

Ozmoo

## **Ozmoo**

*A Z-machine interpreter for the Commodore 64* and similar computers

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# Chapter 1

## Overview

Ozmoo is a redistributable interpreter of Z-code games - Infocom games and games written in Inform, ZIL or Dialog. Ozmoo can be used for new interactive fiction works on the Commodore 64 and similar computers. While the old Infocom interpreters are still available, the license situation is not clear so it is risky to use in new work, especially commercial. Furthermore, some of the newer Inform-based games use features which the old Infocom interpreters on the C64 can't handle. Ozmoo is written to provide a free alternative that doesn't have these risks and limitations.

Ozmoo was originally only developed for the Commodore 64, but it is structured so that it is fairly easy to retarget Ozmoo to computers with similar architecture. Apart from Commodore 64, Ozmoo can currently target the Commodore 128, Commodore Plus/4 and Mega65 computers. There is also a fork of Ozmoo for the Acorn computers (BBC Micro and other variants).

## Features

Ozmoo for the Commodore 64 supports:

- Z-code version 3, 4, 5 and 8. Essentially this covers all games except for the very first (hard to find) versions of Zork I and II and the Infocom games with graphics.
- Fitting a lot more text on screen than Infocom's interpreters - This is done by using all 40 columns, smart wordwrap and a MORE prompt which uses a single character.
- Embedding a custom font. Currently two fonts are included in the distribution, plus some versions for Swedish, Danish, German, Italian, Spanish and French. And you can supply your own font.
- Custom alphabets in Z-machine version 5 and 8.

- Custom character mappings, allowing for games using accented characters. Comes with predefined mappings for Swedish, Danish, German, Italian, Spanish and French.
- Custom colour schemes.
- A fully configurable secondary colour scheme (darkmode) which the player can toggle by pressing the F1 key.
- A configurable splash screen which is shown just before the game starts.
- Up to ten save slots on a save disk (and most games will get the full ten slots).
- Writing a name for each saves position.
- Building a Z-code game without virtual memory. This means the whole game must fit in RAM at once, imposing a size restriction of about 50-52 KB. A game built this way can then be played on a C64 without a diskdrive. This far, save/restore does require a diskdrive, but there may be a version with save/restore to tape in the future. Also, a game built in this mode doesn't support RESTART.
- Building a game as a d81 disk image. This means there is room for any size of game on a single disk. A d81 disk image can be used to create a disk for a 1581 drive or it can be used with an SD2IEC device or, of course, an emulator. Ozmoo uses the 1581 disk format's partitioning mechanism to protect the game data from being overwritten, which means you can safely use the game disk for game saves as well, thus eliminating the need for disk swapping when saving/restoring.
- Using an REU (Ram Expansion Unit) for caching. The REU can also be used to play a game built for a dual disk drive system with just one drive.
- Adding a loader which shows an image while the game loads.

## Limitations

Ozmoo should be able to run most Z-code games, regardless of size (A Z-code game can be up to 512 KB in size). However, there are some limitations:

- A Z-code file always starts with a section called dynamic memory. Ozmoo on the Commodore 64 can't handle games with more than roughly 35 KB of dynamic memory.
- If you want to run Ozmoo on a system with a single 1541 drive (or an emulation of one), the part of the game file that is not dynamic memory can be no larger than 170 KB. This typically means the game file can be about 190 KB in size.
- Some Inform 6 games and pretty much all Inform 7 games are too slow to be much fun on a Commodore 64. In general Infocom games, PunyInform games and modern-day ZIL games work the best. Inform 5 games and early Inform 6 games (typically using library 6/1 or 6/2) often work well too.

## Chapter 2

# Quickstart

The simplest option is to use Ozmoos Online, a web page where you can build games with Ozmoos without installing anything on your computer. It supports most of the options Ozmoos has. Ozmoos online is located at: <http://microheaven.com/ozmoosonline/>

The other option is to install Ozmoos on your computer. This can be done on Windows, Linux and Mac OS X. To build a game, you run something like “`ruby make.rb game.z5`” Add `-s` to make the game start in Vice when it has been built.

