Chroma 81

Getting Started Guide

V1.0

Introduction

This document provides the basic information required to get the Chroma 81 interface set up and includes a step-by-step example on how to program a simple compilation of ZX81 programs into a ZXC4 ROM cartridge. It concludes by explaining how the appearance of programs can be enhanced through the use of colourisation and character definition files. This guide doesn't cover all the functionality available, but provides sufficient information to help put into context the full details available on the ZX81 pages at www.fruitcake.plus.com.

Chroma 81 Suitability

Chroma 81 is only suitable for use with a ZX81 fitted with any of the 3 editions of the BASIC ROM.

Pre-requisites and Precautions

The following important points will help ensure trouble free operations of Chroma 81.

- **Use a higher rated power supply of 1A or more.**
  The ZX81 came with either a 0.7A or 1.2A power supply. The 0.7A power supply is borderline suitable for a ZX81 with Chroma 81 interface but not if a ZXC4 or other device is connected. Modern design higher current rated power supplies sold especially for use with the ZX81 can be found on ebay and direct from various online sellers of Sinclair spares.

- **Clean the ZX81's expansion bus using isopropyl alcohol (isopropanol).**
  The ZX81's expansion bus contacts will oxidise over time and should be cleaned by rubbing with isopropyl alcohol using a cotton bud/swab before connecting Chroma 81, otherwise a poor electrical contact is likely to cause unreliable operation.

- **Only connect / remove Chroma 81 and a ZXC4 ROM cartridge with the power off to the ZX81.**
  Connecting or disconnecting with the power on seriously risks damaging the ZX81 and Chroma 81. Ideally also connect / disconnect all cables before powering on the ZX81 or TV.

- **Be careful not the damage the ZX81's case when connecting / disconnecting Chroma 81.**
  Chroma 81 will form a tight connection on the ZX80's expansion bus. Be careful how you hold the ZX81 to avoid damaging its case due to the force needed to connect / disconnect Chroma 81. Try to keep the interface as straight with the ZX81 as possible, wiggling it gently from side to side as necessary. After disconnecting Chroma 81, always check that its edge connector key has not become dislodged, which would result in damage is the interface is connected misaligned.

- **Only use Chroma 81 with a ZX81.**
  Chroma 81 is not suitable for use with a ZX80 or non-identical clone of the ZX81 due to difference in timing of the expansion bus signals, and damage could occur to the computer or Chroma 81 as a result.

Chroma 81 Facilities

The hardware facilities provided by Chroma 81 are identified below.
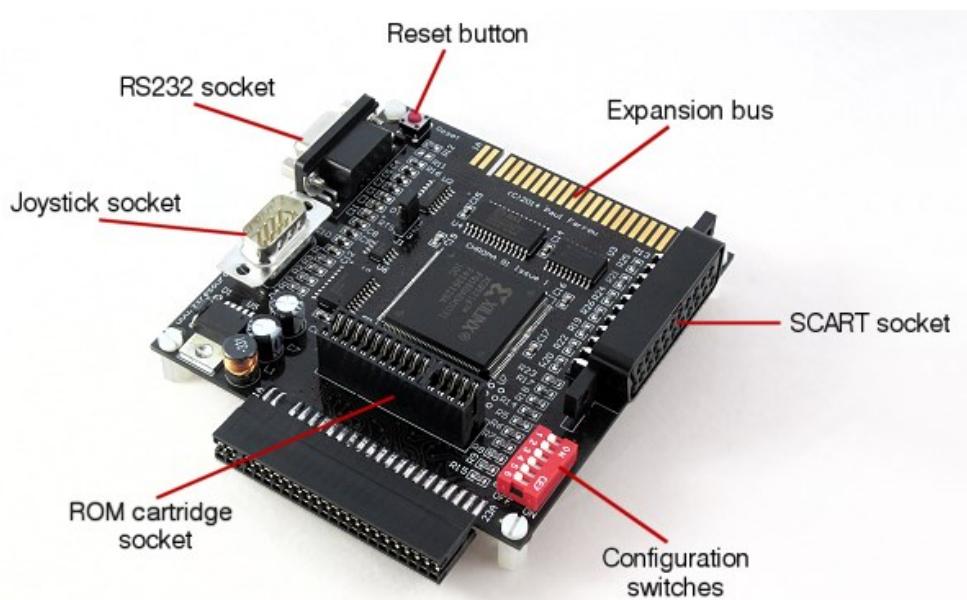
The majority of the hardware and software facilities provided by the Chroma 81 interface can be enabled/disabled via its configuration switches.

