

# Sinclair ZX81 Chroma Colourising Tutorial

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## Introduction

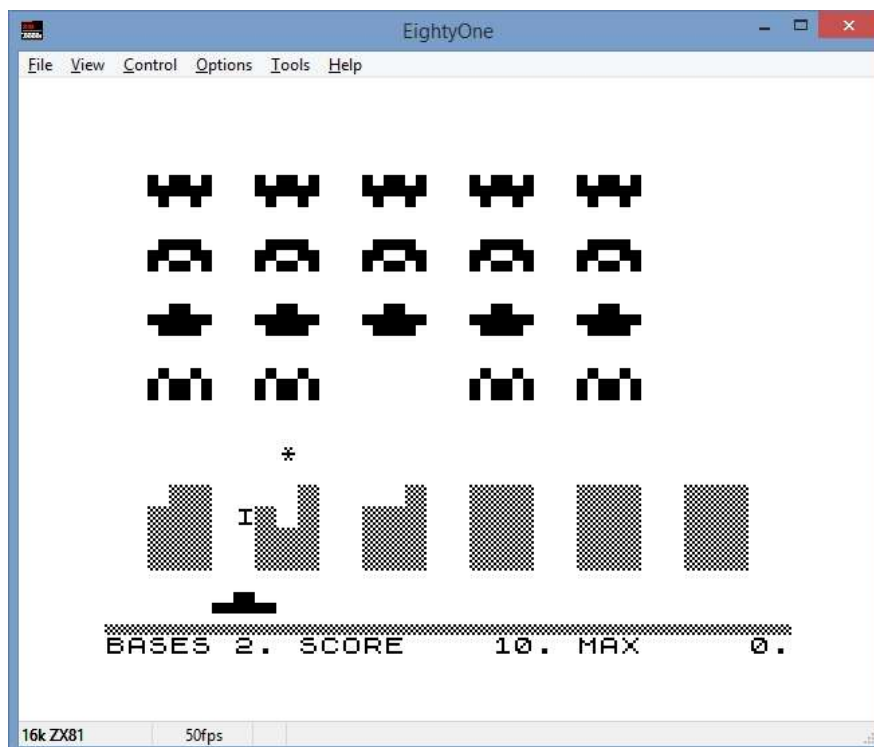
The [Chroma Interface](#) can colourise a ZX81 game by assigning a specific background and foreground colour combination to each character of the ZX81's character set. Colourising a game is done by creating a .col file using the "[Chroma Program Enhancement Creator](#)". This tool can create a .ttx tape file where the colour information from the .col file is automatically loaded before the actual game. Alternatively, the game together with the colour information can be put on a ZXC4 cartridge using the "[ZX ROM Cartridge Creator](#)".

## Choosing a Game to Colourise

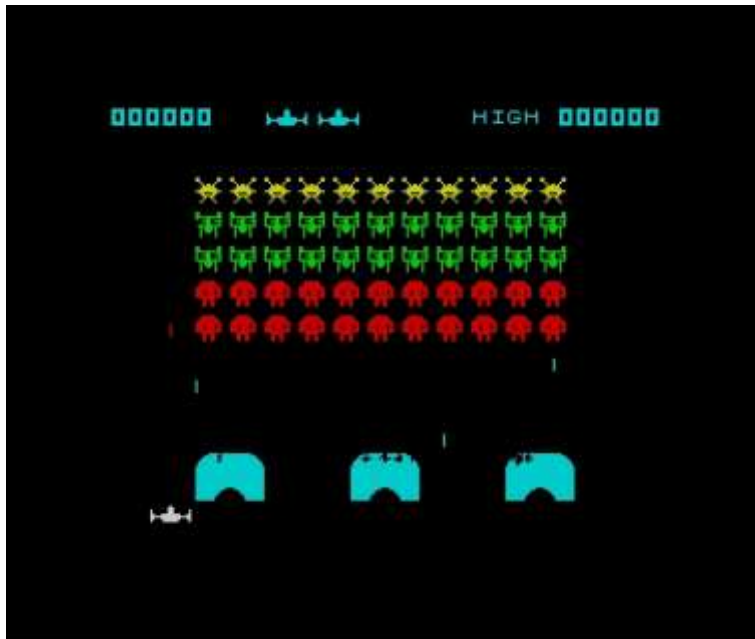
For your first colourising attempt, it is best to try colourising your all-time favourite ZX81 game. Later you will find out that some games are more suitable than others for being colourised. As a guideline, a game using many different characters from the ZX81's graphical character set on its game screen is always a good choice. On the other hand, a game with a simple game screen using maybe only the "Inverse Space" character is better to be left in Black & White.

## Before We Begin

In this tutorial, we will colourise the game "[Space Raiders](#)", a Space Invaders clone published by Psion and Micro Gen in 1982.



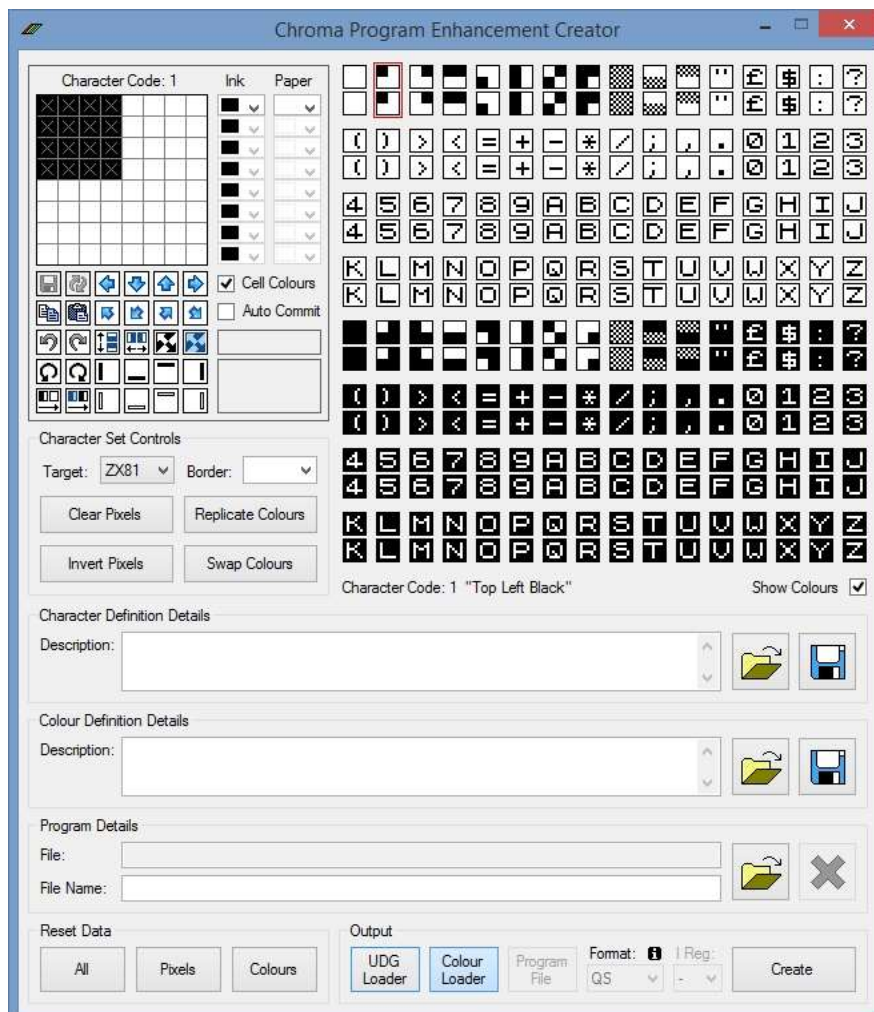
Before you start, try to think about what you would roughly like to achieve. For our Space Raiders game, we can try to loosely reproduce the look of the ZX Spectrum version of that game:



But since our capabilities are somewhat limited, don't expect that we will be able to make it look exactly like this. As you will see, giving each alien row a specific colour will not be possible. But our ZX81 game will look even better and more colourful. :-)

# The "Chroma Program Enhancement Creator"

Installing the CPEC is simple, you can use all the default settings during installation. Now run the program.



The program looks complicated on first sight, but don't worry, we will not use all its functionalities. With the CPEC you can redefine each character and save your custom character set in a character definition file, but in this tutorial we will restrict ourselves to colourising the characters only.

Let us first take a look of the different parts of the user interface.

The top left area shows the character that is currently selected on the right. Here you can adjust the colour of the character.

The top right area shows all characters from the ZX81 character set. Here you can choose the character that you would like to work on in the left part of the screen. Each character is displayed twice: the upper part shows your modified character, while the lower part shows the original character for comparison.