## Dependencies

You need to install:

- Acme cross-assembler
- Exomizer file compression program (tested with 3.0.0, 3.0.1 and 3.0.2)
- Ruby (Tested with 2.4.2, but any 2.4 version should work fine)
- The Vice C64/C128/Plus4 emulator, or the Xemu MEGA65 emulator

### Windows

Acme can be downloaded from SourceForge: <https://sourceforge.net/projects/acme-crossass/>

Exomizer can be downloaded from Bitbucket. The download includes binaries for Windows: <https://bitbucket.org/magli143/exomizer/wiki/browse/downloads>

Get WinVice from SourceForge: <http://vice-emu.sourceforge.net/windows.html>

You can get Ruby from RubyInstaller: <https://rubyinstaller.org/>

## Linux

Acme is available on Debian/Ubuntu with:

```
> sudo apt install acme
```

Exomizer can be downloaded from Bitbucket and compiled:

```
> cd src
> make
```

Vice is available on Debian/Ubuntu with:

```
> sudo apt install vice
```

Note that you have to supply the ROM images (kernal, basic, chargen, dos1541) under `/usr/lib/vice` to make x64 (the C64 emulator) run. See VICE instructions for more details.

Ruby is available on Debian/Ubuntu with:

```
> sudo apt install ruby
```

## Customizing the make script

Edit the file `make.rb`. At the top of the file, you need to specify paths to the Acme assembler, Exomizer, the Vice C64 emulator, and the program “`c1541`” which is also included in the Vice distribution. If you are using Windows, you can ignore the section on Linux and vice versa.

## View all commandline options for make.rb

At a command prompt, type “`ruby make.rb`”

## The basic way to build a game

At a command prompt, type “`ruby make.rb mygame.z5`”

## Build a game which will only consist of a single file

At a command prompt, type “`ruby make.rb -P mygame.z5`” to build a game which will only consist of a single file. A game created in this way does not require a disk drive to play.



## Build a game with optimized preloaded virtual memory data

Use these steps to build a game with optimized preloaded virtual memory data which will make the game as fast as possible at startup:

1. At a command prompt, type “`ruby make.rb -o -s mygame.z5`”
2. Play the game, performing the actions you think the player is likely to do first. Keep playing until the game halts, printing a report with lots of numbers. (You can also end it and get the report earlier by typing `xxx`)
3. In Vice, select Edit -> Copy from the menu
4. Create a text file (let's say you call it `mygame_optimization.txt`), paste the complete text you just copied from Vice into the file and save it.
5. At a command prompt, type “`ruby make.rb -c mygame_optimization.txt mygame.z5`”

## Chapter 3

# Targets

Ozmoo was originally written for the Commodore 64, but has been adapted for some other computers as well. `make.rb` takes a `-t:target` argument to build for other computers, and currently supports these platforms:

Target	Comment
<code>-t:c64</code>	Build Ozmoo for the Commodore 64 (default)
<code>-t:c128</code>	Build Ozmoo for the Commodore 128
<code>-t:plus4</code>	Build Ozmoo for the Commodore Plus/4
<code>-t:mega65</code>	Build Ozmoo for the Mega65

Note that not all build options are supported for every platform. If an option isn't supported, the `make.rb` script will stop with an appropriate error message, and no Ozmoo files will be produced.

### Commodore 64

The Commodore 64 version is the default build target, and supports all build options. A game can have about 35 KB of dynamic memory. Games will need to do more disk access the more dynamic memory they have, so more than ~30 KB may not be advisable. An REU can be used for caching if present.

### Commodore 128

The Commodore 128 version automatically detects if it is started from 40 or 80 columns mode, and adjusts to the screen size. When run in 80 column mode, the CPU runs at 2 MHz, making for quite responsive games. It makes use of the additional ram available compared to the Commodore 64 version, and allows for

games with up to 44 KB dynamic memory. An REU can be used for caching if present.