The permanently enabled facilities are:

- Joystick socket
- Sound via the TV speaker. Sound will be output whenever TV frames are not being produced, e.g. during saving to cassette. Turn down the volume on your TV if you do not wish to hear such sounds.
- ROM cartridge facilities whenever a ROM cartridge is plugged in.

The facilities that can be enabled / disabled via the configuration switches are:

Switch 1   Set this to ON to enable the 16K RAM pack.
Switch 2   Set this to ON to enable WRX high resolution graphic support for the 16K RAM pack (requires switch 1 to be ON also).
Switch 3   Set this to ON to enable 8K RAM between the ROM space and the 16K RAM space. This also enables support for CHR$128 UDG mode.
Switch 4   Set this to ON to enable Quicksilva Character Board UDG support.
Switch 5   Set this to ON to enable the RS232 socket.
Switch 6   Set this to ON to enable colour support.

Using the Joystick Socket

The ZX81 never had a joystick connection standard that games supported, but the cursor keys were often used and so these are what the Chroma 81 joystick socket responds to.

Programming a ZXC4 ROM Cartridge

Chroma 81's ROM cartridge socket supports ROM cartridge designs conforming to the ZX Interface 2 standard devised by Sinclair Research for the ZX Spectrum. Suitable software is available to support the ZXC2, ZXC3 and ZXC4 ROM cartridge designs. These instructions only refer to the ZXC4 since it is the only design still in production. They describe the generation of a simple compilation but won't cover all the setting options available (refer to www.fruitake.plus.com for details about all the available options).

Programming the ZXC4 ROM cartridge requires the following:

- A Windows PC (any version of Windows is suitable).
- An RS232 socket on the PC (male 9-way D-type socket, typically provided by a USB adapter).
- An optional standard 9-way non-crossover male-to-female RS232 extension cable (only required if the USB adapter cable is not long enough to reach Chroma 81's RS232 socket).
- The *ZX ROM Cartridge Creator* software downloaded from www.fruitcake.plus.com and installed on the Windows PC.

The programming process involves the following aspects:

- Prepare a compilation of programs to be installed into the ZXC4 ROM cartridge.
- Download the compilation data to the ZX81 for programming into the ZXC4.
- Accessing the menu system once the compilation has been programmed into the ZXC4 to allow running of the programs it contains.

Preparing a Compilation

- Run the ZX ROM Cartridge Creator utility on the Windows PC.
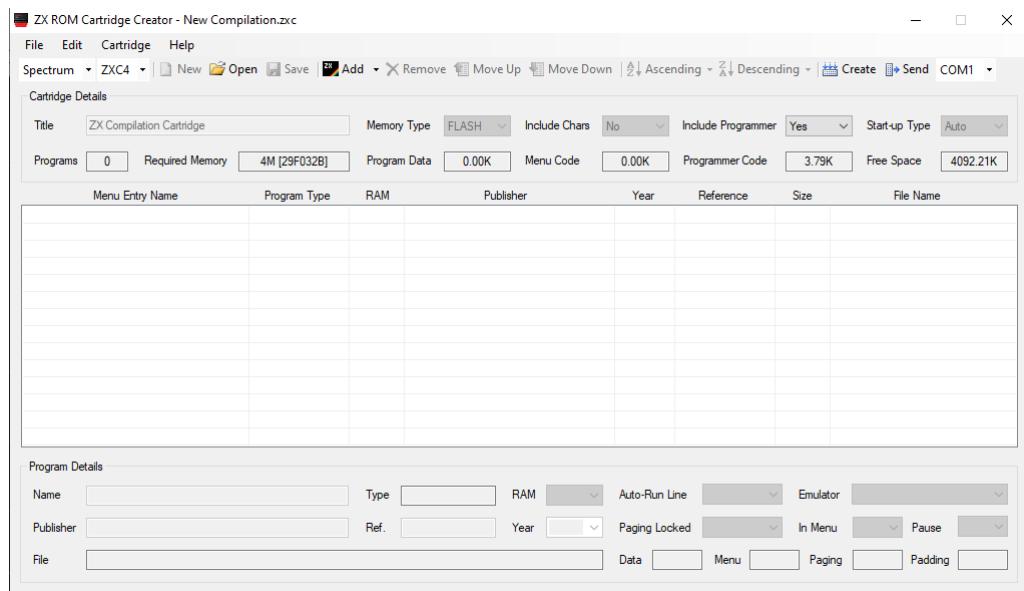
- Change the target computer from *Spectrum* to *ZX81*.

