

SINCLAIR ZX SPECTRUM: 30 years of amusement and learning

Josetxu Malanda
16th June 2012
Nonick 012, Bilbao



THE ANCESTORS OF THE ZX SPECTRUM

The Sinclair ZX 80

Launch date: February 1980

CPU: NEC780-C @ 3,25Mhz (copy of a Zilog Z80A)

ROM: 4 KB (including BASIC interpreter)

RAM: 1 KB (upgradeable to 16 KB)

Sound: none

Resolution: 24x32, no color

Price: 99,95 GBP (or 79,99 GBP in kit form)

Units sold: 20.000 units by September 1980



The Sinclair ZX 81

Launch date: March 1981

CPU: Zilog Z80A @ 3,25Mhz

ROM: 8 KB (including BASIC interpreter)

RAM: 1 KB (upgradeable to 16 KB)

Sound: none

Resolution: 24x32, no color

Price: 69,95 GBP (or 49,99 GBP in kit form)

Units sold: 300.000 units by January 1982



The Sinclair ZX Spectrum

Launch date: 23 April 1982

Codename: ZX82

Price: 125 GBP (16 KB) or 175 GBP (48K)

Units sold: 8.000.000 units

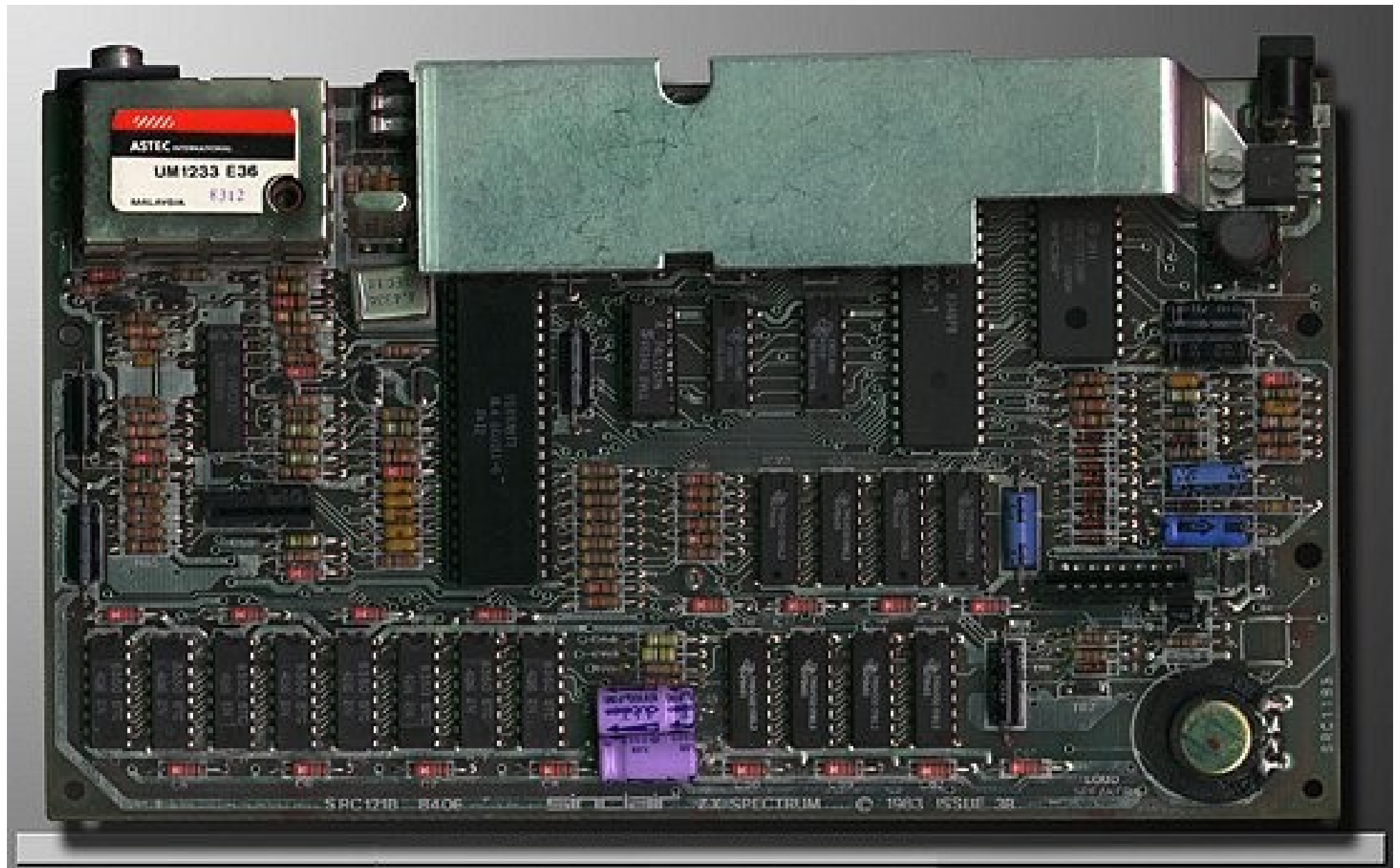


THE ZX SPECTRUM TECHNICAL SPECIFICATIONS

The outside view



The inside view



The generic components

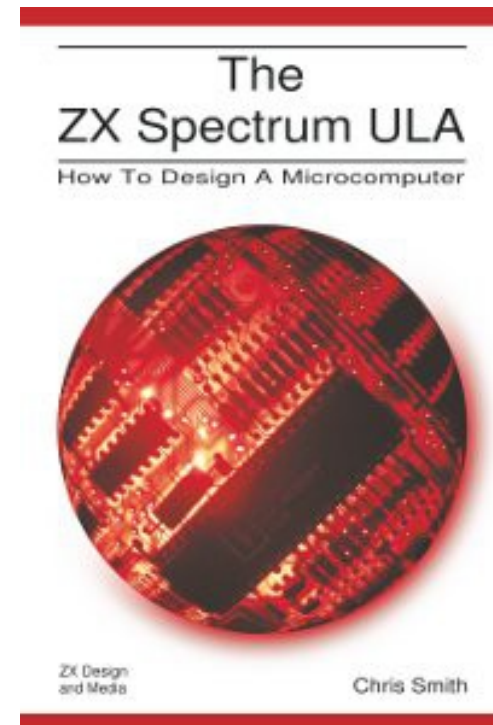
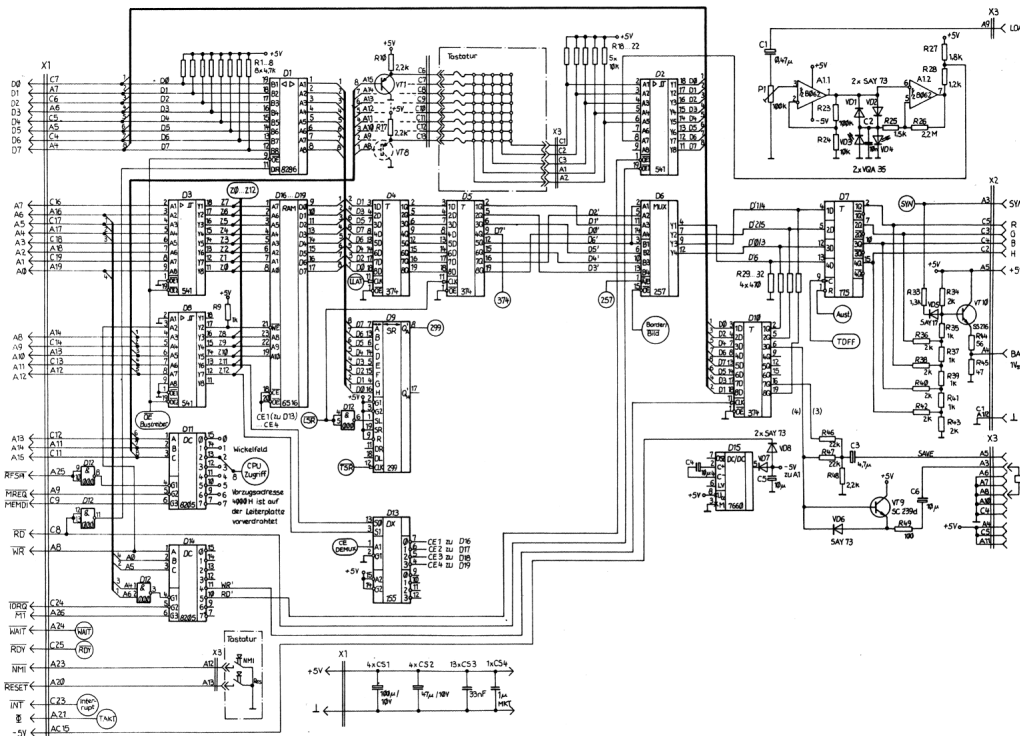
- CPU: Zilog Z80A at 3,5 Mhz
- Memory:
 - 16 KB ROM: Operative system and BASIC interpreter
 - 16 or 32 KB RAM
- Sound: 1-bit loudspeaker
- Connectors:
 - an expansion port for increased RAM, communication devices, the ZX Printer, drives (such as the Sinclair Microdrive) or access directly to the Z80A microprocessor
 - 54-pin male edge connector
 - an RF output socket - standard TV aerial type
 - an earphone jack (used for reading programs from cassette) - 3.5mm jack socket
 - a microphone jack (used for writing programs to cassette)
 - 3.5mm jack socket
 - a power supply socket - 9V DC @ 1.2A

And...

The ULA chip



The ULA is the core of the ZX Spectrum. It performs the role of video generator, CPU clock generator, memory access governor, keyboard controller, cassette I/O and speaker controller.



