2068* was quite an improvement on the British *Spectrum*, sporting built-in joystick ports, a cartridge port, three channel sound via an *AY* sound chip and - most impressive of all - extra video modes: one

doubled the Spectrum's horizontal screen resolution, making it much more suitable for word processing; another reduced attribute clash massively by enabling two colours per character line of eight pixels rather than just two per character. The TS2068 was released in late 1983, which of course begs the question: why weren't either of these video modes built-in to the Spectrum 128 in 1986?

The TS2068 was only compatible with about 10% of Spectrum software (a Spectrum emulator cartridge had to be plugged in to get 100% compatibility); a few have speculated that this might have been one of the reasons for its downfall. The TS2068 was



nothing like as successful as its British counterpart and was withdrawn from sale in 1984. Meanwhile *Timex Portugal* released a version of the computer - The *TC2068* - for European

use (compatible with European televisions and with a Spectrum-style edge connector where the TS2068 had used a ZX81-style connector) and a 'cut down' version without the cartridge port and AY chip called the *TC2048*. It's this latter version that *vbSpec* emulates. The *TC2048* was actually almost 100% compatible with Spectrum software. Although it didn't have the AY sound chip it *did* retain the video modes of the *TS* and *TC2068*. Very little software was produced for it, however, which is a great shame.

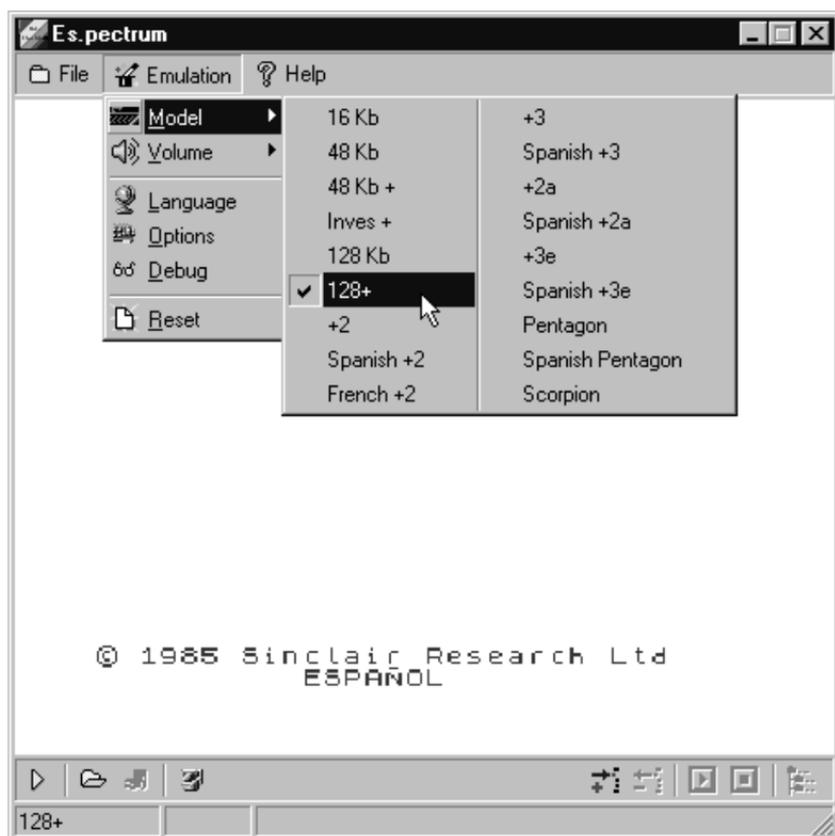
vbSpec's main claim to fame, of course, is that it's written entirely in *Microsoft Visual Basic*. Programmers, I gather, are impressed by that. The emulator was developed originally by *Chris Cowley* and is currently maintained by *Miklos Muhi*.

Also it's the only Spectrum emulator to emulate the *ZX Printer* and include the form feed button. You see, it's the little things that please me...

Es.ppectrum

Still on the subject of official Spectrum variants (as opposed to the Russian and Eastern European clones, which were entirely unofficial), it's worth mentioning also the Spanish machines. Just as Sinclair joint-ventured in the US with Timex, so it teamed up with *Investronica* in Spain. It was actually *Investronica* who developed the first Spectrum 128, which was released in Spain in 1985 - the British version wasn't released until the following year.