The Commodore 128 version does not allow a loader image, and build mode -P is not supported.

## Commodore Plus/4

The Commodore Plus/4 version makes use of the simplified memory map compared to the Commodore 64 version, allowing for games with up to 46 KB dynamic memory. Games will need to do more disk access the more dynamic memory they have, so more than ~30 KB may still not be advisable.

## Mega65

The Mega65 is a recreation of the Commodore 65 computer which was never released. It can currently be built on FPGA or run on an emulator. More information can be found at <https://mega65.org/>

The Mega65 version is always built using the -81 build mode, but apart from this all options are supported. The screen is always set to 80 columns.

## Other targets

A fork of Ozmoo targeting the Acorn computers (BBC Micro and other variants) can be found at <https://github.com/ZornsLemma/ozmoo/tree/acorn>. Note that this fork is using a different build script called `make-acorn.py`.

## Chapter 4

# Build Modes

### Drives and devices

A game built using Ozmoo is placed on one or more disks. These disks can then be used in different disk drives attached to the C64. The device numbers which can be used are 8, 9, 10, 11. If the game has two story disks (meaning it was built using mode D2 or D3), the player will need a computer with at least two disk drives OR one disk drive and an REU to play it.

### List of build modes

Notes:

- Preloading means some or all of memory is filled with suitable parts of the story file, by loading this content from a file as the game starts. Using preloading speeds up game start for many players since this initial loading sequence can use any fastloader the user may have enabled. It also means gameplay is as fast as it gets, right from the start.
- Less RAM available for virtual memory system: This means a smaller part of C64 memory can be used for virtual memory handling, which means the game will need to load sectors from disk more often. This will of course slow the game down.

### Modes not requiring a disk drive for play:

P: *Program file*

- Story file size < ~51 KB: Using full amount of RAM.

Disks used:

- Boot / Story disk. This contains a single file, which may be moved to any other medium, like another disk image or a tape image.

### **Modes requiring a single 1541 drive for play:**

S1: *Single 1541 drive, one disk*

- Story file size < ~150 KB: Full preloading. Full amount of RAM available for virtual memory system.
- Story file size < ~170 KB: Less preloading the larger the story file. Full amount of RAM available for virtual memory system.

Disks used: - Boot / Story disk

S2: *Single 1541 drive, two disks*

- Story file size < ~190 KB: Full preloading. Full amount of RAM available for virtual memory system.

Disks used:

- Boot disk
- Story disk

### **Modes requiring two 1541 drives for play:**

D2: *Double 1541 drives, two disks*

- Story file size < ~330 KB: Full preloading. Full amount of RAM available for virtual memory system.
- Story file size < ~360 KB: Less preloading the larger the story file. Full amount of RAM available for virtual memory system.

Disks used:

- Boot disk / Story disk 1
- Story disk 2

D3: *Double 1541 drives, three disks*

- Story file size < ~370 KB: Full preloading. Full amount of RAM available for virtual memory system.

Disks used:

- Boot disk
- Story disk 1
- Story disk 2

### **Modes requiring a 1571 drive for play:**

71: *Single 1571 drive, one disk*

- Story file size < ~320 KB: Full preloading. Full amount of RAM available for virtual memory system.
- Story file size < ~340 KB: Less preloading the larger the story file. Full amount of RAM available for virtual memory system.

Disks used:

- Boot / Story disk

### **Modes requiring a 1581 drive for play:**

81: *Single 1581 drive, one disk*

Any story size: Full preloading. Full amount of RAM available for virtual memory system.

Thanks to the partitioning available on the 1581, the story data is protected even in the event of a validate command. Thus, the user can safely use the story disk as a save disk as well.

Disks used:

- Boot / Story disk

### **Modes requiring an SD2IEC:**

To be added at a later date. An SD2IEC mode could enable full 512 KB story sizes.