The video display

Video memory is shared with RAM memory

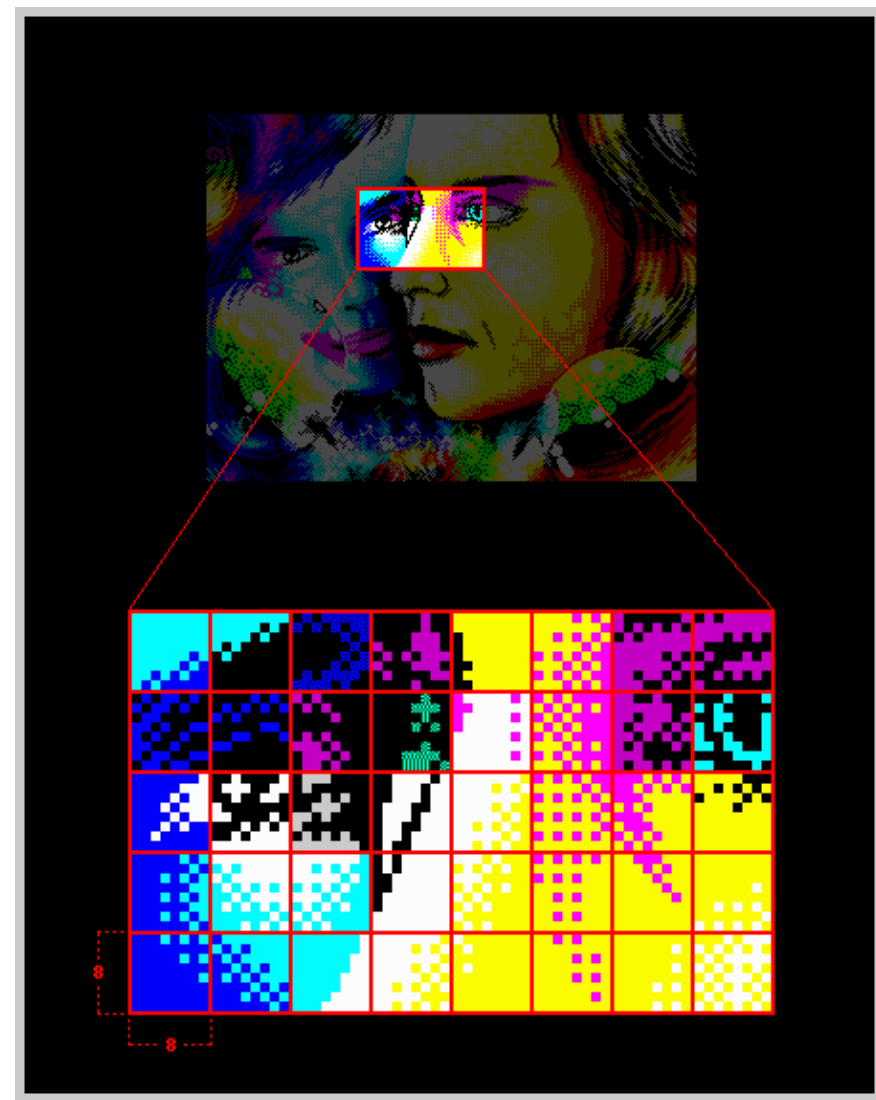
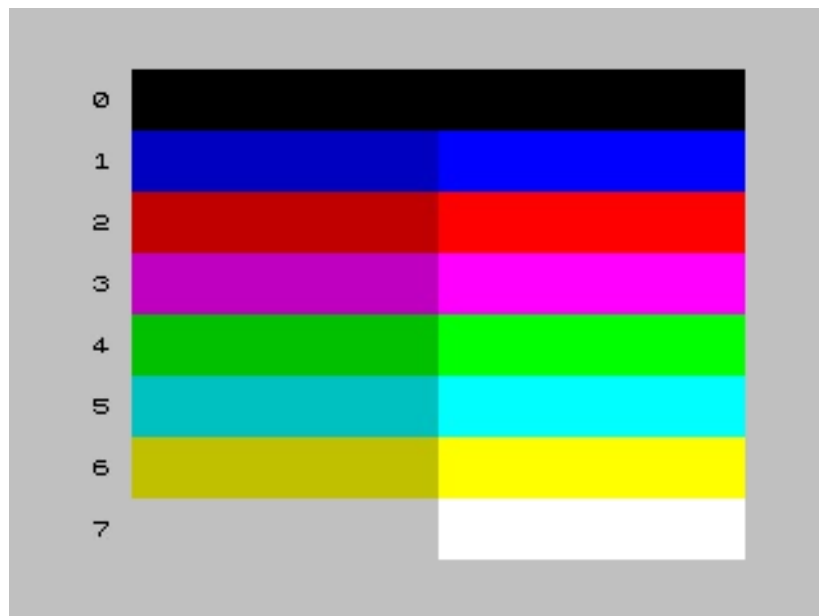
Less than 7 KB needed:

$$6912 \text{ bytes} = ((256 \times 192) / 8) + 32 \times 24$$

Pixel resolution: 256 x 192 pixels

Color resolution: 32 x 24 (8 bytes high and 1 byte wide)

Palette: 16 colors (8 different colors and their corresponding BRIGHT ones – well, Black is the same)



Attribute clash

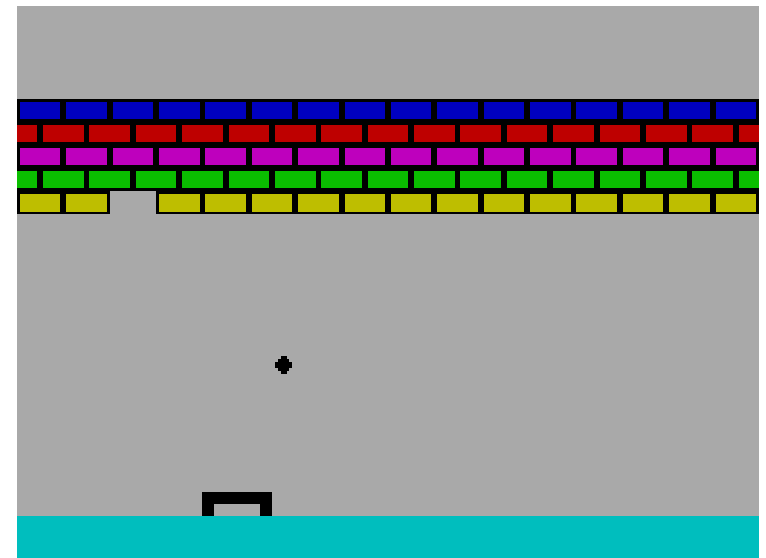
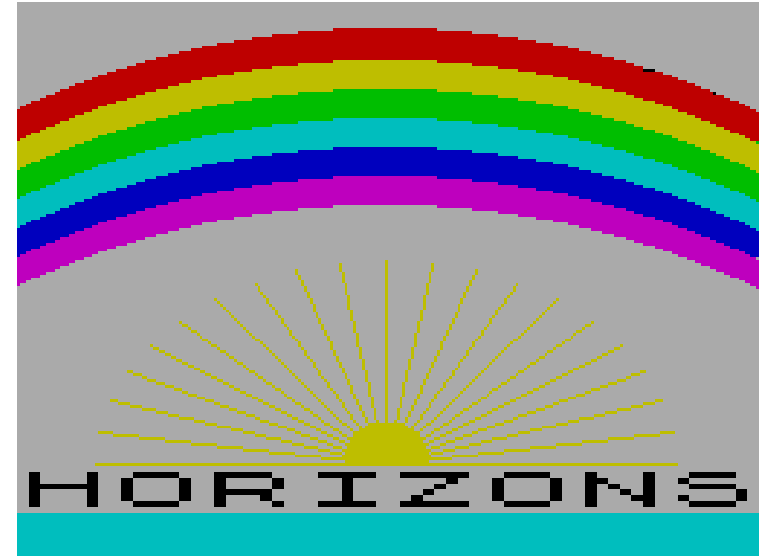
The expansion port

- Joystick interfaces: Kempston, Sinclair...
- Printers: ZX Printer...
- Interface 2 Roms
- Disk drives: Microdrives, Disciple, Divide...
- Light pen
- Modem
- Spectranet: ZX Spectrum connected to internet!



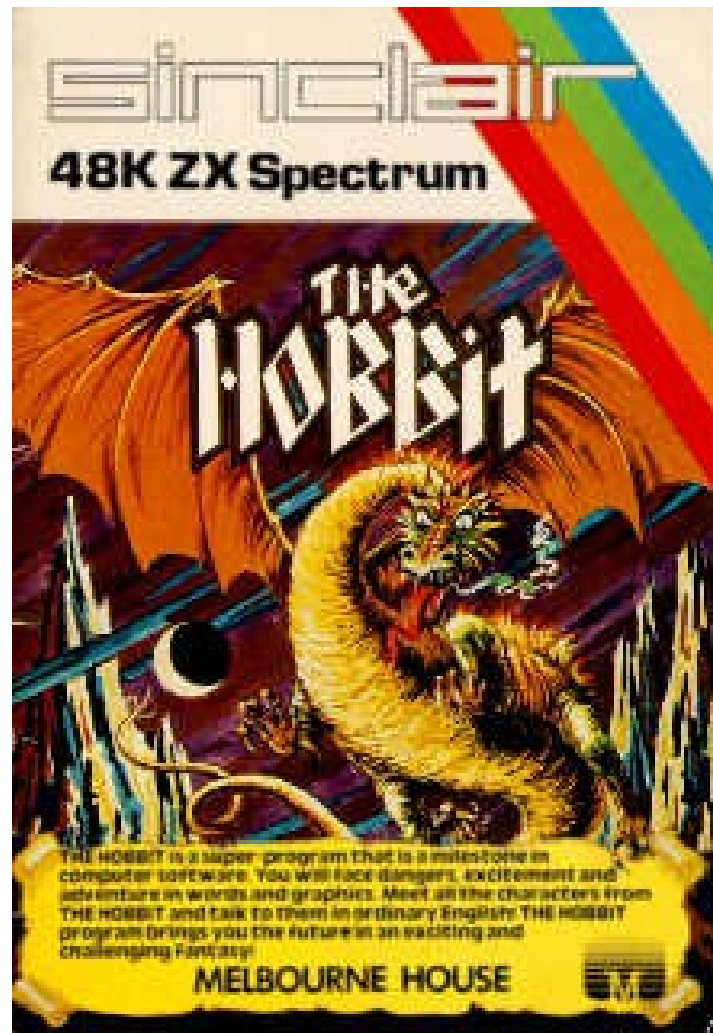
REMARKABLE GAMES FOR THE ZX SPECTRUM

Horizontes (Sinclair Research Ltd, 1982)