The Spanish 128 is pretty much identical, hardware-wise, to the British version, however it didn't use the familiar menu system of the British 128 - that was developed later. Instead it features a built-in text editor; it's not particularly complex and greatly inferior to the various word processors of the day (which is probably why Sinclair dropped it for the British version in favour of a more user-friendly interface), but it's a curiosity, nonetheless. Which brings us nicely to Spanish Spectrum emulator *Es.ppectrum* by *Javier Chocano*. In addition to all the British machines and the Russian *Pentagon* and *Scorpion* clones, *Es.ppectrum* also emu-



lates all the Spanish variants on the Spectrum also. A French version of the +2 is included too for good measure. It's certainly the biggest range of models I've seen an emulator cover.

Warajevo

No longer maintained and a DOS emulator for much older PCs than the current standard, *Warajevo* is nonetheless a highly significant Spectrum emulator. Developed in Sarajevo during the Bosnian War by *Samir Ribic* and *Zeljko Juric*, the emulator was an attempt by these two "to remove the dark thoughts" from their heads. Amidst falling grenades, sniper fire, power-cuts and very little food to eat, *Warajevo* was a lifeline to its developers

because it reminded them "of all of the times when, in [their] neighbour-hoods, the life was nice and normal". It was one of the first Spectrum emulators for the PC.

Warajevo is today a dated emulator, although it remains the only dedicated Spectrum emulator that I am aware of to support the *Timex Sinclair 2068* (the American version of the Spectrum).

X128

X128 is a DOS Spectrum emulator written by *James McKay* that supports a wide range of file types, including .TRD TR-DOS disk images and .MGT *Disciple* disk images. Like most DOS emulators, it's not happy on Windows XP, but on earlier versions of Windows it works just fine. Speaking personally, this is the emulator that seems to work for me on overstretched systems when others fail. I have a Toshiba laptop that runs Windows 98 on 16Mb RAM, for example, and *X128* seems quite at home there.

ZX32

ZX32 is a Windows Spectrum emulator by *Vaggelis Kapartzianis*. This was one of the first Windows emulators and remains a very popular, very widely used program. It hasn't actually been updated since 2000 and, as such, does not compare well on features next to the likes of *SPIN* and *Spectaculator*. As emulators go, however, it's a very straightforward and uncomplicated piece of software and I suspect this accounts for a lot of its continuing appeal.

SpecEmu

Another Windows emulator, this time by *SPIN* co-author *Woody*. *SpecEmu* supports just the British Spectrum models, loading all the associated file formats.

An emulator with a sense of humour, *SpecEmu* includes also an option to simulate the infamous audio distortion of the Spectrum

+3! 'Error emulation' is a topic that often comes up for discussion in the various on-line discussion forums such as *WoS Forums* or *comp.sys.sinclair*; it seems modern emulators are just too perfect for some to allow them to truly connect with their past. Proposed new features have included tape loading error emulation and interface wobble emulation. So you see, there's plenty left to do in the emulator scene!

Appendix I

Key websites

The number of websites dedicated to the ZX Spectrum is... big. Here, then, are a few of the coolest corners of the Spectrum's cyber-community.

World of Spectrum

The cornerstone of the Spectrum community. An immense archive of games, emulators, utilities, magazines and more. A very active discussion forum.

www.worldofspectrum.org

SinclairFAQ

A remarkable knowledgebase covering many, many aspects of the Spectrum and its community, from emulators to weblinks to technical information. So much more, in fact, than a mere FAQ.

www.sinclairfaq.com

raww.org

The best site for Spectrum news on the net, updated very regularly and drawing from a wide range of sources - everything from emulators to demo scene events.

<http://raww.org>

SinclairFAQ

Frequently Asked Questions

Welcome to SinclairFAQ, an online repository for all Sinclair-related FAQ documents. Here, we aim to provide you with the answers to virtually any question you may have about many Sinclair products. If you have any difficulty finding the information you need, please [contact us](#) and we'll try to help, or will pass your inquiry to someone that can assist you.