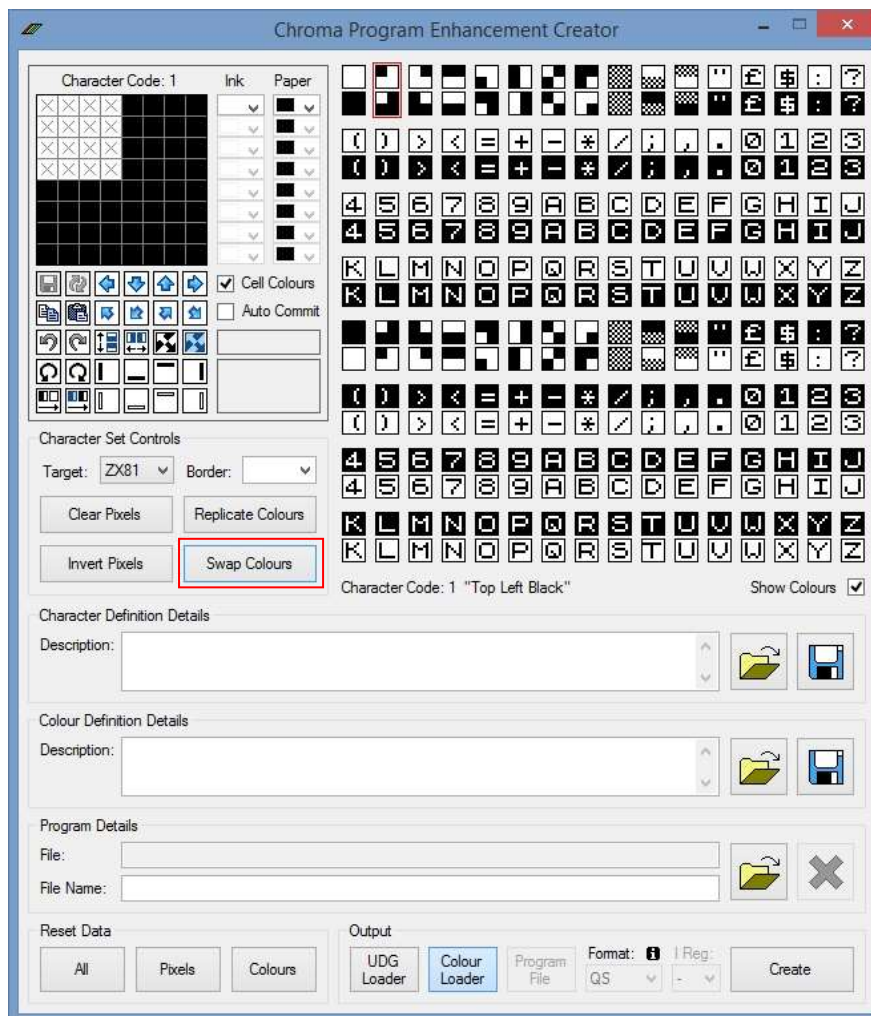
In the area below you can save or load your work to files. We will not need the "Character Definition Details" area in this tutorial.

You should first adjust some settings that we will need for this task. Enable the "Cell Colours" check box in the top left area, make sure that "Show Colours" on the right is enabled, and disable the "UDG Loader" button at the bottom.

## First Steps

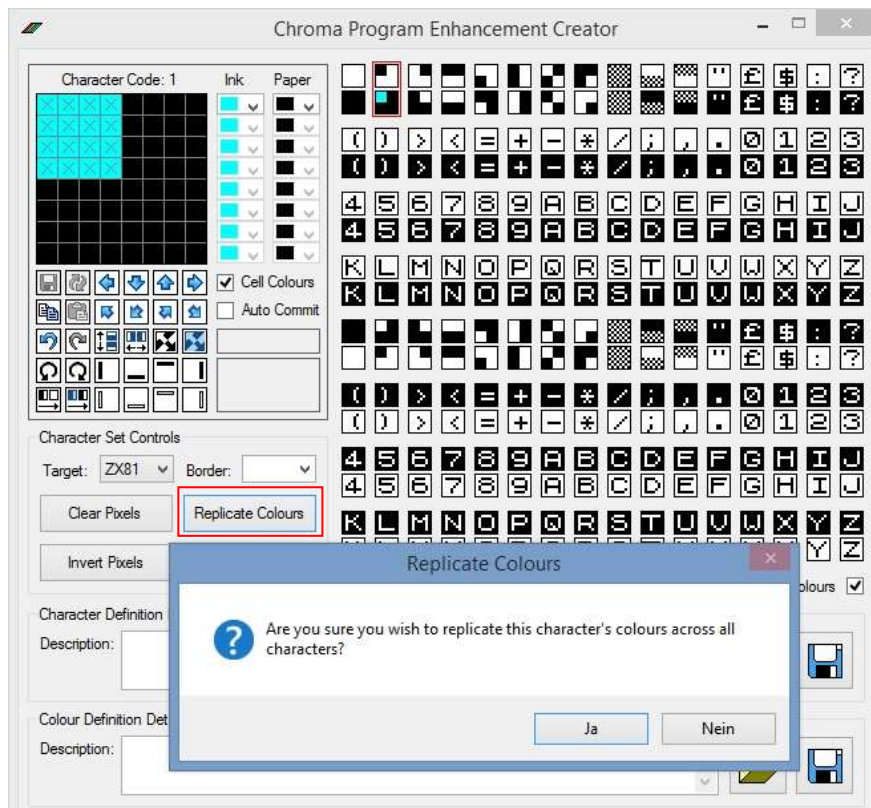
As we have seen, the Spectrum version of the game uses a black background, while the ZX81 version uses a black-on-white display.

We can now simply invert the display by pressing the "Swap Colours" button, this will invert all characters:

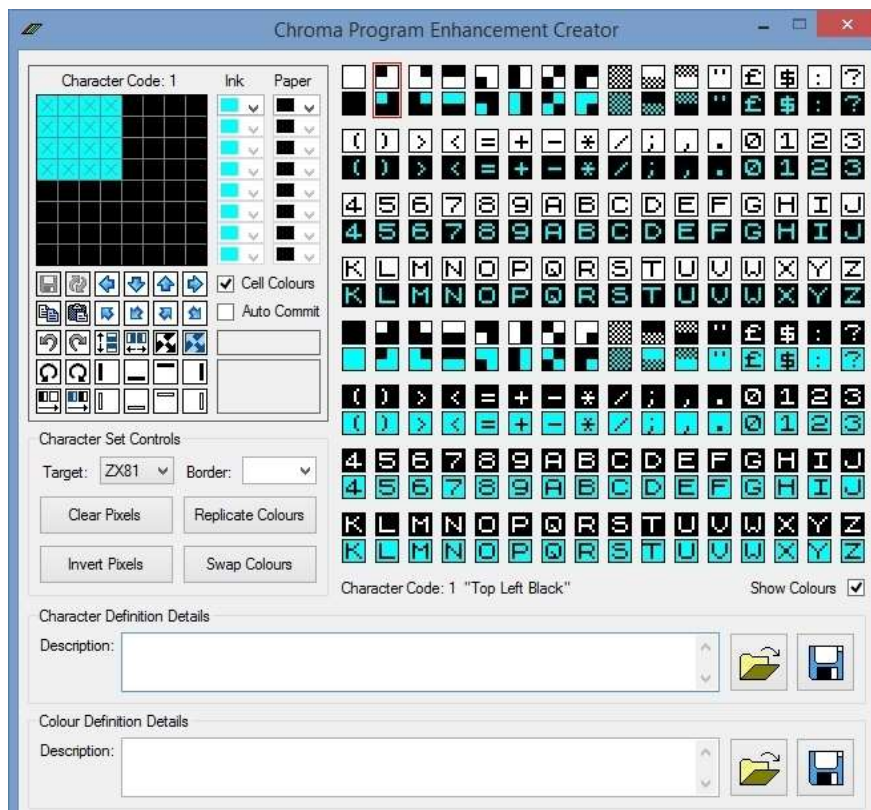


In the Spectrum screenshot, we see that the score is displayed in cyan. So we will first make this the default foreground colour in the game. To achieve this in the CPEC, we only need to colourise any character and then press "Replicate Colours". This means that this colour will be assigned to the entire character set - we will of course later change the colour of some characters again.

We now select for example the second character (the first one would not be a good choice since it is the space character which has no “ink” pixels). In the top left area, we set its ink colour to bright cyan. When you select any other character, your change is committed (select "Yes" to apply your changes). Then press "Replicate Colours" and confirm this question:



As you can see, all characters are now in cyan-on-black, and the inverse ones are black-on-cyan:

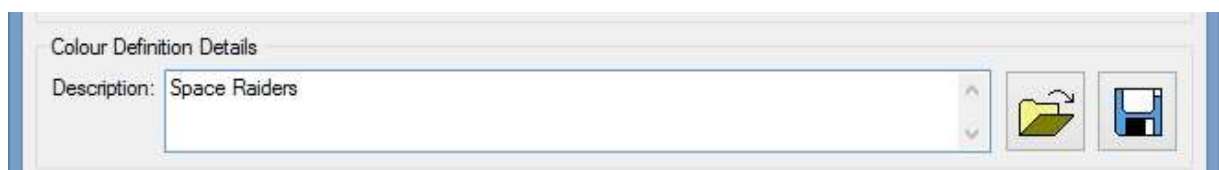


Additionally, we can set the screen border colour to black:



Now we will check our work in the "[EightyOne](#)" ZX81 emulator. You will use this procedure many times while you are working on colourising a game.