The Hobbit

(Melbourne House, 1982)



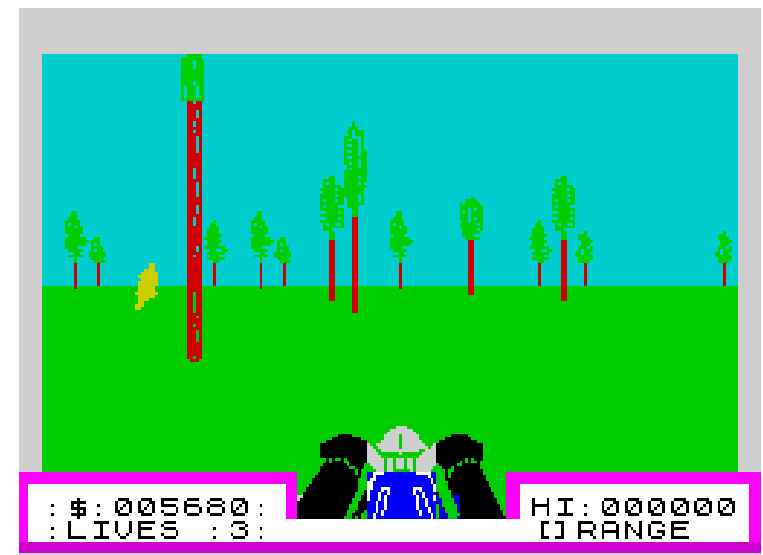
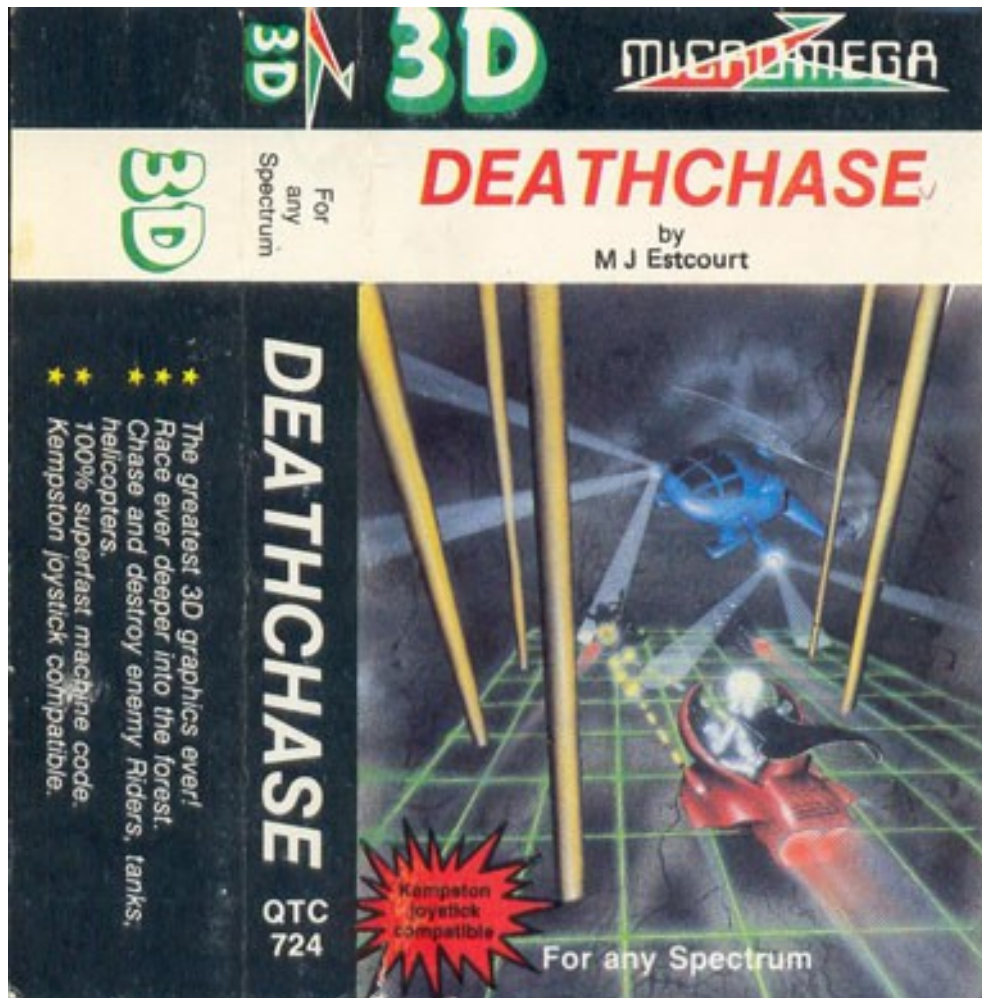
Manic Miner

(Bug-Byte Software Ltd, 1983)



Deathchase

(Micromega, 1983)



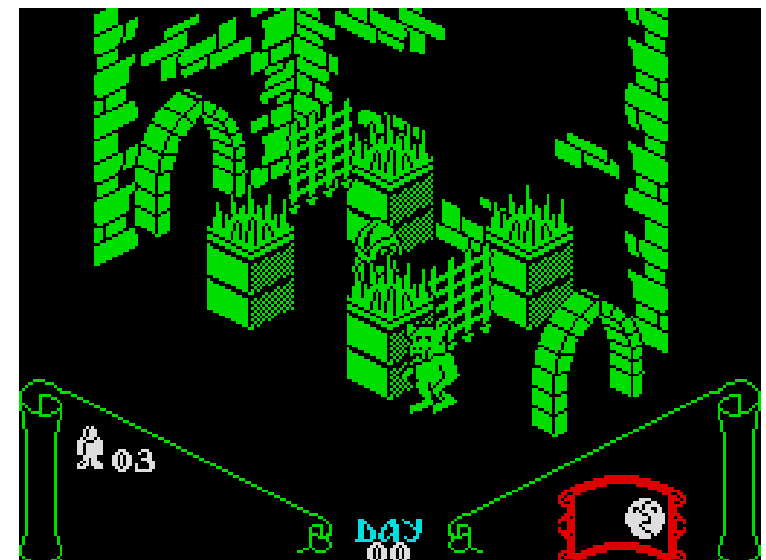
La Pulga

(Investrónica S.A., 1983)



Knight Lore

(Ultimate Play The Game, 1984)



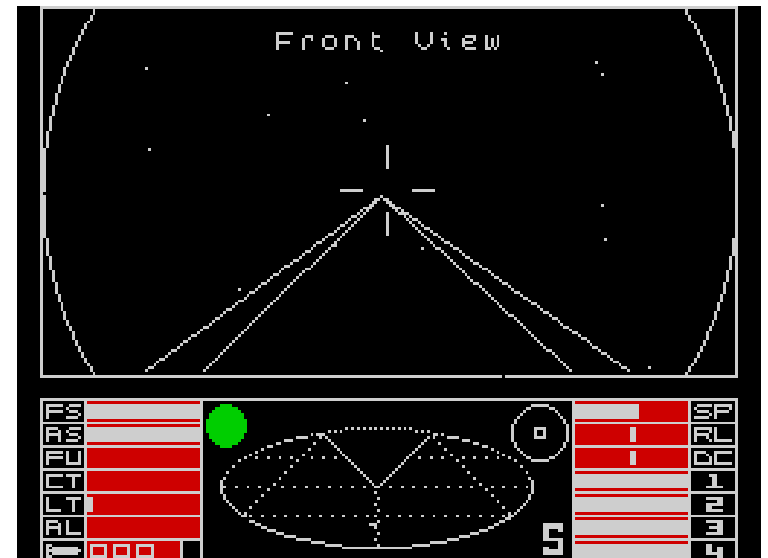
Hyper Sports

(Imagine Software Ltd, 1985)