- Leave the target ROM cartridge as *ZXC4*.
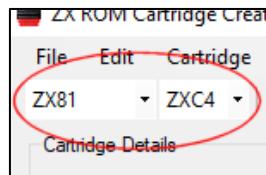
- Select the COM port number corresponding to the RS232 socket on the PC that is connected to Chroma 81's RS232 socket (this setting is only applicable if your PC has multiple RS232 sockets).
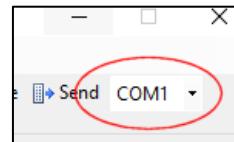

- Download the ZX81 programs to include in the ZXC4 compilation. For this example, the following games were downloaded from www.fruitcake.plus.com.

Note that supported ZX81 programs will have file extension .p or .p81. Two ZX80 games are included here which target the 8K ROM, i.e. the ZX81 ROM, and so will also run on the ZX81.

- Open Windows File Explorer on the PC and browse to the folder containing the ZX81 games. Drag and drop the files into the main area of the ZX ROM Cartridge Creator utility. The file names will be used to set the default menu entry names, truncating them as necessary so that they will fit the ZX81's 32 column display.
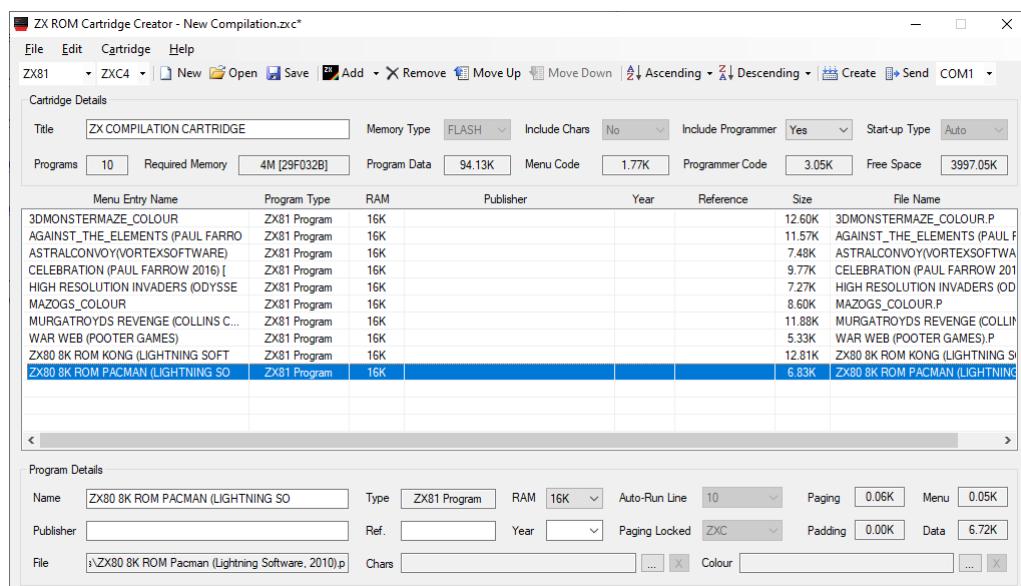
- The *Title* field within the Cartridge Details area will be used as the heading for the menu that will appear when the compilation is run on the ZX81. It can be edited as desired, e.g. ZX81 GAMES.
- Leave the *Include Programmer* field set to *Yes*. This will keep a copy of the ZXC4 Programmer utility in the cartridge to allow it to be quickly accessed for subsequent re-programming of the ZXC4, otherwise it will be necessary to load it in from a backup made to cassette.
- Click on each game entry in turn and edit the *Name* field to tidy up any truncated text. The *Name* field will be used for the descriptions shown in the menu when the compilation is run on the ZX81.
- For each game entry, optionally fill in the *Publisher*, *Ref* and *Year* fields. These will appear at the bottom of the screen on the ZX81 when the menu is browsed through and simply provide more information to identify each program. Any text displayable by the ZX81 may be set for the *Publisher* and *Ref* fields, with the latter useful for indicating a product code, or version number, author, etc. Select or type in the year of release of the game into the *Year* field. Any of the fields can be left blank if desired.
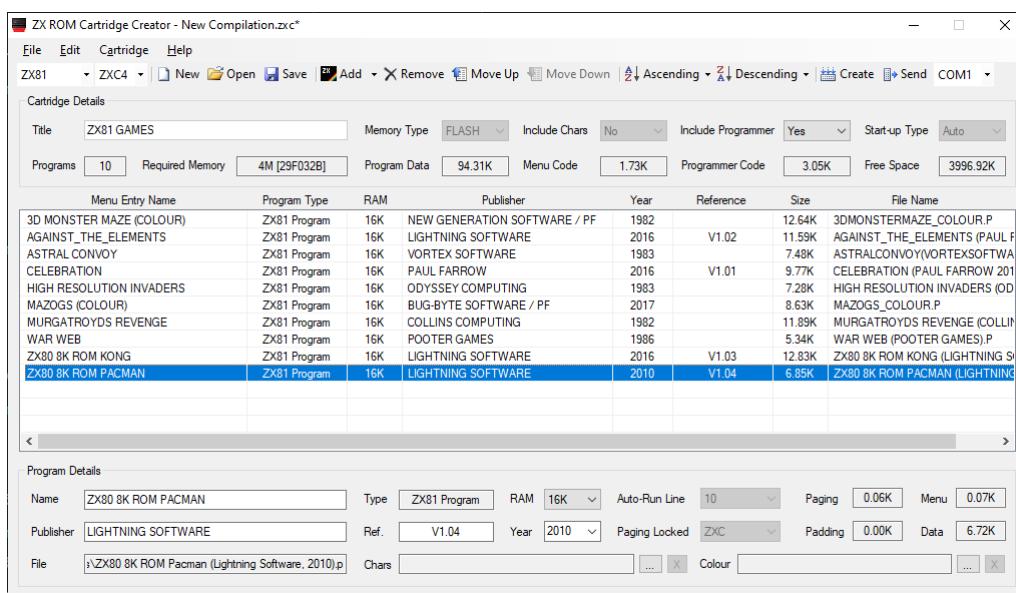