Several external mirrors of each included FAQ may exist - please check each document for a current list of alternate locations. A complete version of this site is available to download for use offline. In addition, offline versions of each individual FAQ may also be available - please check the 'Versions' section of each, or follow the links on the introductory page where provided.

Sinclair FAQ Documents:

Please select one of the FAQs from the list below.

- [alt_binaries.comp.sinclair.FAQ](#)
This document is not currently hosted by SinclairFAQ. Please contact us if you would like to see it included.
- [comp.sys.sinclair](#)
The comp.sys.sinclair FAQ is the first in a series of revised and republished documents to be made available directly from the SinclairFAQ site. Many entries are new or revised, and much of the old content has been updated, corrected or removed with this release. Please read each section carefully and let us know if there are any errors in the current version, or if you feel something is missing.
- [comp.sys.sinclair.Folklore.FAQ](#)
The definitive guide to the people and chat generally found on comp.sys.sinclair. Not really a FAQ, more of an A-Z instead. Tch, eh?
- [SE Basic - Pending](#)
A FAQ and guide to SE Basic is currently in development, and will be available here shortly. Please read the [SE Basic Reference](#) page at the World of Spectrum in the interim.
- [Sinclair.QL](#)
The link provided will direct you to the current version of the QL FAQ. If you can contribute any information, please contact us or the current maintainer with your entry. You will be credited for your submission if it is used.
- [MK-14, ZX80, ZX81 and Jupiter Ace](#)
The links provided will direct you to the current version of these FAQs. If you can contribute any information, please contact us or the current maintainer with your entry. You will be credited for your submission if it is used.

/* #id: index.html,v 1.4 2004/03/25 00:34:53 neuro Exp \$ */
Hosting for the primary SinclairFAQ site kindly provided by Martijn van der Heide.

Demotopia

The Spectrum demo scene produces some of the most breathtaking graphics, music and animations ever seen on the Spectrum. You won't believe your eyes. *Demotopia* is your gateway to it all.

www.zxdemo.org

The Tipshop

A vast on-line database of hints, tips, pokes and maps for over two-and-a-half thousand Spectrum titles.

www.the-tipshop.co.uk

Planet Sinclair

All things Sinclair, from radios to the Spectrum to the TV80 flat-screen TV to the C5 electric car.

www.nvg.ntnu.no/sinclair/

Magazines

World of Spectrum now hosts an immense collection of magazine scans, including *Crash*, *Your Sinclair*, *Sinclair User*, *Sinclair Programs* and *MicroHobby* magazine for Spanish users. But there's also the website versions of the 'big three' to browse:

Crash www.crashonline.org.uk

Your Sinclair www.ysrnry.co.uk

Sinclair User www.sincuser.f9.co.uk

Retrospec

Not exactly a *Spectrum* website; actually it's a website for remakes of old games from a number of different 'vintage' platforms. As the name suggests, however, many of these were either Spectrum games originally or Spectrum game inspired. You won't believe what you can download for nothing here.

<http://retrospec.sgn.net/>

ZXF magazine

Shameless self-plug here. ZXF, in case you didn't know, is my PDF magazine covering all of the goings on in the Spectrum world today. It's published every April, August and December. And it's free. You can pick it up from the ZXF website, where there are other on-line features to explore too.

www.cwoodcock.co.uk/zxf

Appendix II

Key documents

The assumption I've made throughout this book is that you're well able to operate a ZX Spectrum; you just need a little help with the PC emulators. Bearing in mind it might be nearly twenty years perhaps since you last used a Spectrum, I suppose that might not actually be a valid assumption at all. It matters not, for there is plenty of original Sinclair documentation to be found on the web which will refresh your memory of all the various BASIC and DOS commands.