## Chapter 5

# Splash Screen

By default, Ozmoo will show a splash screen just before the game starts. At the bottom of the screen is a line of text stating the version of Ozmoo used and instructions to use F1 to toggle darkmode. After three seconds, or when the player presses a key, the game starts.

You can use the following commandline parameters add up to four lines of text to the splash screen:

```
-ss1:"text"  
-ss2:"text"  
-ss3:"text"  
-ss4:"text"
```

```
-sw:nnn
```

This sets the number of seconds that Ozmoo will pause on the splash screen. The default is three seconds if no text has been added, and ten seconds if text has been added. A value of 0 will remove the splashscreen completely.

Example:

```
ruby make.rb supermm.z5 -ss1:"Super Mario Murders" -ss2:"A coin-op mystery" \  
-ss3:"by" -ss4:"John \"Popeye\" Johnsson" -sw:8
```

# Chapter 6

## Colours

Ozmoo lets you pick two different colour schemes for your game. We refer to these two colour schemes as normal mode and darkmode. The idea is that you may want lighter text on a dark background when playing at night, while dark text on a light background has proven to be easier to read, in well-lit conditions. Ozmoo will always start in normal mode, and the player can switch between normal mode and darkmode using the F1 key. When switching modes, Ozmoo will change the colour of all onscreen text which has the default foreground colour *or* which has the same colour as the background colour in the mode it's switching to and thus would otherwise become invisible.

### Colour switches

make.rb has the following switches to control colours:

`-rc:(Z-code colour)=(C64 colour), ...`

Replace colours: Replaces one or more colours in the Z-code palette with the specified colours in the C64 palette.

`-dc:(Default background colour):(Default foreground colour)`

Default colours: This picks the Z-code colours to use as default background and foreground colours.

`-sc:(Statusline colour)`

Statusline colour: This picks the Z-code colour to use as statusline colour. This is only possible with version 3 story files (z3).

`-bc:(Border colour)`

Border colour. This picks the Z-code colour to use as border colour. Special values: 0 = same as background colour (default), 1 = same as foreground colour.



If the game itself changes the screen colours, as it may do in Z5+ games, values 0 and 1 mean the border changes too.

`-cc:(Cursor color)`

Cursor colour: This picks the Z-code colour for the cursor shown when waiting for player input. 1 = same as foreground colour (default). If the game itself changes the screen colours, as it may do in Z5+ games, value 1 mean the cursor changes too.

`-dmdc: (same as -dc but for darkmode)`

`-dmisc: (same as -sc but for darkmode)`

`-dmbc: (same as -bc but for darkmode)`

`-dmcc: (same as -dc but for darkmode)`

## Cursor switches

The shape and the blinking of the cursor can also be customized:

`-cb:(delay)`

Cursor blinking frequency. delay is 1 to 99, where 1 is fastest.

`-cs:(Cursor shape)`

Cursor shape: either of b,u or l; where b=block (default) shape, u=underscore shape and l=line shape.

## Palette

Z-code has a palette of 8 colours, numbered 2-9:

2 = black  
3 = red  
4 = green  
5 = yellow  
6 = blue  
7 = magenta  
8 = cyan  
9 = white

The Commodore 64 has 16 colours, numbered 0-15:

0 = black  
1 = white  
2 = red

3 = cyan  
4 = purple  
5 = green  
6 = blue  
7 = yellow  
8 = orange  
9 = brown  
10 = pink  
11 = dark grey  
12 = grey  
13 = light green  
14 = light blue  
15 = light grey

When building Ozmoos for the Plus/4, Ozmoos has a list of Plus/4 colours which are approximately equivalent to the 16 colours of the C64. Thus, you use the same colour numbers as for the C64 when referring to “native” (non Z-code) colours.

The 80-column mode of the C128 has a different and rather limited palette. Ozmoos tries to use colours which are approximately the same as the C64 colours.

