

File format of the *.r_{cd} data files

Alberth

Built October 23, 2011

Contents

1	File header	1
2	Data blocks	1
2.1	Sprite Pixels	1
2.2	Sprite block	2
3	Game blocks	2
3.1	Tile surface sprite sub-block	2
3.2	Ground tiles block	3
3.3	Tile selection	4
3.4	Tile area selection	4
3.5	Patrol area selection	4
3.6	Tile corner selection block	4
3.7	Shops/stalls	5
3.8	Build direction arrows	5
3.9	Foundations block	5
3.10	Path block	6
3.11	Platforms	8
3.12	Platform supports	8
4	GUI	8
4.1	Generic GUI border sprites	8
4.2	Checkbox and radio buttons	10
4.3	Slider-bar elements	10
4.4	Scroll-bar elements	11
5	Future	12

1 File header

Each data file starts with a file header indicating it is a RCD file. The format is as follows

Offset	Length	Contents description
0	4	Magic string 'RCDF'
4	4	Value '1', version number of the data file format.
8	Total length	

2 Data blocks

After the file header come the various data blocks. The goal of data blocks is to provide blobs of information that are somewhat independent. The data blocks are referenced by game blocks by their ID. The first data block gets number 1, the second block number 2, etc.

A reference to data block 0 means ‘not present’.

2.1 Sprite Pixels

A data block containing the actual image of a sprite (in 8bpp).

Offset	Length	Contents description
0	4	Magic string ‘8PXL’
4	4	Version number of the block ‘1’.
8	4	Length of the block excluding magic string, version, and length.
12	2	Width of the image.
14	2	h , height of the image.
16	$4 * h$	Jump table to pixel data of each line. Offset is relative to the first entry of the jump table. Value 0 means there is no data for that line.
?	?	Pixels of each line.
?	Variable length	

Line data is a sequence of pixels with an offset. Its format is

Offset	Length	Contents description
0	1	Relative offset (0-127), bit 7 means ‘last entry of the line’.
1	1	n , number of pixels that follow this count (0-255).
2	n	Pixels, 1 byte per pixel (as it is 8bpp).
?	Variable length	

The offset byte is relative to the end of the previous pixels, thus an offset of 0 means no gap between the pixels. A count of 0 is useful if the gap at a line is longer than 127 pixels.

Note: Some simple form of compressing may be useful in the pixels as it decreases the amount of memory transfers.

2.2 Sprite block

Data of a single sprite.

Offset	Length	Contents description
0	4	Magic string ‘SPRT’
4	4	Version number of the block ‘2’.
8	4	Length of the block excluding magic string, version, and length.
12	2	(signed) X-offset.
14	2	(signed) Y-offset.
16	4	Sprite image data.
20	0	(removed in version 2) Palette data.
20	Total length	

3 Game blocks

A game block is a piece of data useful for the game. Normally it refers to one or more data blocks.

3.1 Tile surface sprite sub-block

In several game blocks you can find a set of sprite for the ground. Below is the layout of such a sub-block. Note that the sprites should look to the north (thus, the sprite at 4 has its back corner up).

Offset	Length	Contents description
0	4	Flat surface tile.
4	4	North corner up.
8	4	East corner up.
12	4	North, east corners up.
16	4	South corner up.
20	4	North, south corners up.
24	4	East, south corners up.
28	4	North, east, south corners up.
32	4	West, north corners up.
36	4	West, east corners up.
40	4	West, north, east corners up.
44	4	West, south corners up.
48	4	West, north, south corners up.
52	4	West, east, south corners up.
56	4	Steep north slope.
60	4	Steep east slope.
64	4	Steep south slope.
68	4	Steep west slope.
72	Total length of the sub-block	

3.2 Ground tiles block

A set of ground tiles that form a smooth surface.