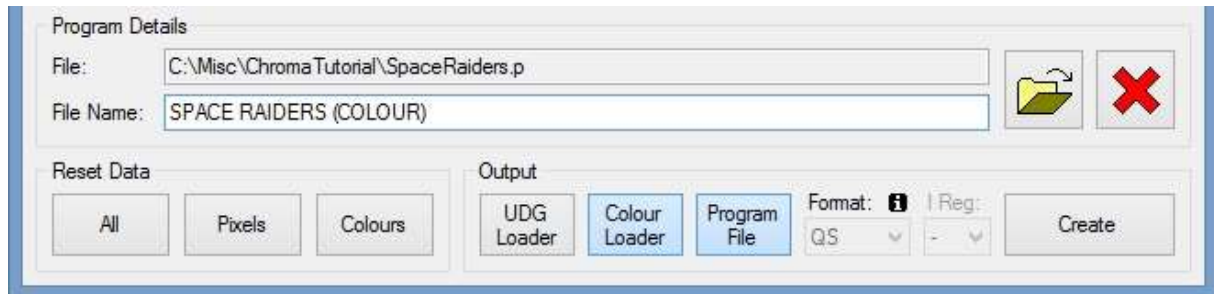
First enter a description in the "Colour Definition Details" area and press the Diskette button on the right to save the .col file. Save it to the same path where your program file is located and give it the same name, in our case SpaceRaiders.col.



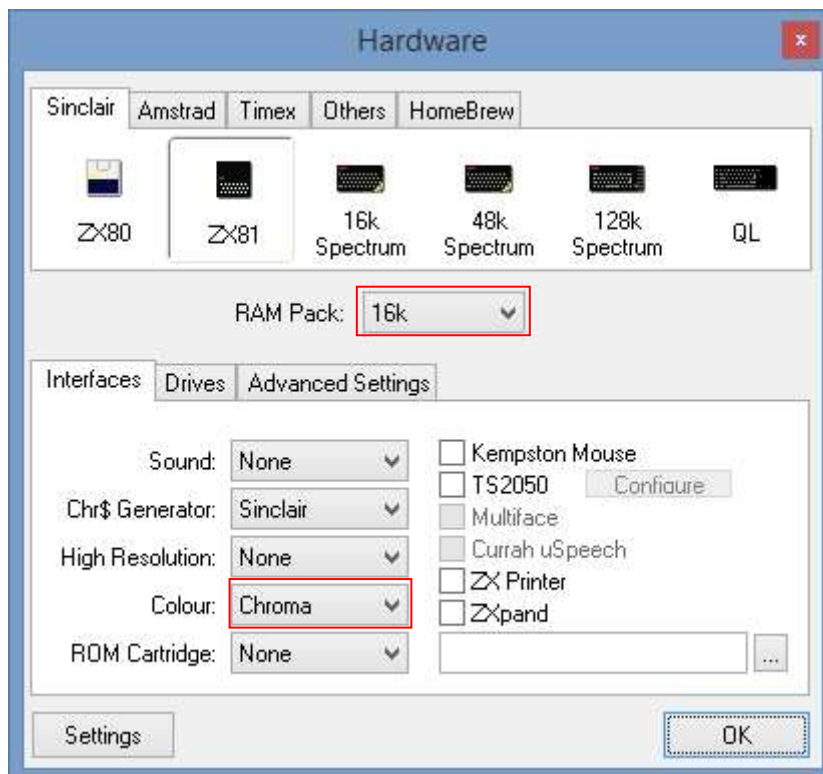


Now we will create a tape file containing the game file and our colour file. In the "Program Details" area, select the program file (.p or .p81) containing the game. After that you can prettify the "File Name" (the program file name has been automatically put there as a default value).

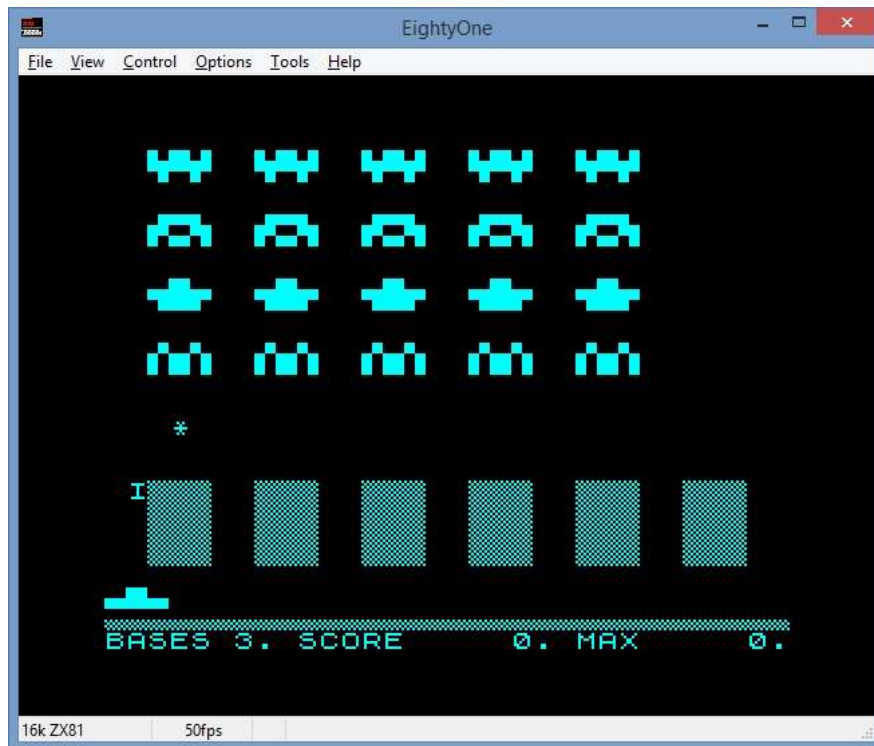
Below, make sure that "UDG Loader" is disabled and "Colour Loader" and "Program File" are both enabled, and then press "Create". Choose the "ZX81 ZX-Tape File (\*.tzx)" format and save the file to the same path where the game file and colour file are.



And now we will load the tape file in the EightyOne emulator to see the result of our work. In the "Options" - "Hardware" settings of the emulator you need to set the "Colour" option to "Chroma", and of course you need to enable 16K RAM.



Go to "File" - "Open Tape" and select the .TZX file that we have just created. And you will see that the game is now in cyan-on-black!

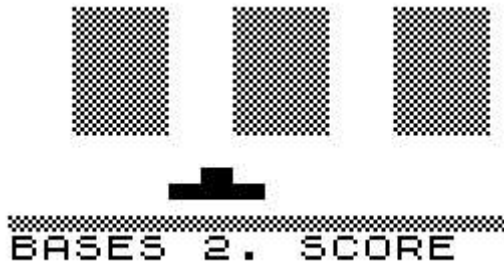




## Identifying Characters

Let us now add more colour to the game. The key for this is to identify the characters that are used to display the game graphics. For this we better use the original screenshot again, so that we do not get confused with the inverse colours that we have just created.

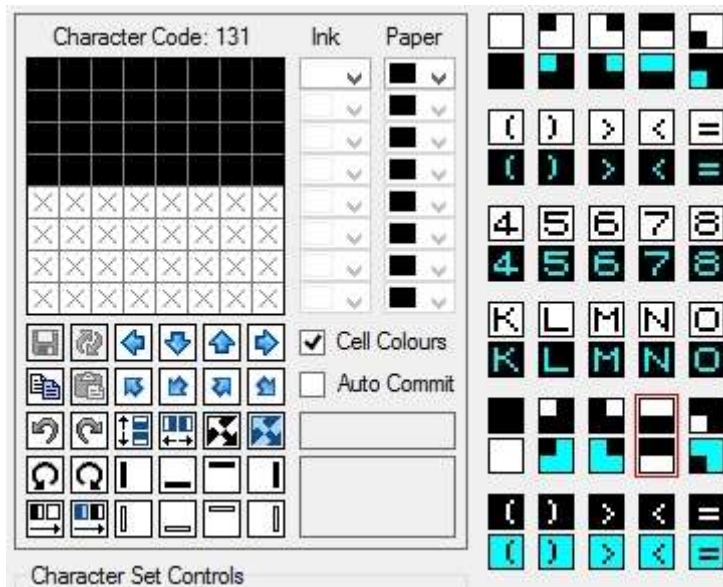
First take a look at the player's base:



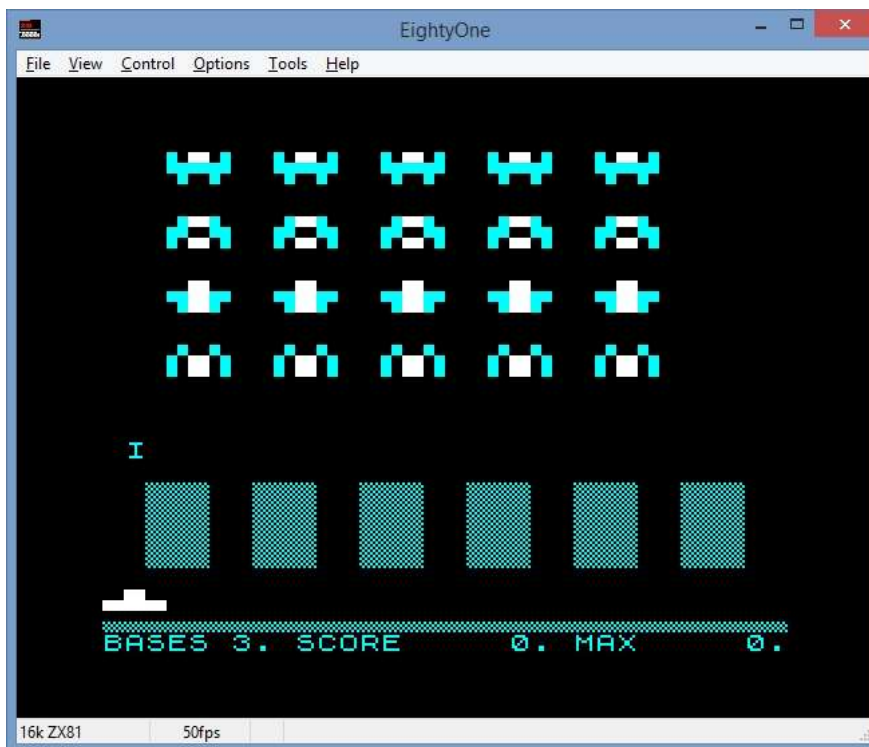
The centre part of it is obviously made of the "Inverse Space" character (128), and the side parts are made of the "Bottom Black" character (131).