The information below should serve as a handy guide. For much more in-depth and up-to-date lists, consult these pages also:

www.sinclairfaq.com/cssfaq/resources/documents.htm

www.worldofspectrum.org/documentation.html

www.madhippy.com/8-bit/index.php?machine=sinclair

Spectrum manuals

48K Introduction booklet

www.worldofspectrum.org/ZXSpectrumIntroduction/

48K Spectrum manual

www.madhippy.com/8-bit/sinclair/zxspecman/

128K Introduction booklet

www.worldofspectrum.org/ZXSpectrum128Manual/

Spectrum +3 manual

www.madhippy.com/8-bit/sinclair/zxspec3man/index.html

Disk interface manuals

ZX Interface 1 and Microdrive manual

www.madhippy.com/8-bit/sinclair/zxif1micro.html

Beta 128 Disk Interface manual (TR-DOS)

www.madhippy.com/8-bit/sinclair/betadisk/manual.txt

MGT Plus D manual

ftp://ftp.worldofspectrum.org/pub/sinclair/technical-docs/MGTPlusD_Manual.zip

Opus Discovery manual

ftp://ftp.worldofspectrum.org/pub/sinclair/technical-docs/OpusDiscovery_Manual.rtf

Other peripheral manuals

ZX Printer manual

www.madhippy.com/8-bit/sinclair/zxprinter/index.html

Multiface 1 manual

www.madhippy.com/8-bit/sinclair/multiface1.html

Multiface 128 manual

www.madhippy.com/8-bit/sinclair/multiface128.html

Multiface 3 manual

ftp://ftp.worldofspectrum.org/pub/sinclair/technical-docs/Multiface3_Manual.txt

Currah μ Speech manual

www.madhippy.com/8-bit/sinclair/microspeech.html

Appendix III

comp.sys.sinclair

These days, the forums section of the *World of Spectrum* website is probably the main on-line area for Spectrum related discussion and debate. But before *WoS Forums* the *comp.sys.sinclair* newsgroup was the number one Spectrum cyber hang-out. It's still a very busy place today too, of course, although be prepared that conversation is just as likely to focus on the crisps, sweets, fizzy drinks and TV programmes of the 1980s as it is Sinclair computers!

CSS has been around since December 1993, and in this time it's grown its very own culture and terminology. Did you know, for example, that:

chuntey is the mystical aura surrounding your Spectrum whilst you load in a game? Disruption of the chuntey by, for example, the switching on of a local electrical appliance or by your mother waking into the room is highly likely to result in an 'R Tape loading error'.

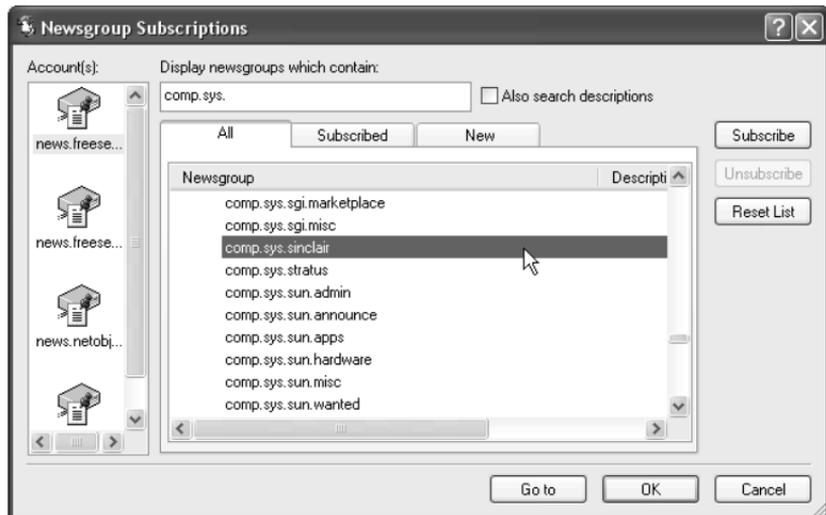
cheatingbastness is the term applied to computers very obviously and shamelessly cheating in order to bring about your demise. Never ever allow the computer to roll the dice in Sinclair's *Backgammon*, for example.

The *comp.sys.sinclair Folklore FAQ* expands on these and many other terms, and forms a part of the Sinclair FAQ at www.sinclairfaq.com.

The largest part of the Sinclair FAQ, in fact, is the main

comp.sys.sinclair FAQ. Not so much an FAQ about CSS as it is an FAQ about Sinclair stuff *by* CSS members, the main page nevertheless does give you some important information which you should read through before posting yourself. CSS is a strictly text only newsgroup, for example, so please don't attach any files to your posts or post in HTML.