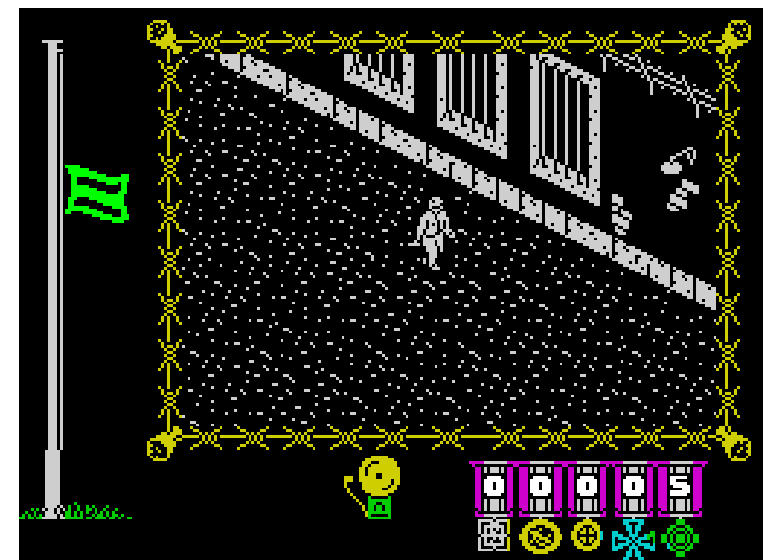
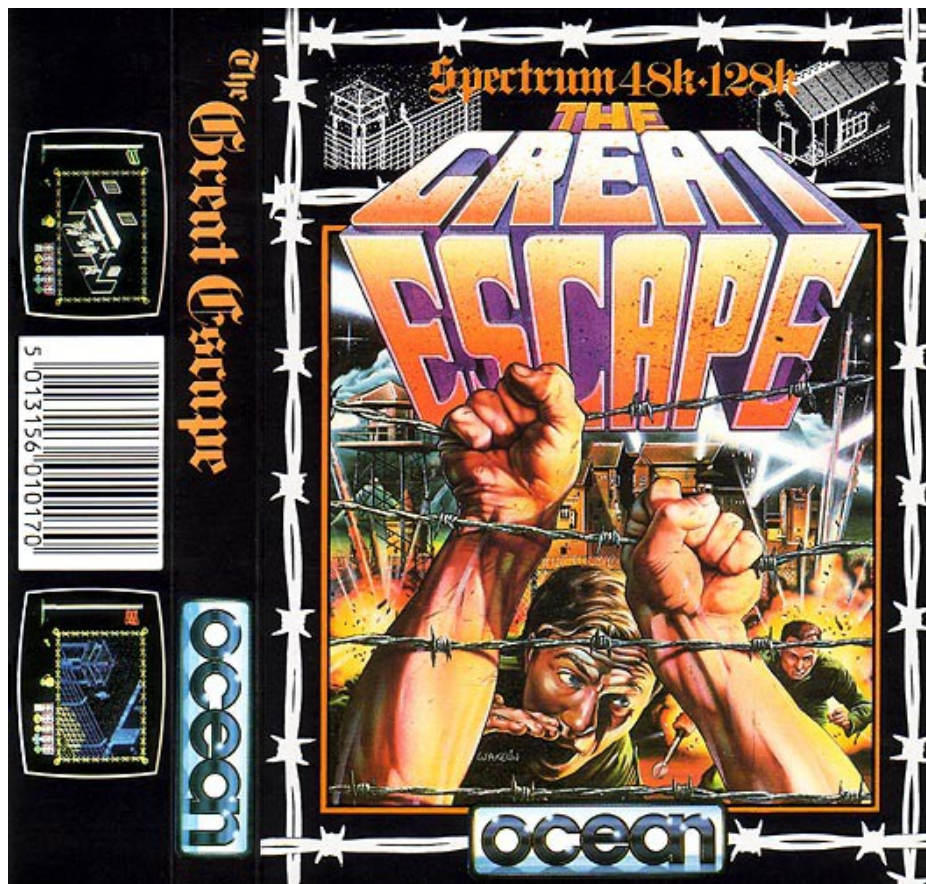
Elite

(Firebird Software Ltd, 1985)



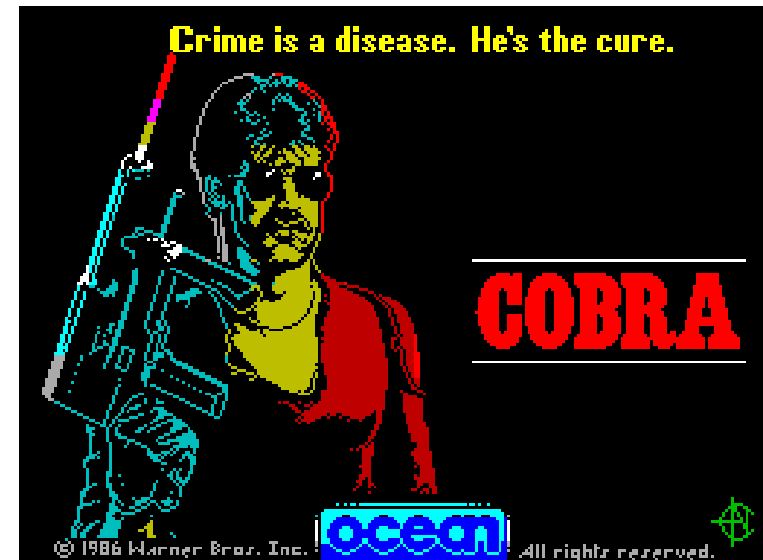
The Great Escape

(Ocean Software Ltd, 1986)



Cobra

(Ocean Software Ltd, 1986)

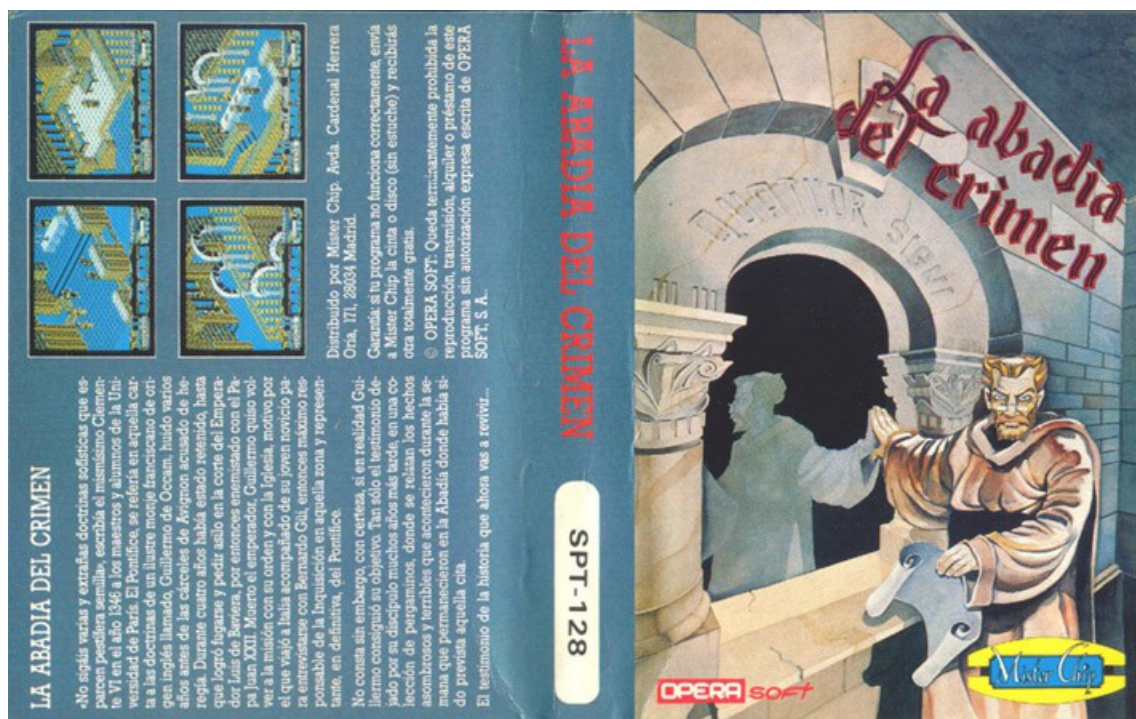


Head Over Heels

(Ocean Software Ltd, 1987)

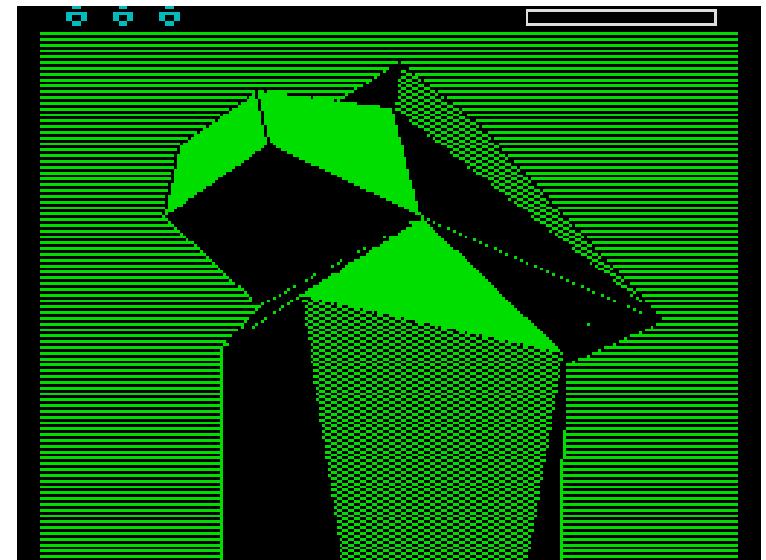


La Abadía del Crimen (Opera Soft S.A., 1987)



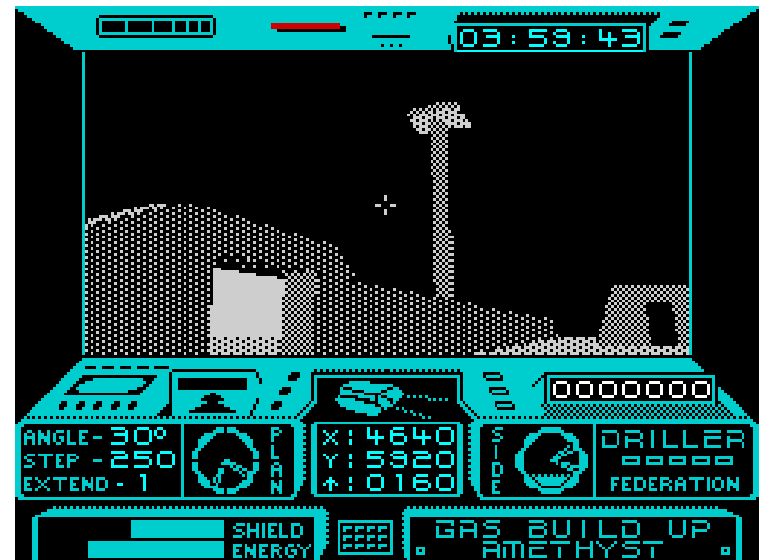
The Sentinel

(Firebird Software Ltd, 1987)