In the Spectrum version of the game, the base is white. So we change the ink colour of these two characters to white:



Save the colour file, create the tape file and load it in the emulator. You will see that the base has now turned white:



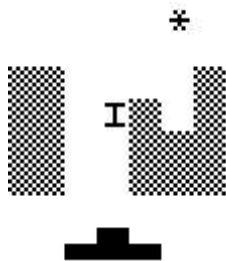
But you will also notice that some parts of the aliens have turned white as well. The reason for this is that these two characters will now be white everywhere else where they are used on the game screen. You cannot do anything about this, just choose nice colours for the adjacent alien parts that will fit to the white parts.

As you can see already, the more characters you colourise, the easier it is to identify the individual characters on the game screen.

## More Colour...

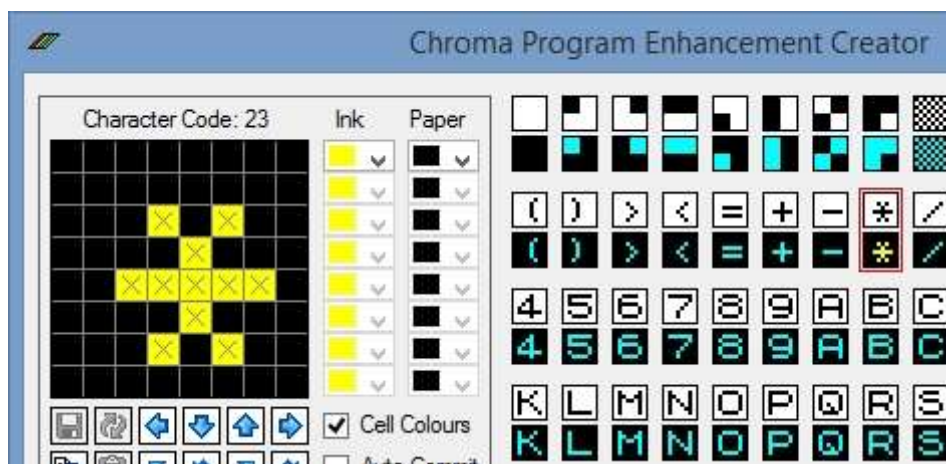
Let's continue with our work. The blocks above the player's base are already in cyan as in the Spectrum version, so no further action is required there.

But let's now work on the player's "missile" and the aliens' "bomb":

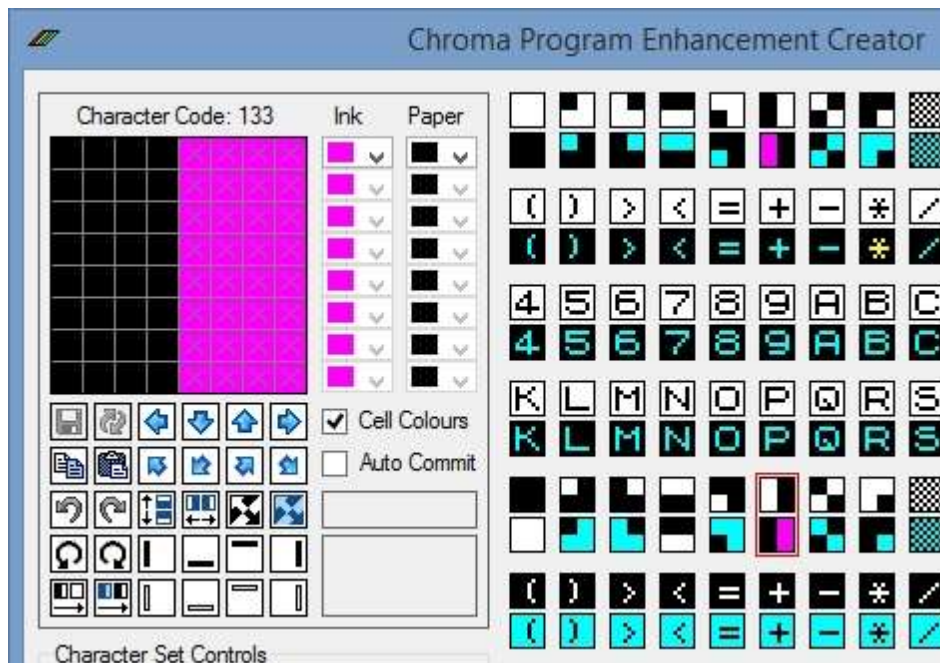


You can easily see that these two are simply made of the characters "I" (I as in Icarus) and "\*". If you would now change the colour of the "I" character to e.g. red, it would be also in red in the title screen. This is no big problem if you cannot avoid it, as the game screen is more important than the title screen, but here we better leave the "I" character in cyan.

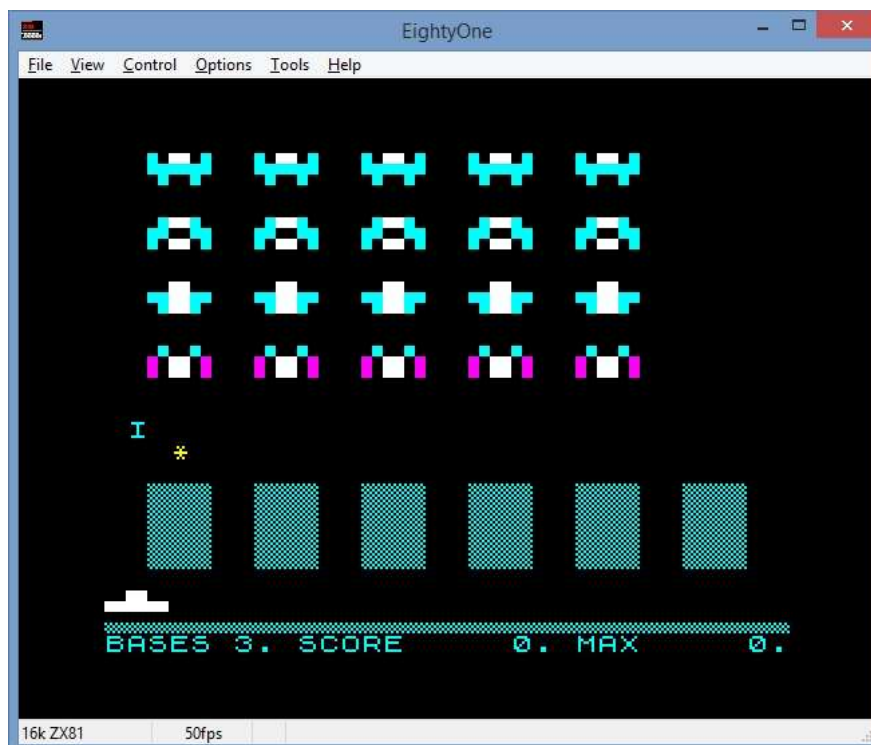
But luckily the \* character is not used on the title screen, so we change its colour to yellow, giving it a "fireball" look:



And now you can start to colourise the remaining alien parts, beginning with those that you can easily identify. Let us start at the bottom alien row: there you see that the side parts are made of the "Left Black" (5) and "Right Black" (133) characters. What colours you choose is your artist's freedom, but don't overdo it. For symmetry reasons we make both parts the same colour, we choose magenta:



And the result so far looks like this:

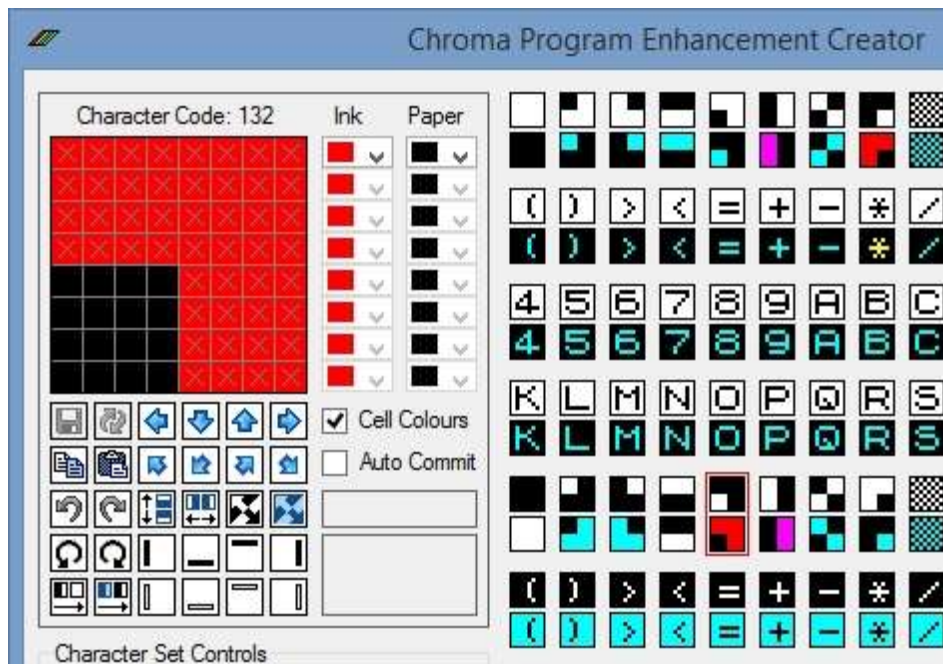


Now for the aliens in the third row. The side part characters are easy to identify: they are obviously "Bottom Left White" (132) and "Bottom Right White" (7). Inspired by the paint scheme of this beautiful *Saab Draken* airplane...