## Examples

Use cyan text on black background with a yellow statusbar (Please note that specifying the colour of the statusbar only works for z3!):

```
make.rb -dc:2:8 -sc:5 game.z3
```

Change so Z-code color 7 is dark grey instead of magenta and Z-code color 8 is light grey instead of cyan, and use these as default colors:

```
make.rb -rc:7=11,8=15 -dc:7:8 game.z5
```

Setting up the default palette (even though this isn’t useful) is equivalent to using:

```
make.rb -rc:2=0,3=2,4=5,5=7,6=6,7=4,8=3,9=1 game.z5
```

# Chapter 7

## Fonts

When building a game with `make.rb`, you can choose to embed a font (character set) with the game using the `-f` option. This will use up 2 KB of memory which would otherwise have been available for game data. The font file should be exactly 2048 bytes long and just hold the raw data for the font, without load address or other extra information.

Included with the Ozmoos distribution are these custom fonts:

- `Clairsys.fnt`: Clairsys, by Paul van der Laan.
- `Clairsys-it.fnt`: Italian version of Clairsys, by Paul van der Laan.
- `PXLfont-rf.fnt`: `PXLfont88665b-RF2.3-C64sys` by Retrofan.
- `PXLfont-rf-da.fnt`: Ozmoos version of `PXLfont88665b-RF2.3-C64sysDA` by Retrofan. Note: This font is for usage in Danish games.
- `PXLfont-rf-de.fnt`: Ozmoos version of `PXLfont88665b-RF2.3-C64sysDE` by Retrofan. Note: This font is for usage in German games.
- `PXLfont-rf-es.fnt`: Ozmoos version of `PXLfont88665b-RF2.3-C64sysES` by Retrofan. Note: This font is for usage in Spanish games.
- `PXLfont-rf-fr.fnt`: Ozmoos version of `PXLfont88665b-RF2.3-C64sysFR` by Retrofan. Note: This font is for usage in French games.
- `PXLfont-rf-it.fnt`: Ozmoos version of `PXLfont88665b-RF2.3-C64sysIT` by Retrofan. Note: This font is for usage in Italian games.
- `PXLfont-rf-sv.fnt`: Ozmoos version of `PXLfont88665b-RF2.3-C64sysSV` by Retrofan. Note: This font is for usage in Swedish games.
- `system-da.fnt`: Ozmoos/Danish version of the original Commodore 64 system font. Note: This font is for usage in Danish games.

- `system-es.fnt`: Ozmoo/Spanish version of the original Commodore 64 system font. Note: This font is for usage in Spanish games.
- `system-fr.fnt`: Ozmoo/French version of the original Commodore 64 system font. Note: This font is for usage in French games.
- `system-it.fnt`: Ozmoo/Italian version of the original Commodore 64 system font. Note: This font is for usage in Italian games.
- `system-sv.fnt`: Ozmoo/Swedish version of the original Commodore 64 system font. Note: This font is for usage in Swedish games.

You are free to use one of these fonts in a game you make and distribute, regardless of whether you make any money off of the game. You must however include credits for the font, stating the name of the font and the creator of the font. We strongly suggest you include these credits both in the docs / game distribution and somewhere within the game (Some games print “Type ABOUT for information about the game.” or something to that effect as the game starts).

To see all the licensing details for each font, read the corresponding license file in the “fonts” folder. The full information in the license file must also be included with the game distribution if you embed a font with a game.

## Chapter 8

# Loader image

When building for the Commodore 64 or Plus/4, it is possible to add a loader which shows an image while the game is loading, using `-i` (show image) or `-if` (show image with a flicker effect in the border). The image file must be a Koala paint multicolour image (10003 bytes in size) when building a game for the C64, or a Multi Botticelli multicolour image (10050 bytes in size) when building a game for the Plus/4. Border flicker is not supported for the Plus/4. Example commands:

```
make.rb -if mountain.kla game.z5
make.rb -i spaceship.mb -t:plus4 game.z5
```