Offset	Length	Contents description
0	4	Magic string 'SURF'
4	4	Version number of the block '3'.
8	4	Length of the block excluding magic string, version, and length.
12	2	(added in version 2) Type of ground.
14	2	Width of a tile of the surface.
16	2	Change in Z height (in pixels) when going up or down a tile level.
18	72	Tile surface sprite sub-block for north viewing direction.
90	0	(removed in version 3) Tile surface sprite sub-block for east viewing direction.
90	0	(removed in version 3) Tile surface sprite sub-block for south viewing direction.
90	0	(removed in version 3) Tile surface sprite sub-block for west viewing direction.
90	Total length	

Known types of ground:

- Empty (0) Reserved, do not use in the RCD file.
- Grass (16-19) Green grass ground, with increasing length grass on it.
- Sand (32) Desert 'ground'.
- Cursor (48) Cursor test tiles. Internal use. Defines what part of a tile is selected. Colour 181 means 'north corner', 182 means 'east corner', 184 means 'west corner', 185 means 'south corner', and 183 means 'entire tile'.

To do: Move the cursor tile to another position.

3.3 Tile selection

A tile selection cursor. It is very similar to ground tiles, except there is no type.

Offset	Length	Contents description
0	4	Magic string 'TSEL'
4	4	Version number of the block '1'.
8	4	Length of the block excluding magic string, version, and length.
12	2	Width of a tile of the surface.
14	2	Change in Z height (in pixels) when going up or down a tile level.
16	72	Tile surface sprite sub-block.
88	Total length	

3.4 Tile area selection

Offset	Length	Contents description
0	4	Magic string 'TARE'
4	4	Version number of the block '1'.
8	4	Length of the block excluding magic string, version, and length.
12	2	Width of a tile of the surface.
14	2	Change in Z height (in pixels) when going up or down a tile level.
16	72	Tile surface sprite sub-block.
88	Total length	

3.5 Patrol area selection

Offset	Length	Contents description
0	4	Magic string 'PARE'
4	4	Version number of the block '1'.
8	4	Length of the block excluding magic string, version, and length.
12	2	Width of a tile of the surface.
14	2	Change in Z height (in pixels) when going up or down a tile level.
16	72	Tile surface sprite sub-block.
88	Total length	

3.6 Tile corner selection block

Offset	Length	Contents description
0	4	Magic string 'TCOR'
4	4	Version number of the block '1'.
8	4	Length of the block excluding magic string, version, and length.
12	2	Width of a tile of the surface.
14	2	Change in Z height (in pixels) when going up or down a tile level.
16	72	Tile surface sprite sub-block for selected corner pointing north.
88	72	Tile surface sprite sub-block for selected corner pointing east.
160	72	Tile surface sprite sub-block for selected corner pointing south.
232	72	Tile surface sprite sub-block for selected corner pointing west.
304	Total length	

3.7 Shops/stalls

One tile objects.

Offset	Length	Contents description
0	4	Magic string 'SHOP'
4	4	Version number of the block '1'.
8	4	Length of the block excluding magic string, version, and length.
12	2	Width of a tile of the surface.
14	2	Height of the shop in voxels.
16	4	View to the north where the entrance is at the NE edge.
20	4	View to the north where the entrance is at the SE edge.
24	4	View to the north where the entrance is at the SW edge.
28	4	View to the north where the entrance is at the NW edge.
32	Total length	

3.8 Build direction arrows

Offset	Length	Contents description
0	4	Magic string 'BDIR'
4	4	Version number of the block '1'.
8	4	Length of the block excluding magic string, version, and length.
12	2	Width of a tile of the surface.
14	4	Arrow pointing to NE edge.
18	4	Arrow pointing to SE edge.
22	4	Arrow pointing to SW edge.
26	4	Arrow pointing to NW edge.
30	Total length	

3.9 Foundations block

Vertical foundations to close gaps in the smooth surface.

Offset	Length	Contents description
0	4	Magic string 'FUND'
4	4	Version number of the block '1'.
8	4	Length of the block excluding magic string, version, and length.
12	2	Type of foundation.
14	2	Width of a tile.
16	2	Change in Z height of the tiles.
18	4	Vertical south-east foundation, east up, south down.
22	4	Vertical south-east foundation, east down, south up.
26	4	Vertical south-east foundation, east up, south up.
30	4	Vertical south-west foundation, south up, west down.
34	4	Vertical south-west foundation, south down, west up.
38	4	Vertical south-west foundation, south up, west up.
42	Total length	

Known types of foundation:

- Empty (0) Reserved, do not use in the RCD file.
- Ground (16)
- Wood (32)
- Brick (48)

The tile width and z-height are used to ensure the foundations match with the surface tiles.