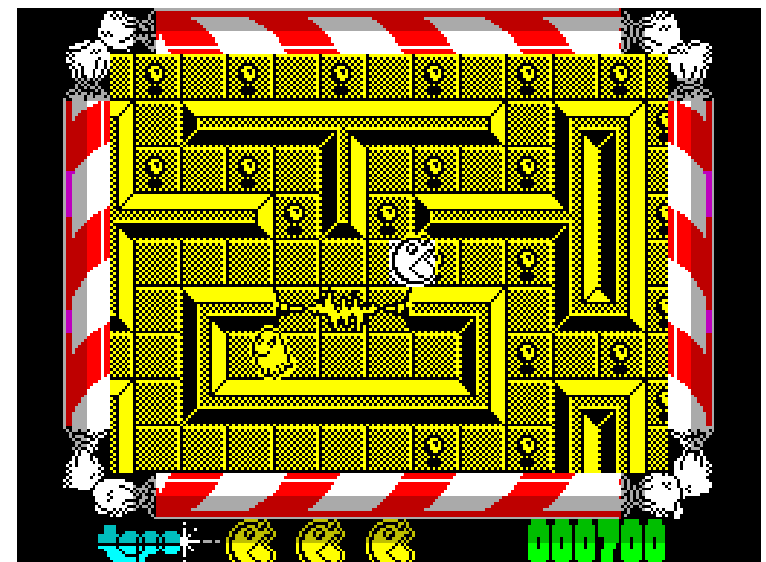


Driller

(Incentive Software Ltd, 1987)

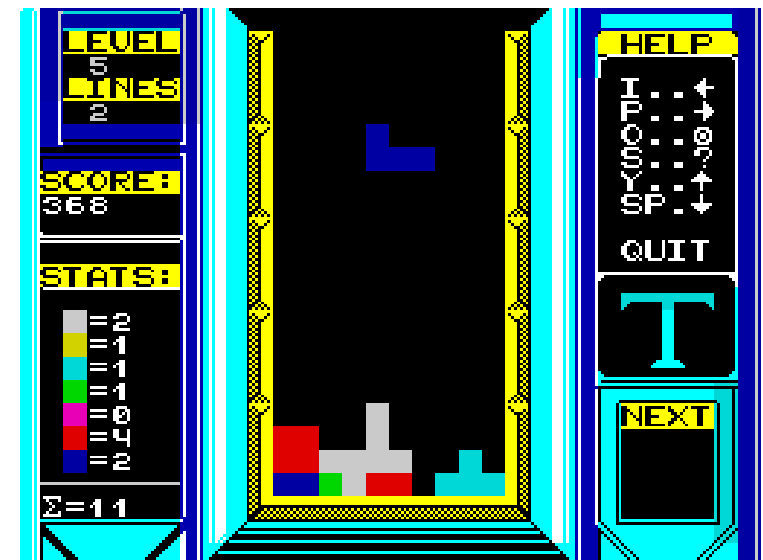


Mad Mix Game (Topo Soft, 1988)



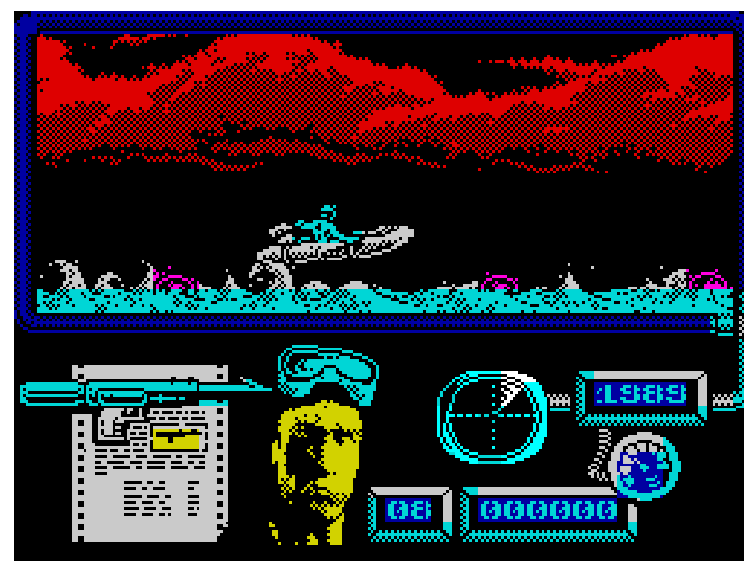
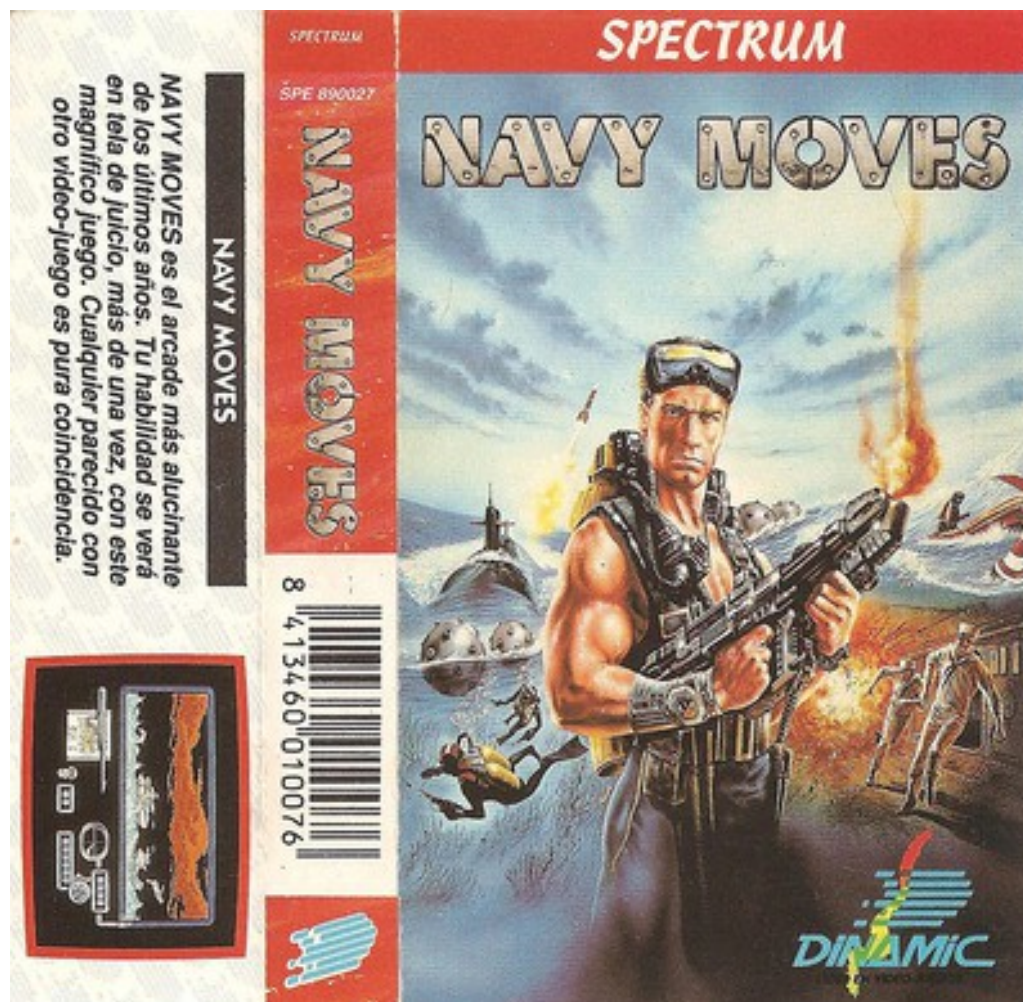
Tetris

(Mirrorsoft Ltd, 1988)



Navy Moves

(Dinamic Software, 1988)



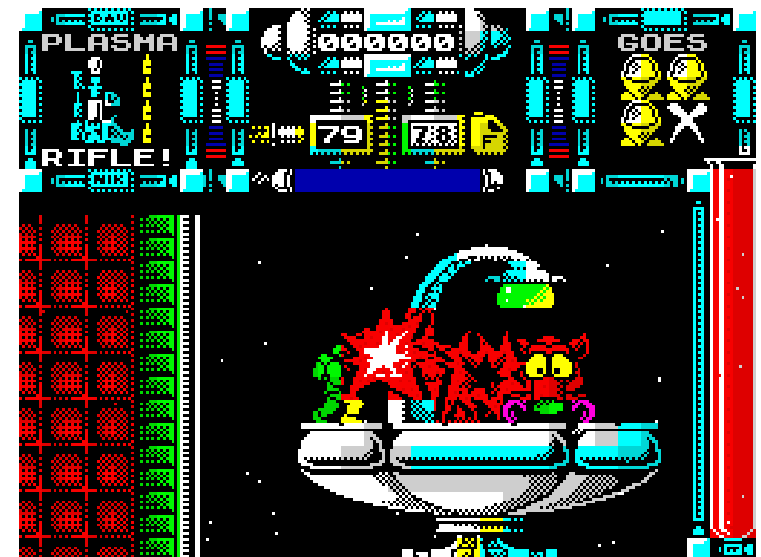
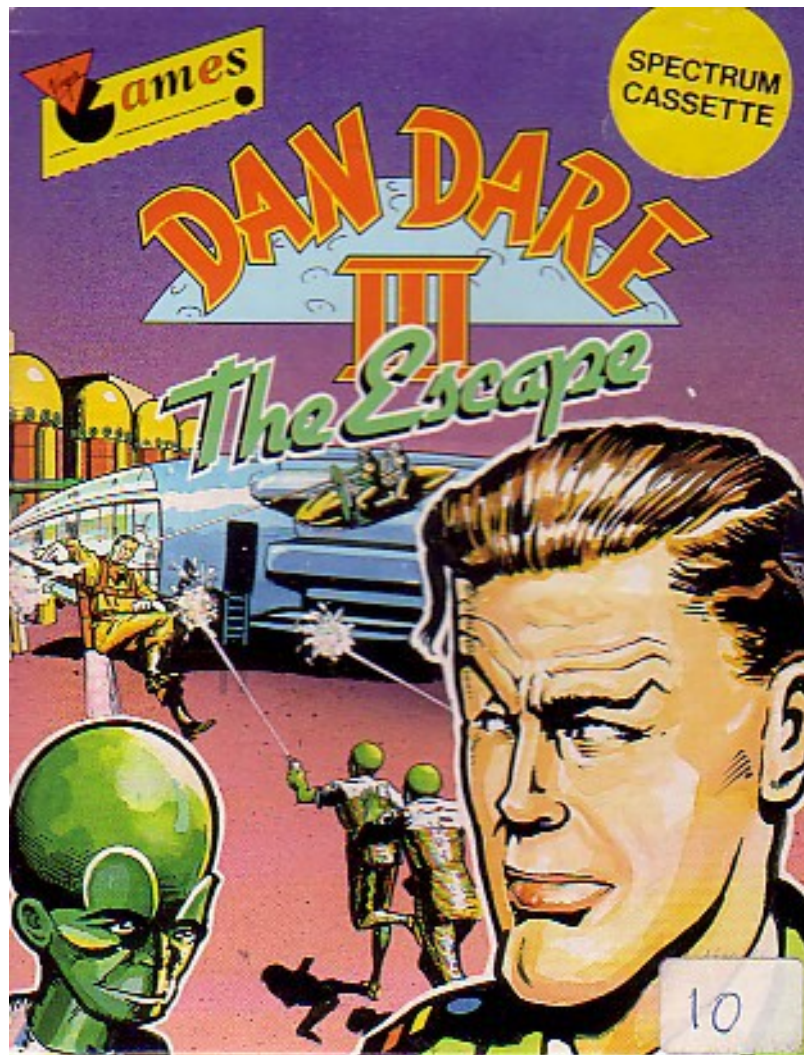
La Aventura Original