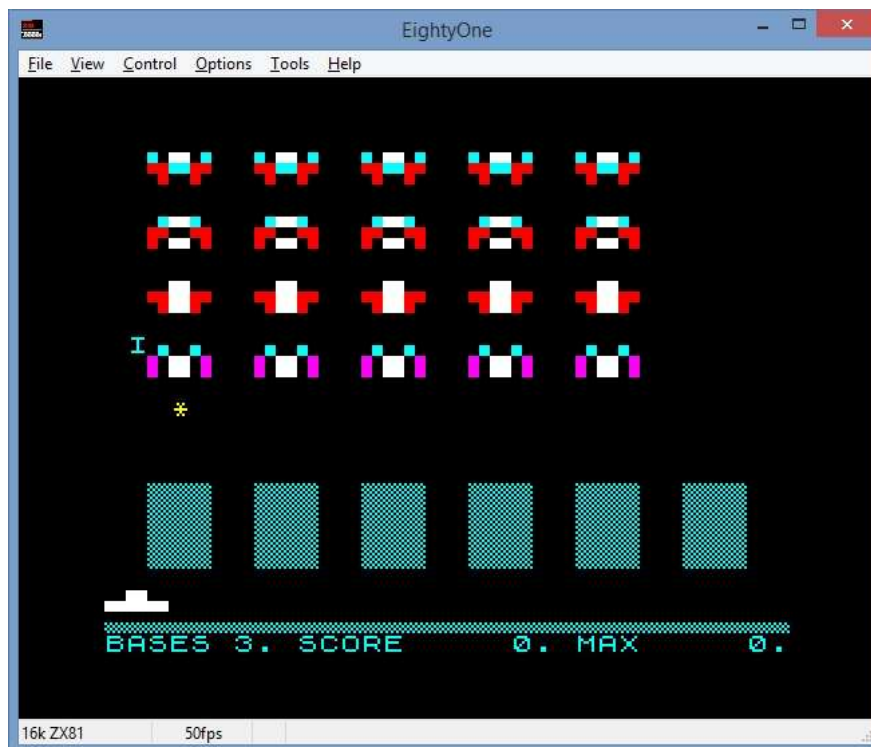
(Image Source: Wikimedia Commons)

...we set the ink colour of both characters to red.



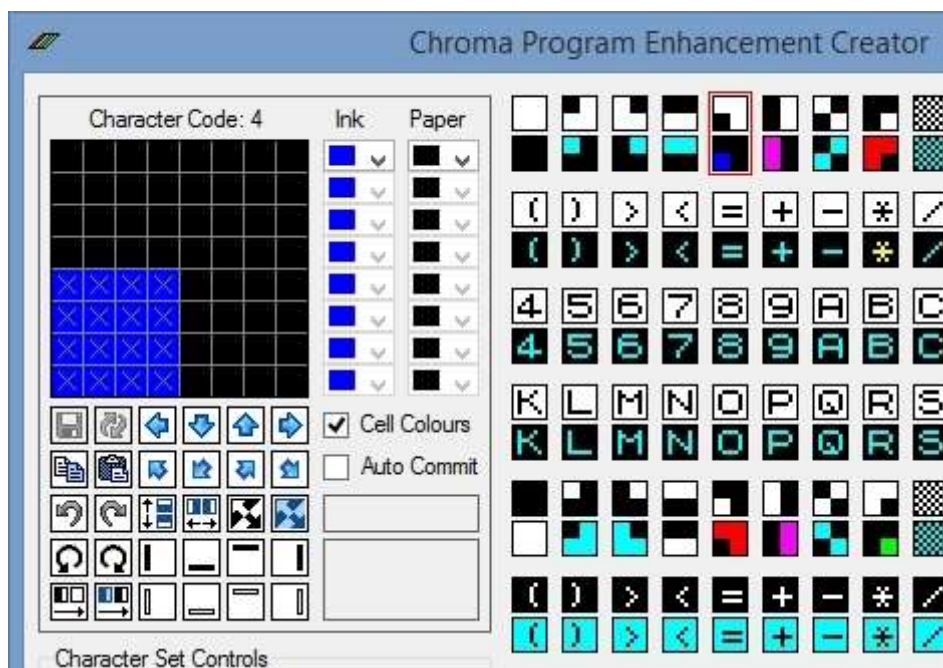


And here is the result:



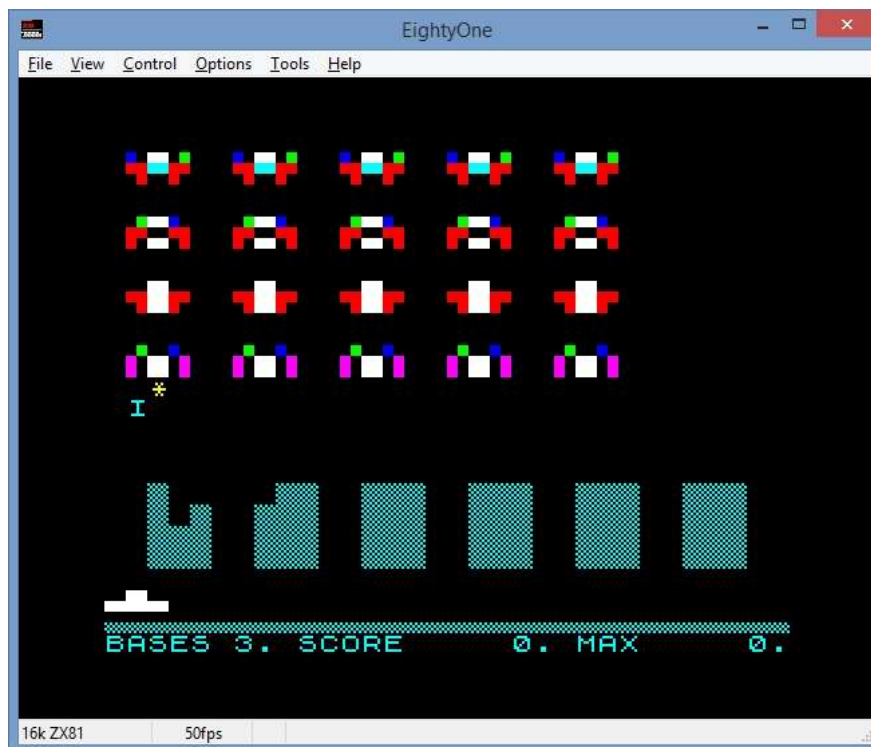
Again, some other parts of the aliens in the two top rows have also turned red, because these two characters are used there as well.

All that is now left to colourise are the remaining parts that still have the default cyan colour, and these are three characters in total. First the aliens' "eyes" in rows one, two and four. As you can now easily see, these are made of "Bottom Left Black" (4) and "Bottom Right Black" (135). We make these blue and green respectively, as we haven't used these colours so far:

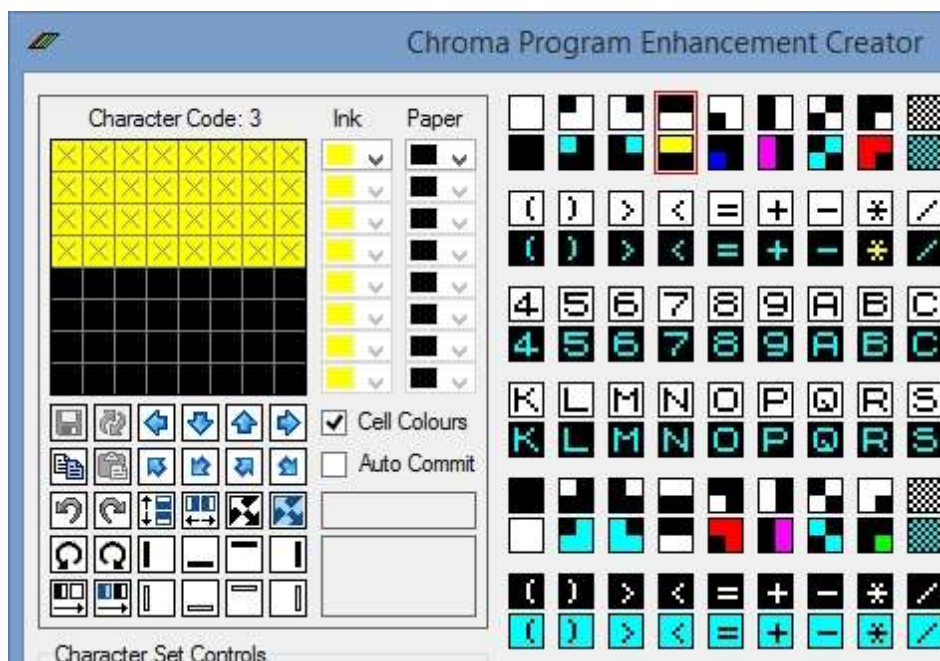




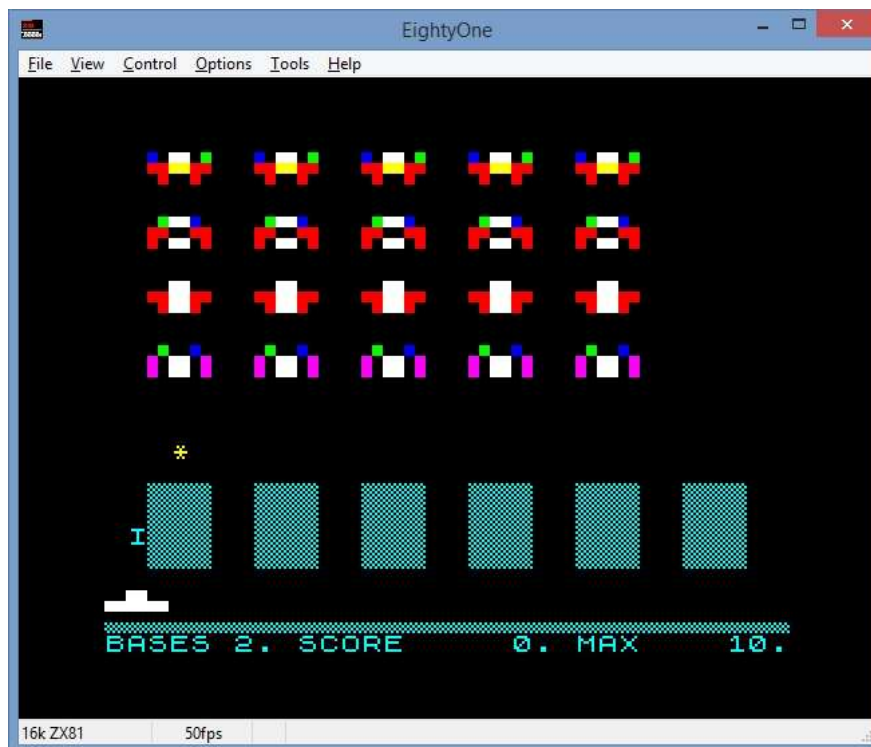
Again we check the result in the emulator:



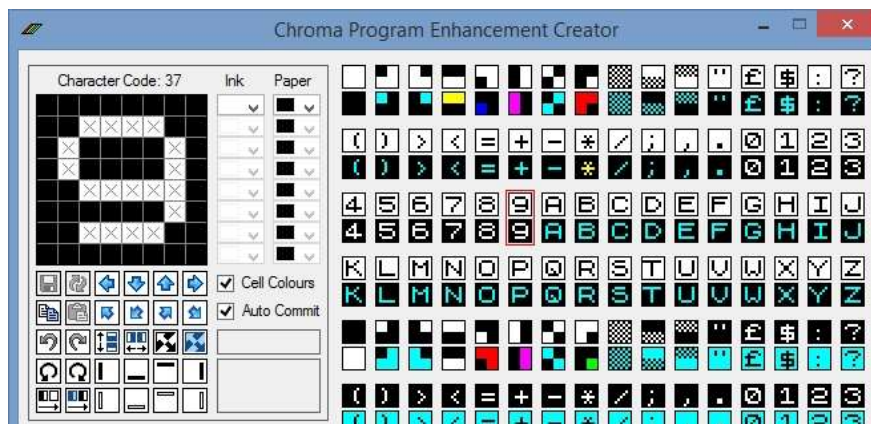
Now there is only one alien character left to colourise, which is the centre part of the top alien made of the "Top Black" (3) character. We make this yellow, as this will give a nice effect when a yellow bomb drops out of the yellow "bomb bay".



Now all aliens have their final colours:

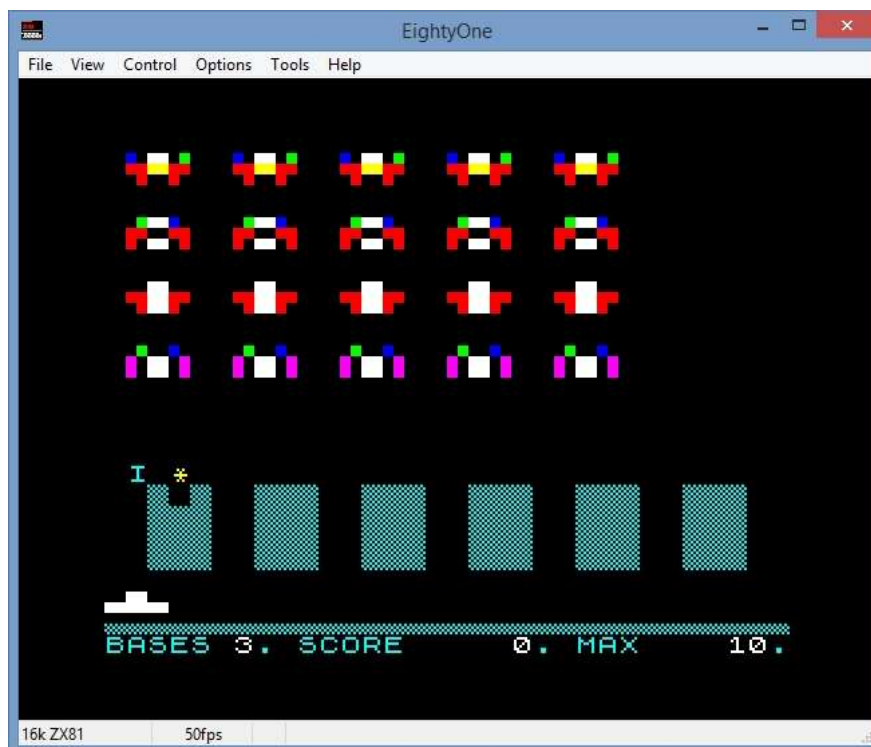


That looks good already. To break the cyan colour up further, we can change the colour of the score digits to white. Before you start doing this, we would recommend you to activate the “Auto Commit” check box so that you don’t need to confirm the commit question for each character.



By the way, in case that you don’t like the full stops after each value in the score line, you could hide them by simply setting that character’s fore and back colour to black. But here we will leave them visible.

And here is the result, the score digits have now turned white:



When you take a look at the title screen, you will see that – as expected – the digits are now white there as well, which incidentally looks quite good...



## Line Colours

With what you have learned until now, you are ready to colourize your favourite game, and you will be delighted when you play it in colour for the first time.

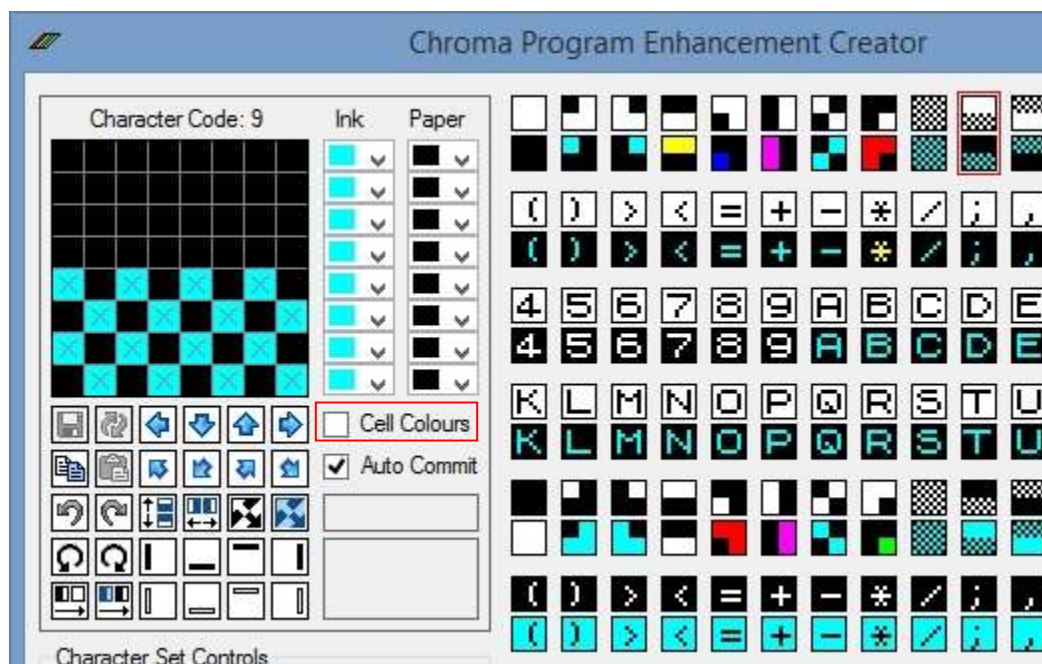
But in these final two chapters want to show you a little more “advanced” techniques that can give your colourised game the final touch. But don’t worry, it will not be too complicated.