3.10 Path block

Path coverage is a set of at most 47 flat images. Paths can connect to neighbouring tiles through four edges, optionally also covering the corner between two connecting edges.

Starting at offset 14 are the sprite block numbers of each sprite. As normal, use 0 to denote absence of a sprite. Two letter words in the description denote an edge connects, one letter words denote the corner is covered.

Besides the maximal 47 flat sprites there are also 4 sprites with one edge raised.

Known types of path surface:

- Empty (0) Reserved, do not use in the RCD file.
- Concrete (16)

Offset	Length	Contents description
0	4	Magic string 'PATH'
4	4	Version number of the block '1'.
8	4	Length of the block excluding magic string, version, and length.
12	2	Type of path surface.
14	2	Width of a tile.
16	2	Change in Z height of the tiles.
18	4	- (empty)
22	4	NE
26	4	SE
30	4	NE, SE
34	4	NE, SE, E
38	4	SW
42	4	NE, SW
46	4	SE, SW
50	4	SE, SW, S
54	4	NE, SE, SW
58	4	NE, SE, SW, E
62	4	NE, SE, SW, S
66	4	NE, SE, SW, E, S
70	4	NW
74	4	NE, NW
78	4	NE, NW, N
82	4	NW, SE
86	4	NE, NW, SE
90	4	NE, NW, SE, N
94	4	NE, NW, SE, E
98	4	NE, NW, SE, N, E
102	4	NW, SW
106	4	NW, SW, W
110	4	NE, NW, SW
114	4	NE, NW, SW, N
118	4	NE, NW, SW, W
122	4	NE, NW, SW, N, W
126	4	NW, SE, SW
130	4	NW, SE, SW, S
134	4	NW, SE, SW, W
138	4	NW, SE, SW, S, W
142	4	NE, NW, SE, SW
146	4	NE, NW, SE, SW, N
150	4	NE, NW, SE, SW, E
154	4	NE, NW, SE, SW, N, E
158	4	NE, NW, SE, SW, S
162	4	NE, NW, SE, SW, N, S
166	4	NE, NW, SE, SW, E, S
170	4	NE, NW, SE, SW, N, E, S
174	4	NE, NW, SE, SW, W

Table continued at next page

<i>Path sprites continued</i>		
Offset	Length	Contents description
178	4	NE, NW, SE, SW, N, W
182	4	NE, NW, SE, SW, E, W
186	4	NE, NW, SE, SW, N, E, W
190	4	NE, NW, SE, SW, S, W
194	4	NE, NW, SE, SW, N, S, W
198	4	NE, NW, SE, SW, E, S, W
202	4	NE, NW, SE, SW, N, E, S, W
206	4	NE edge up.
210	4	NW edge up.
214	4	SE edge up.
218	4	SW edge up.
222	Length of one view direction.	

3.11 Platforms

Offset	Length	Contents description
0	4	Magic string 'PLAT'
4	4	Version number of the block '1'.
8	4	Length of the block excluding magic string, version, and length.
12	2	Width of a tile of the surface.
14	2	Change in Z height (in pixels) when going up or down a tile level.
16	2	Platform type.
18	4	Flat platform for north and south view.
22	4	Flat platform for east and west view.
26	4	Platform is raised at the NE edge.
30	4	Platform is raised at the SE edge.
34	4	Platform is raised at the SW edge.
38	4	Platform is raised at the NW edge.
42	Total length	

Platform type:

- Empty 0, do not use.
- Wood 16.

3.12 Platform supports

-rotation? -steep slopes?

4 GUI

GUI sprites, in various forms.

4.1 Generic GUI border sprites

The most common form of a widget is a rectangular shape. To draw such a shape, nine sprites are needed around the border of the rectangle.

top-left	top-middle	top-right
left	middle	right
bottom-left	bottom-middle	bottom-right

The ‘top-left’, ‘top-right’, ‘bottom-left’ and ‘bottom-right’ sprites are used for the corners of the widget or window. The ‘top-middle’, ‘middle’, and ‘bottom-middle’ should be equally wide, and are used to insert horizontal space between the left and the right part (with step size equal to the width of the sprites. The ‘left’, ‘middle’, and ‘right’ do the same, except their common height is used for vertical resizing.