(Aventuras AD S.A., 1989)



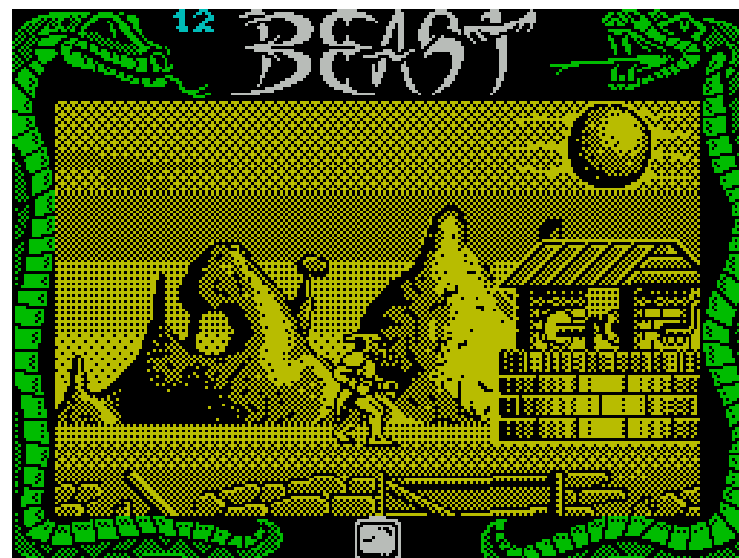
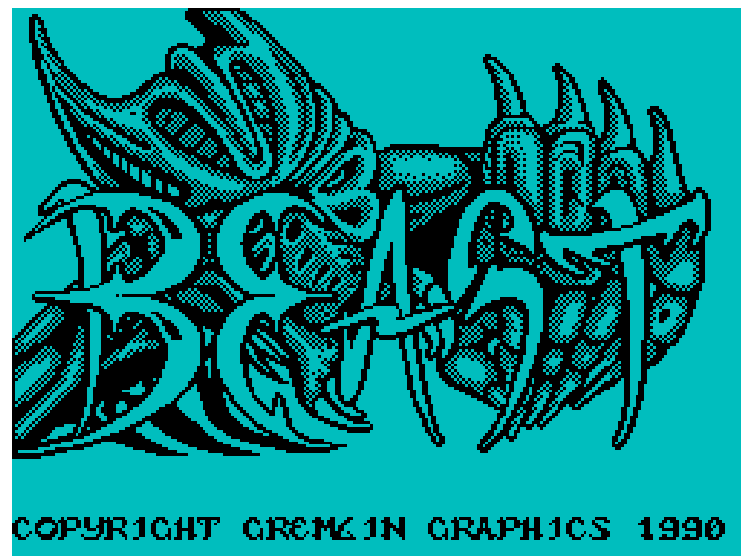
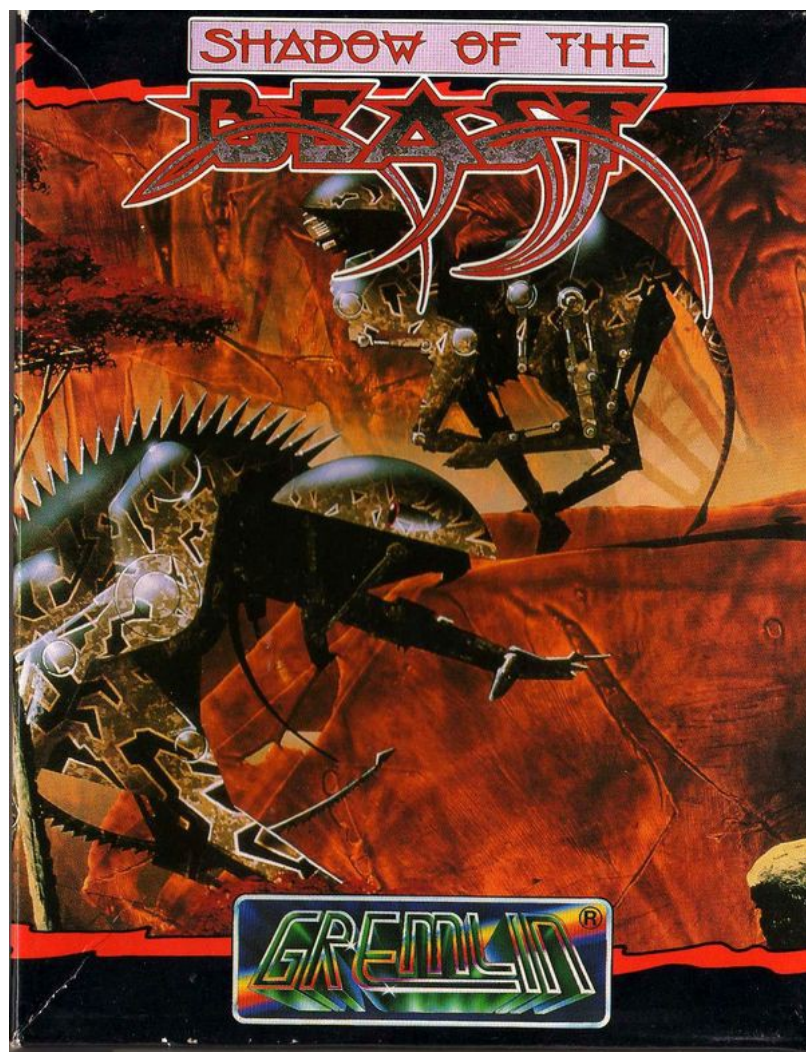
Dan Dare III

(Virgin Games Ltd, 1990)

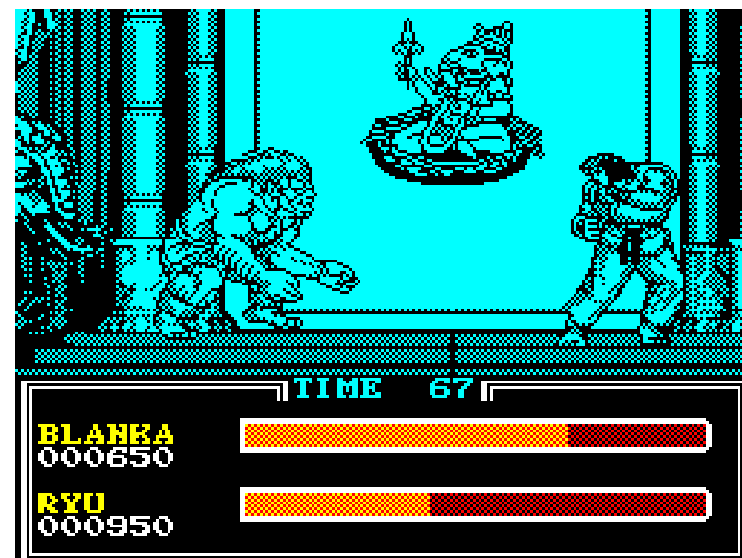


Shadow of the Beast

(Gremlin Graphics Software Ltd, 1990)



Street Fighter II (Go!, 1993)

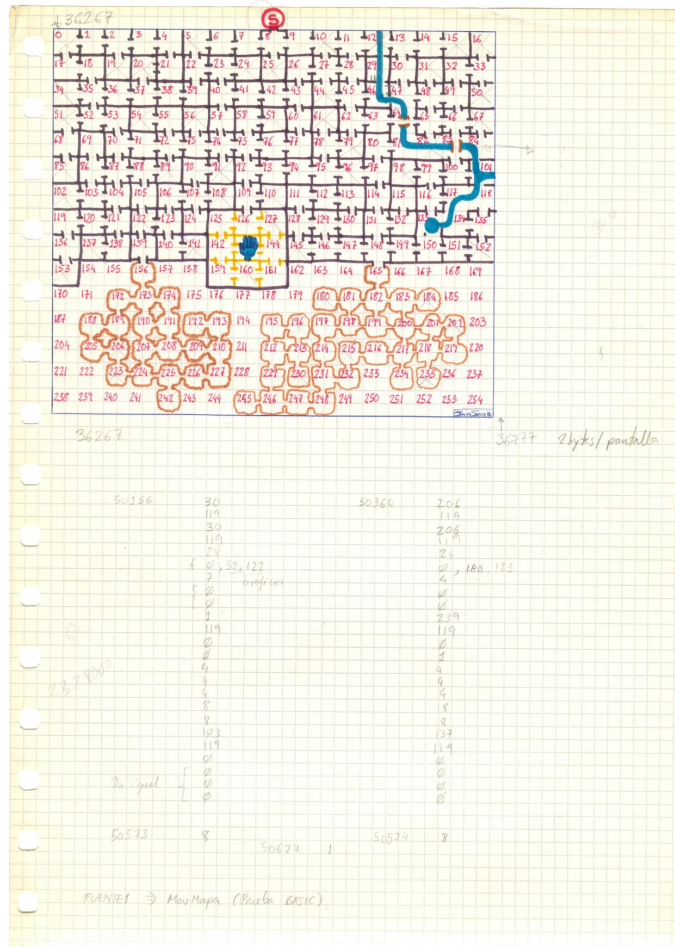


DEVELOPMENT TOOLS:

How to develop
the ZX Spectrum

A notebook

(preferably graph paper with 8x8 squares)



A real ZX Spectrum

Built-in BASIC interpreter

```
110>BORDER 5: PAPER 5: INK 1: 0
VER 0: FLASH 0: CLS
120 GO SUB 4000
130 REM Grd EFFECT: CAMPIGNE
140 BORDER 4: PAPER 4: INK 6: 0
VER 0: FLASH 0: CLS
150 GO SUB 5000
160 REM LAST EFFECT: POTPOURRI
170 BORDER 0: PAPER 0: INK 7: 0
VER 0: FLASH 0: CLS
180 GO SUB 6000
9999 STOP
1000 FOR a = 0 TO 78
1010 LET b = RND% 128
1020 PLOT 0, a: DRAW b, 0
1030 PLOT 255, a: DRAW -b, 0
1040 PLOT 0, 175 - a: DRAW b, 0
1050 PLOT 255, 175 - a: DRAW -b,
0
1060 BEEP 0.005, a / 2
1070 NEXT a
1080 PRINT AT 10, 7; FLASH 1; "G
```

K

A real ZX Spectrum

3D Construction Kit, 3D Game Maker, Arcade Game Designer,
Platform Game Designer, Shoot-Em-Up Designer



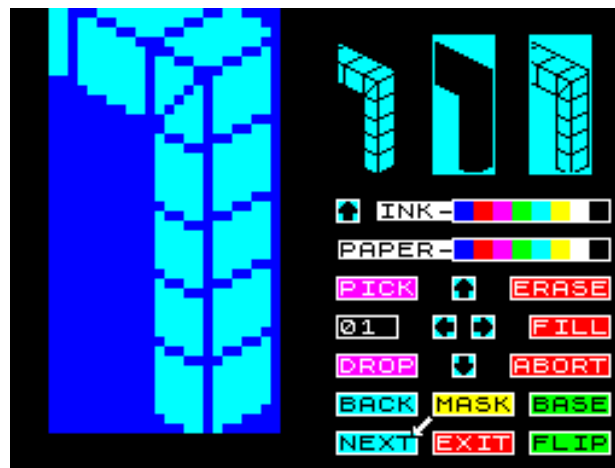
```

V1.1                               Memory:23745

      Arcade Game Designer

B. Blocks
O. Screen layouts
mm. Events
T. Sounds
G. Save game
X. Keys
L. Load game
M. Map
N. Sprite positions
S. Sprite images
T. Text
W. Window area
X. Test game

© 2008 Jonathan Cauldwell
  
```



A real ZX Spectrum

Compiled BASIC:

HiSoft Basic Compiler, Mcoder, HiSoft Colt Compiler

```
HiSoft BASIC version 1.0  
Copyright © 1986 Cameron Hayne
```

```
HiSoft COLT COMPILER v1.0  
© 1985 Hodgson and Threlfall  
The compiler is invoked by  
RAND USR 60000.
```

```
Your BASIC is compiled to  
locations 40000 upwards.
```

```
Compiler error messages follow  
standard SINCLAIR practice of ?
```

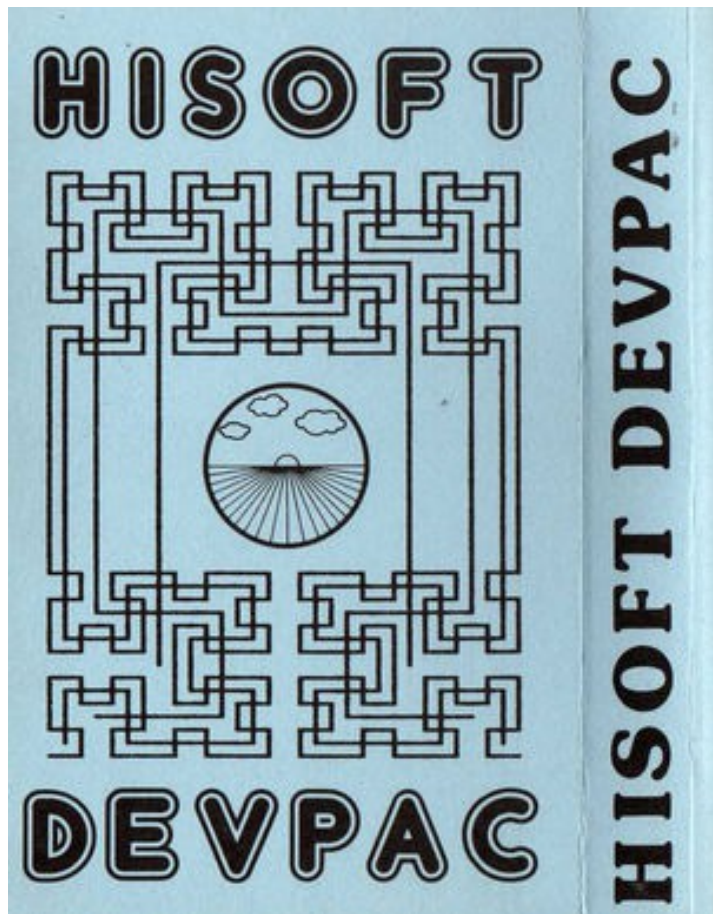
```
Errors when the program is  
running are given in the  
SPECTRUM users manual.
```

```
To run a correctly compiled  
program use RAND USR 40000
```

```
COMPILER NOW LOADING
```

A real ZX Spectrum

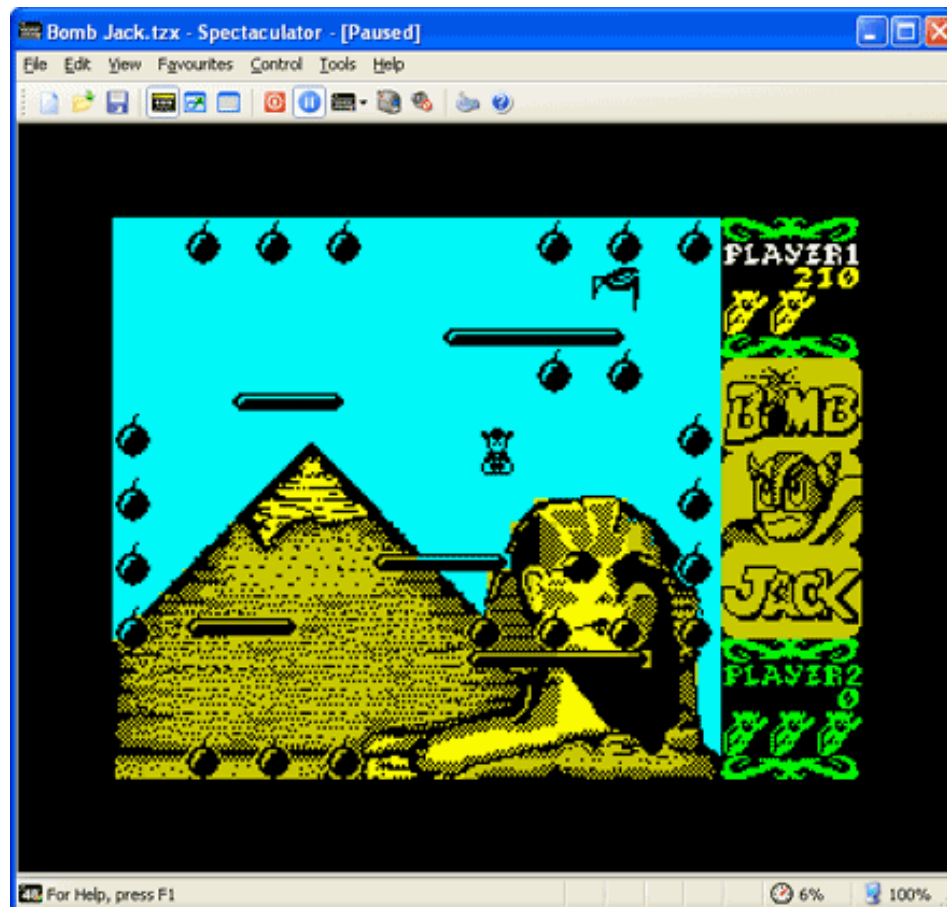
Assembler:
HiSoft DevPac (Gens & Mons)



```
Bytes: GENS3M  
Buffer size? 20000  
Copyright © HISOFT 1983  
All rights reserved  
  
> LABEL  
Pardon?  
> 10  
> 30 : INPUT  
> 40 PUSH HL  
> 50 ADD HL, HL  
> 60 PIP BC  
> 70 REY  
> 0
```

Personal computers

Emulators:
Spectaculator, ZX Spin, FUSE



Personal computers

Compiled BASIC: ZX Basic



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translate

Seleccionar idioma

Con la tecnología de Google

General

- » **About**
About the ZX BASIC SDK
- » **ChangeLog**
A reduced list of changes/bugfixes
- » **Installation**
How to install the ZX Basic SDK in your system, and prerequisites for doing so.
- » **SDK tools**
Tools available in the SDK.
- » **Command line options**
Command line options table for the compiler (zxb)

Download

Get the latest version of ZX BASIC from the [archive](#).

Tutorials

- » **Programming tutorials**
A collection of third-party tutorials about development with ZX BASIC.
- » **Sample programs**
Sample programs you can try to see what ZX BASIC looks like and how fast it runs.
- » **Game examples**
Some little games examples.

Help & Support

- » **Community Forum**
Have a question? Need help or comment a report a bug? Go to the [ZX BASIC forum](#)

External resources

- » Here you are **external resources**: other tools, IDEs, graphic designers and projects related to ZX BASIC. Have a look!