Remember that at the beginning we activated the “Cell Colours” check box. This means that you can give an entire character a foreground colour and a background colour.

But the Chroma Interface can do more: it can assign to each of the character’s eight *lines* a foreground and a background colour. We call this “Line Colours” as opposed to “Cell Colours”.

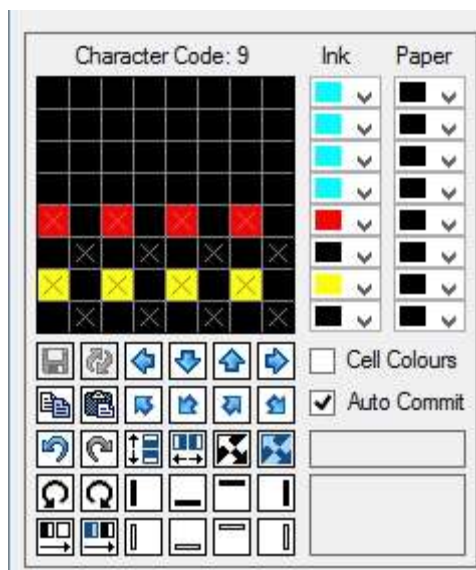
We will now work on the bottom line of the game screen to show you what can be done with this technique. First we need to identify the character that the line is made of. You see that the bottom line it is adjacent to the “BASES” text below it, and there is a half character space between the line and the player’s base above. So it must be made of the "Top White, Bottom Chequerboard" (9) character, which is not used anywhere else in the game.

Click on that character, and now deactivate the “Cell Colour” check box.

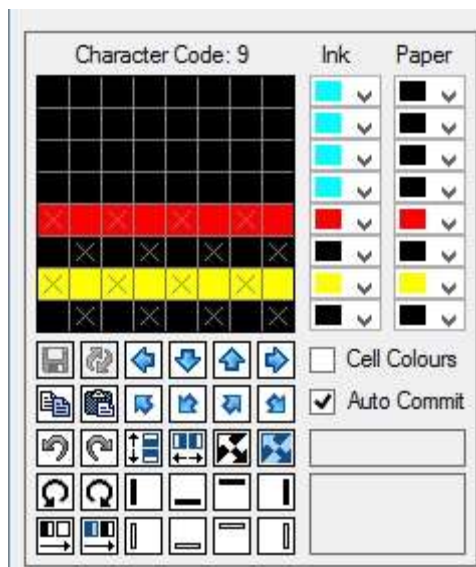


By adjusting the line colours you can completely change the look of each character, which can help you to remove the typical (maybe unwanted) ZX81 look of some games. Here are two examples just for demonstration, we will do something even better later on.

You could adjust the character's colours like this:



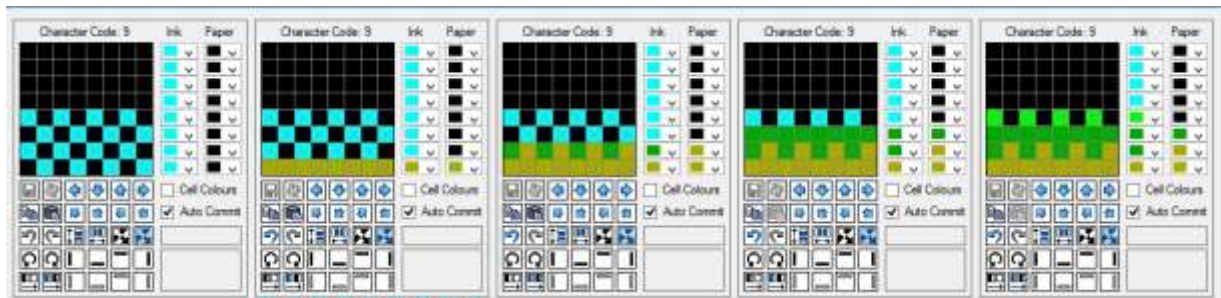
Or like this:



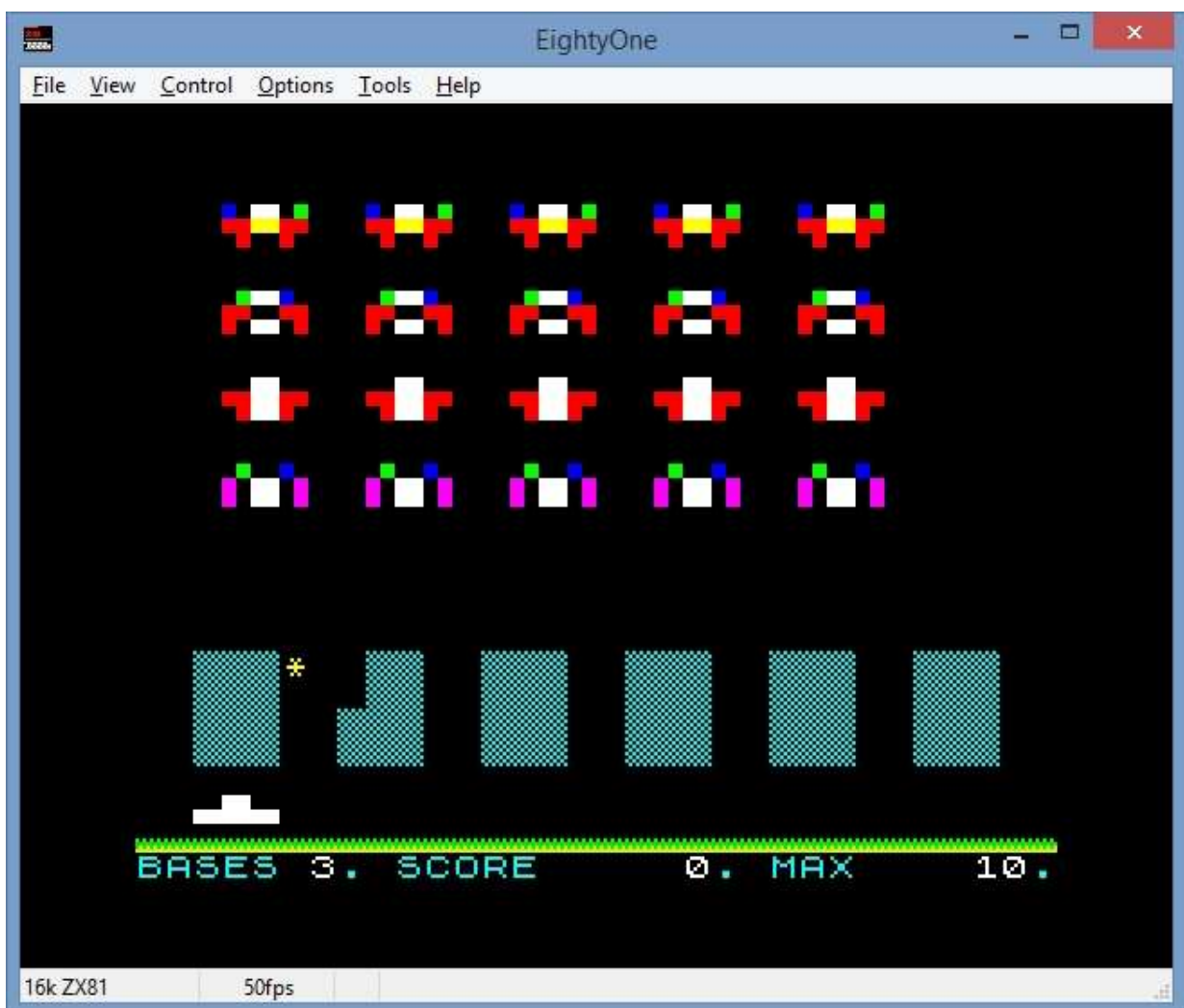


But we will now try to give this character a “grassy” look, having some dark yellow soil at the bottom and green grass at the top.

Now work your way up from the bottom. Set the bottom line’s foreground and background colour to dark yellow. Then for the next line use dark green and dark yellow. Then make the line above – we are getting closer to the surface – entirely dark green. And finally give the top line a bright green foreground colour (this will look like blades of grass) and leave it’s back colour black.



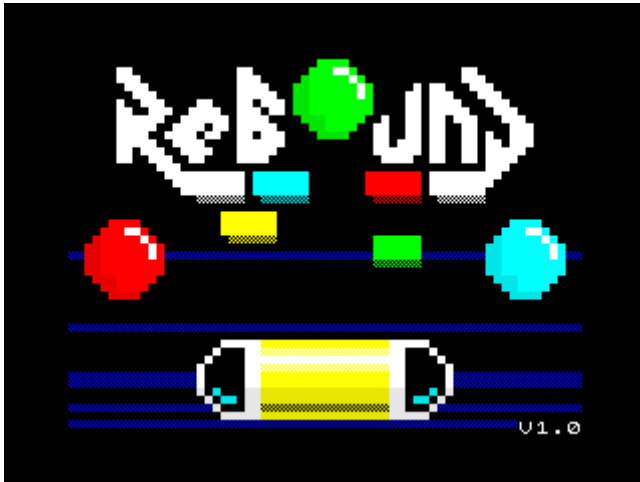
And here is the result, we now have grass at the bottom! Did you ever believe that a ZX81 can produce something like that?