Except for the ‘top-left’ sprite any of the sprites can be dropped. If you leave out ‘top-middle’, ‘middle’, or ‘bottom-middle’, horizontal resizing is not possible. If you leave out ‘left’, ‘middle’, or ‘right’ vertical resizing is not possible. If you leave out ‘top-right’, the ‘top-right’, ‘right’, and ‘bottom-right’ sprites are considered not needed. Similarly for the ‘bottom-left’ sprite. Supplying the ‘top-right’ sprite but leaving out ‘bottom-right’ (and similarly for ‘bottom-left’ and ‘bottom-right’) gives undefined behaviour.

A sprite coverage of the edge has four border width parameters (top, left, right, and bottom), measured in pixels. In addition, a horizontal and a vertical offset needs to be specified relative to the bounding box of the widget contents.

That leads to the following block:

Offset	Length	Contents description
0	4	Magic string ‘GBOR’
4	4	Version number of the block ‘1’.
8	4	Length of the block excluding magic string, version, and length.
12	2	Widget type.
14	1	Border width of the top edge.
15	1	Border width of the left edge.
16	1	Border width of the right edge.
17	1	Border width of the bottom edge.
18	1	Minimal width of the border.
19	1	Minimal height of the border.
20	1	Horizontal stepsize of the border.
21	1	Vertical stepsize of the border.
22	4	Top-left sprite.
26	4	Top-middle sprite.
30	4	Top-right sprite.
34	4	Left sprite.
38	4	Middle sprite.
42	4	Right sprite.
46	4	Bottom-left sprite.
50	4	Bottom-middle sprite.
54	4	Bottom-right sprite.
58	Total length	

Known widget types:

- 0 Invalid, do not use.
- 16 Window border.
- 32 Titlebar.

- 48 button, 49 pressed button, 52 rounded button, 53 pressed rounded button.
- 64 frame
- 80 inset frame

4.2 Checkbox and radio buttons

Offset	Length	Contents description
0	4	Magic string 'GCHK'
4	4	Version number of the block '1'.
8	4	Length of the block excluding magic string, version, and length.
12	2	Widget type.
14	4	Empty.
18	4	Filled.
22	4	Empty pressed.
26	4	Filled pressed.
30	4	Shaded empty button.
34	4	Shaded filled button.
38	Total length	

Known widget types:

- 96 Checkbox.
- 112 Radio-button.

4.3 Slider-bar elements

For slider-bar GUI elements, the following block should be used.

Offset	Length	Contents description
0	4	Magic string 'GSLI'
4	4	Version number of the block '1'.
8	4	Length of the block excluding magic string, version, and length.
12	1	Minimal length of the bar.
13	1	Stepsize of the bar.
14	1	Width of the slider button.
15	2	Widget type.
17	4	Left sprite.
21	4	Middle sprite.
25	4	Right sprite.
29	4	Slider button.
33	Total length	

Known slider-bar widget types:

- 128 Horizontal slider bar + button
- 129 Shaded horizontal slider bar + button
- 144 Vertical slider bar + button
- 145 Shaded vertical slider bar + button

4.4 Scroll-bar elements

For scroll-bar GUI elements, the following block should be used.

Offset	Length	Contents description
0	4	Magic string 'GSCL'
4	4	Version number of the block '1'.
8	4	Length of the block excluding magic string, version, and length.
12	1	Minimal length scrollbar.
13	1	Stepsize of background.
14	1	Minimal length bar.
15	1	Stepsize of bar.
16	2	Widget type.
18	4	Left button.
22	4	Right button.
26	4	Left bar bottom (the background).
30	4	Middle bar bottom (the background).
34	4	Right bar bottom (the background).
38	4	Left bar top.
42	4	Middle bar top.
46	4	Right bar top.
50	Total length	

Known scroll-bar widget types:

- 160 Horizontal scroll bar + button
- 161 Shaded horizontal scroll bar + button
- 176 Vertical scroll bar + button (left = top, right = bottom).
- 177 Shaded vertical scroll bar + button (left = top, right = bottom).

5 Future

To consider:

- Place for the license
- Author and other information?
- Readme document?
- ...?

To do:

- (nothing, at the moment)