If you've never accessed a newsgroup before and don't understand what this is all about, you should be pleasantly surprised to learn that you can use plain old *Outlook Express* - the Windows email program - to read newsgroup messages. You can also get dedicated 'newsreader' programs, but if you're new to all of this *Outlook Express* is probably the easiest place to start. Newsgroups, incidentally, predate the web by many years (for example, *net.micro.zx* was a newsgroup for the Spectrum - actually *for* the Spectrum - set up in 1982), which is why they are primarily text based.



Your ISP (internet Service Provider) should provide the newsgroup access for you that allows *Outlook Express* to connect to groups like *comp.sys.sinclair* - actually ISP newsgroup access

does tend to vary from ISP to ISP, but most do provide access to CSS (where it tends to vary is in access to the *binary* newsgroups such as *alt.binaries.comp.sinclair*). In *Outlook Express*, choose *Tools > Newsgroups* and type *comp.sys.sinclair* into the box that appears. Then it's simply a matter of selecting the group and clicking on 'subscribe.' The newsgroup should now appear in the main Folders panel; click on it, and up come the messages.

For any newsgroup, there are a few netiquette niceties you should be aware of before making your first post. First off all, don't 'top-post'; when making a reply to someone else's post, put your comments *below* the bit of their post you're replying to. Don't quote enormous chunks of text from others' posts - just include the bits relevant to your reply. Don't 'cross-post' your message (post to more than one newsgroup at the same time) unless it's absolutely relevant to all the groups included. And don't type your messages all in capital letters.

Just in case your ISP *doesn't* provide newsgroup access (also sometimes referred to as *Usenet* access), you can still get to CSS via Google's *Google Groups* archive on the web. Simply visit www.google.com and type 'comp.sys.sinclair' into the search box, then click on 'Groups' and hit the 'Google Search' button. The Google Groups archive goes back years and years and years (you can even search *net.micro.zx* if you want to) and you can search it in exactly the same way that you search the web with Google, so this is an immensely rich and valuable information source. If you've got a question to ask it's always worth checking Google Groups first - the chances are fairly good it's already been asked and answered (possibly several times over).

The CSS community do do other things besides talking about Rolos. There's the annual *comp.sys.sinclair Crap Games Competition*, for example, which is always hosted (on a web site) by a CSS member. A celebration of the appalling quality of the contents of the *Cascade Cassette 50* games compilation, CSS-CGC has been running since 1996 and resulted in some quite dreadful games. The titles quite often speak for themselves:

The Amazing Tony Blair Experiment
Fuel Protest 2000
Lying Minesweeper
Advanced Weapons Inspector Simulator
Chuckle Brothers Golf

The *Crap Games Competition* is now such an established event it even has its own web ring! You can check it out at <http://r.webring.com/hub?ring=crapgameswebring>.

And then there's the annual *Speccy Games Tournament*, for which a number of classic games are chosen by the group and played by entrants to see who can score the highest. Competitors record and submit an RZX file (see chapter 4), so there's no possibility of cheating!

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BACK TO THE SPECTRUM!

More than twenty years on from its original release, the best-selling Sinclair ZX Spectrum is now one of the most emulated computers in the world. Far from dead, a thriving community of enthusiasts has kept the spirit of this little machine alive through an enormous range of emulators for just about every modern computer platform there is. For the PC in particular, the complexity of these emulators is simply amazing.

With the rise in interest in retro-gaming, the Spectrum community is starting to grow again as more and more one-time Spectrum owners come back to their computing roots to rediscover the 8 colours and 48K that somehow captured their imagination back in the 1980s. If you are one of these people then this book is for you.

Focusing primarily on the two most popular Windows emulators, *Spectaculator* and *SPIN*, *The ZX Spectrum on your PC* explains all the main features of these programs. Illustrated walkthroughs teach you everything from how individual cassettes are emulated to how to print from your virtual Spectrum. In no time at all you'll find yourself enjoying all the old games and activities of your youth... on your PC!

The Author

C. Woodcock is the editor of *ZXF* magazine. He has also written several articles on the ZX Spectrum for *Micro Mart* magazine.