## Smoothing the Edges

While you were previously selecting the ink and paper colours, you noticed that the 16 available colours consist of eight colours in both a dark and a bright variation. This can be used for some limited shading to create a three-dimensional look. The title screen of the game “[Rebound](#)” shows impressively what *can* be done with that when you design a ZX81 Chroma game from scratch, provided that you are very talented:



Notice the shades and highlights on the three balls.

But beware that when colourising an existing game our capabilities are very limited – remember what you learned about “Line Colours” in the previous chapter. It would of course be nice to assume that the light source is at the top right and therefore we would make the bottom left part of each character a little darker, but unfortunately we cannot have more than two colours per character line.

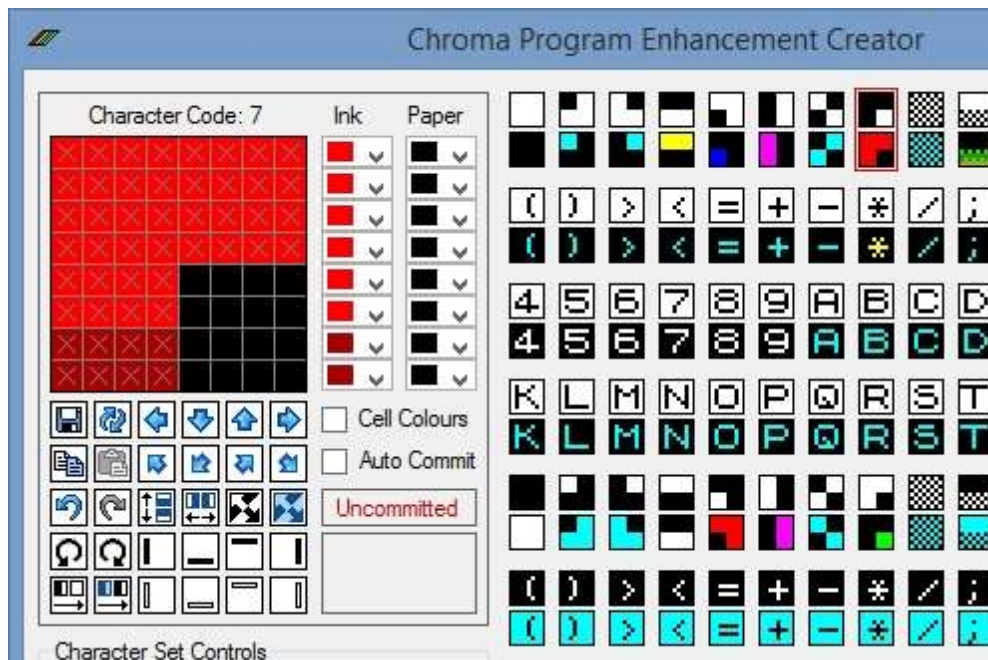
But we can make the entire bottom part of some of our characters darker to give them a “rounded” look. It will not make a big difference, but little details like these can positively influence the overall look of the game screen.

Now we choose the characters to work on. The player’s base is no good candidate for this, because its centre character is also used in the third alien row, and there we have two of these characters one above the other. So if we added a shadow at the bottom, the alien would have an unwanted shadow line in its middle. And we have the same problem with the blocks above the player’s base.

But we will work on the side parts of the aliens in rows three and four, and on the yellow part of the aliens in row one.

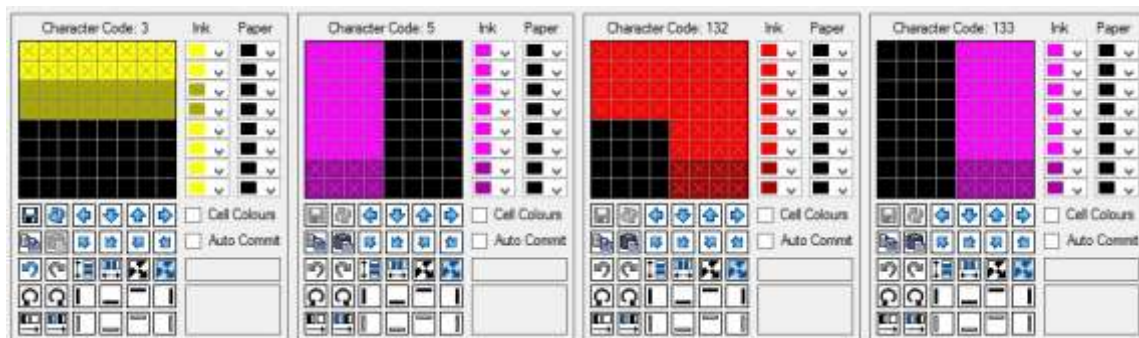
Select these characters in the CPEC (make sure that “Cell Colours” is disabled) and change the ink colour of their bottom two lines to the respective darker colour. You will need to change at least two lines, because a shadow of only one line would hardly be visible on the screen.

We begin with the red L-shaped part from the third alien row:



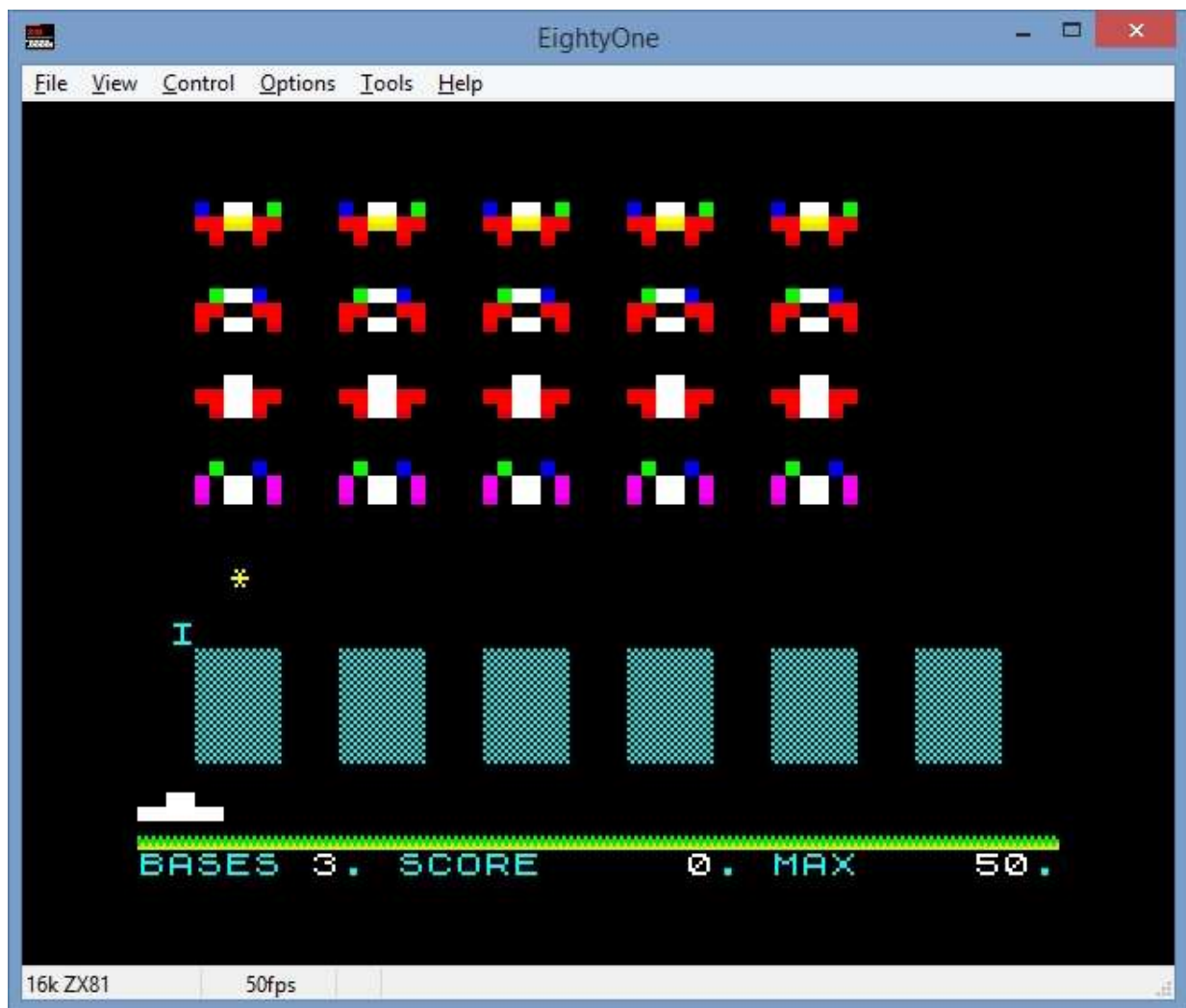
It would of course be nice to make the other bottom edge on the right dark as well, but as we have mentioned before, this is not possible because we can only define one ink colour.

Now do the same to the other alien parts...



...and create the .TZX file for the final time to check the result. You will need to take a closer look to notice the darker parts at the underside. It is not very effective for this game, but it may be for some other game that you will colourise. In this chapter we wanted to show you just what *can* be done.

And now we have a finished game in full colour!



We hope that you enjoyed this tutorial, and now you may try to colourise your favourite ZX81 game on your own!