Products

- » **Released programs**
A list of third-party released programs (mostly games) for the ZX-Spectrum developed with ZX BASIC.

Language Reference

- » **Language syntax**
Language Syntax is very close to the original Sinclair BASIC, but it's expanded and enhanced.
- » **Data types**
Language data types: Instead of working always with Floating Point numbers (also available), there are also some integer types which are faster and take less memory.
- » **Reserved words**
Comprehensive list (alphabetically ordered) of identifiers you shouldn't use as a *variable name*. E.g. FOR, PRINT. If you want usage instructions on a statement, also look here.

External libraries

- » **Library**
Library of functions and subroutines you can use in your programs. You might find them really useful.

Inline assembler

Embedding inline assembler in your code is pretty easy.

Compiler Internals

Only for true hackers: This explains how the compiler does its job, how to expand it, etc. You must be a bit crazy if you enter here...

Other Architectures

ZX Basic was designed from the base as a Retargetable Compiler, so it should be not hard to extend it to other architectures. This is **work in progress**. See [Other Architectures](#) for more info.

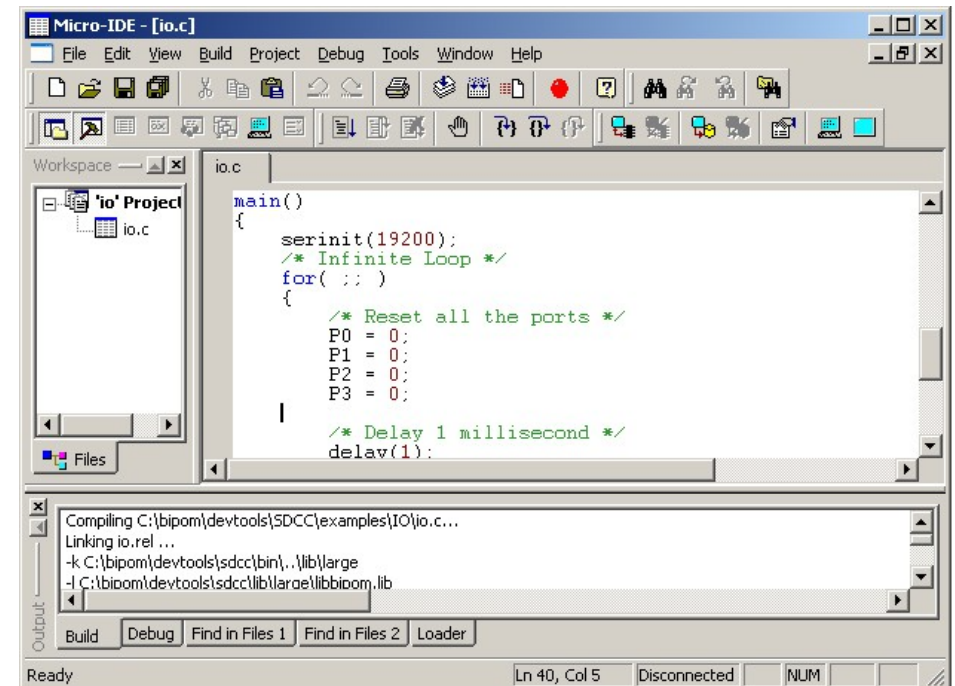
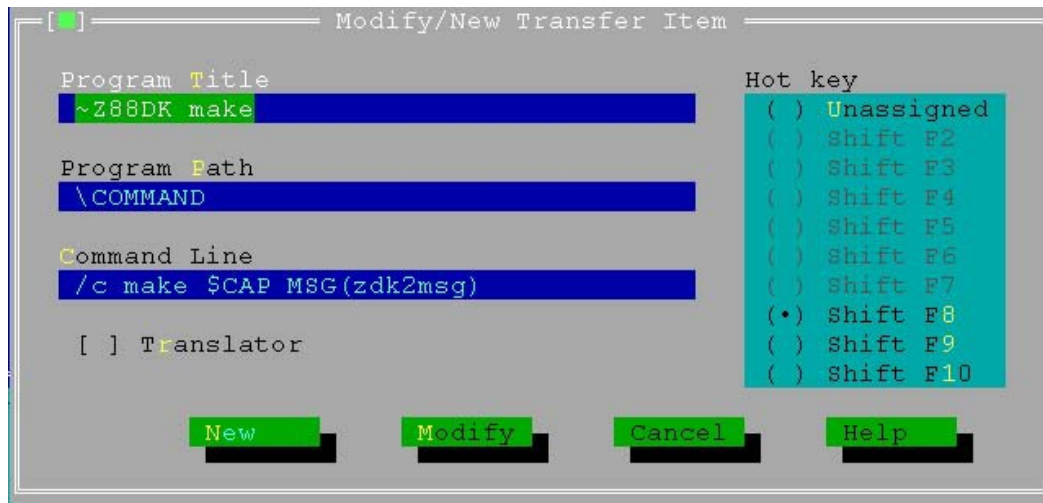


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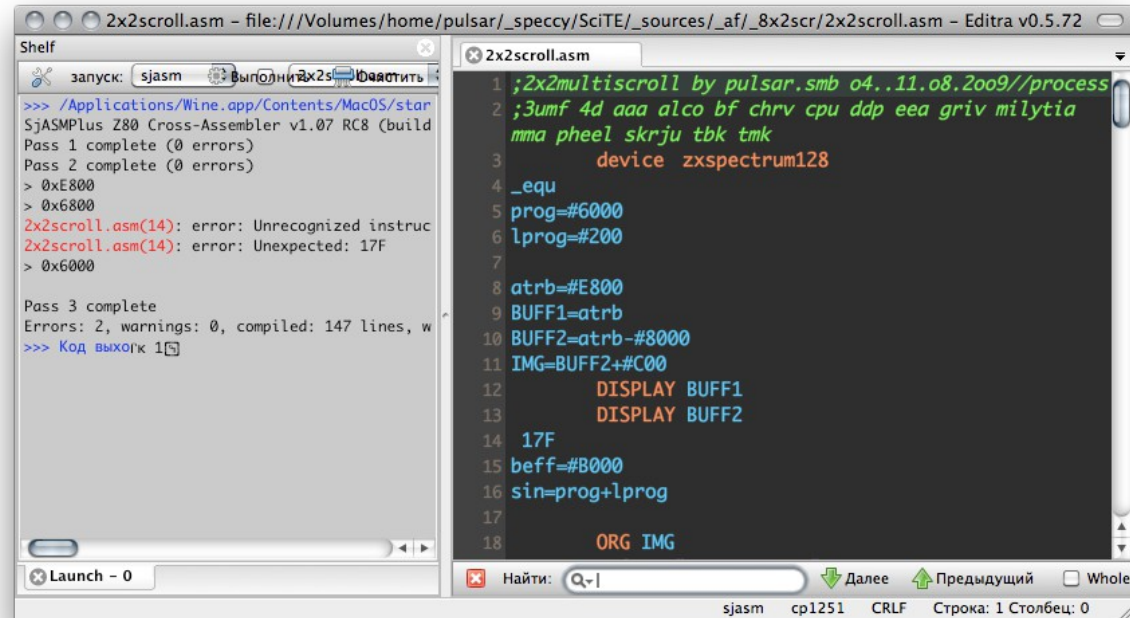
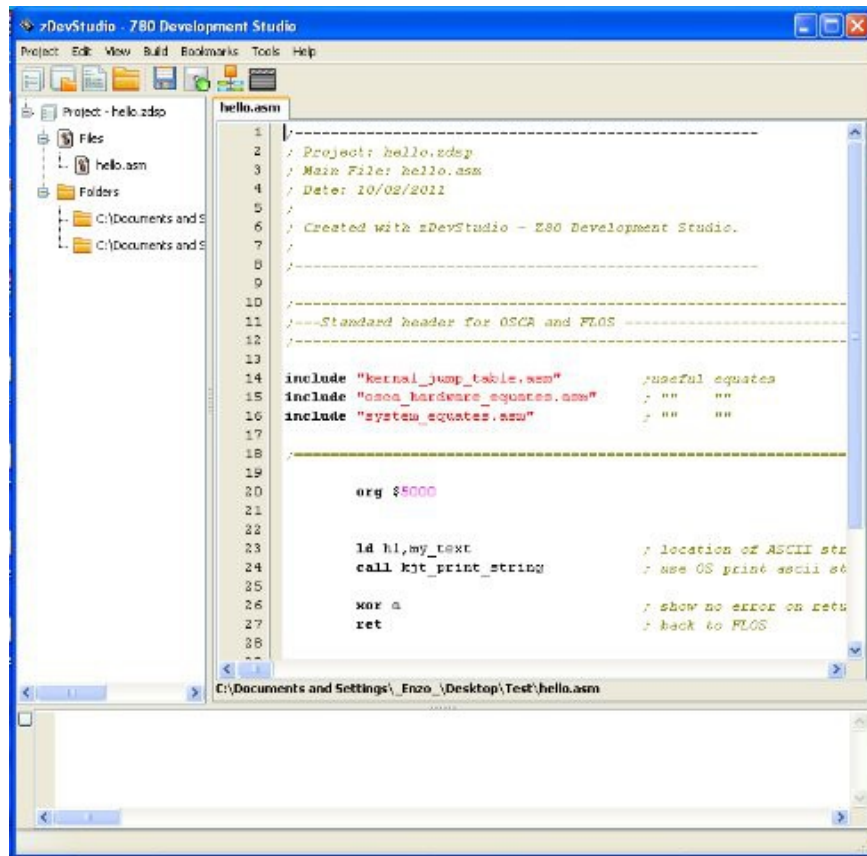
Personal computers

C:
z88dk, SDCC



Personal computers

Assembler:
Pasm, SjASMPPlus...



NEED MORE INFORMATION?

The World of Spectrum

<http://www.worldofspectrum.org>

Speccy.org forums
(for Spanish users)

<http://www.speccy.org>

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