- For each game, it is recommended to leave the *RAM* field set to 16K unless there is a real necessity to change it lower, which will provide maximum program compatibility.
- Programs can be dragged and dropped to re-order them, with other facilities available from the menu toolbar to sort them by various criteria.
- Leave the *Auto-Run Line* field at its default for each program for now. This field allows programs that don't automatically run upon loading to be started from a specified line number. The facility works by changing the value of system variable NXTLIN, which controls the line to run after a program has loaded.

Downloading the Compilation to the ZX81 for Writing into the ZXC4

The compilation data is sent over to the ZX81 as a number of blocks of 8K or less. These instructions assume that all of Chroma 81's switches are initially set to OFF.

- Ensure the ZX81 is powered off.
- Set switch 1 of Chroma 81 to ON to enable the 16K RAM pack.
- Connect the PC's RS232 socket to Chroma 81's RS232 socket (use an extension cable if required).
- Plug the ZXC4 into Chroma 81's ROM cartridge socket.

- Set switch 5 of Chroma 81 to ON to enable the RS232 socket.
- Set switch 6 of Chroma 81 to ON to enable the colour support (since some of the game will be using colour).
- Power on the ZX81.
- The ZXC4 Programmer will automatically appear:
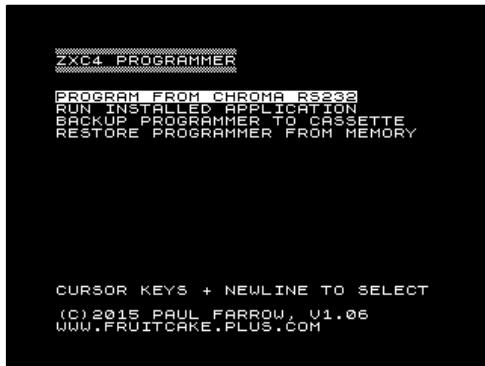
- Press NEWLINE to select **PROGRAM FROM CHROMA RS232**.
- The ZX81 will display that it wants to receive the first block of data.


- The ZX81's screen then changes to white with thin black lines across it, indicating that it is waiting to receive data.
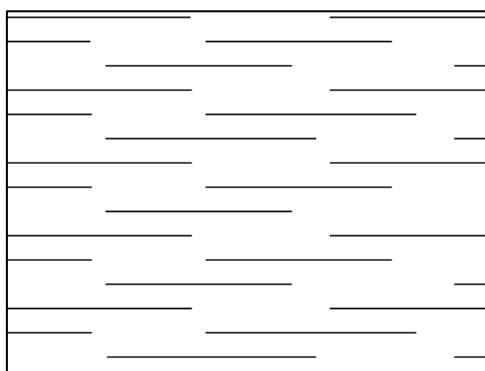

- On the ZX ROM Cartridge Creator, click the Send button.
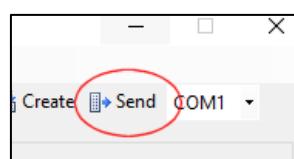
- The ZX ROM Cartridge Creator will display a progress dialog showing details about the block currently being sent.
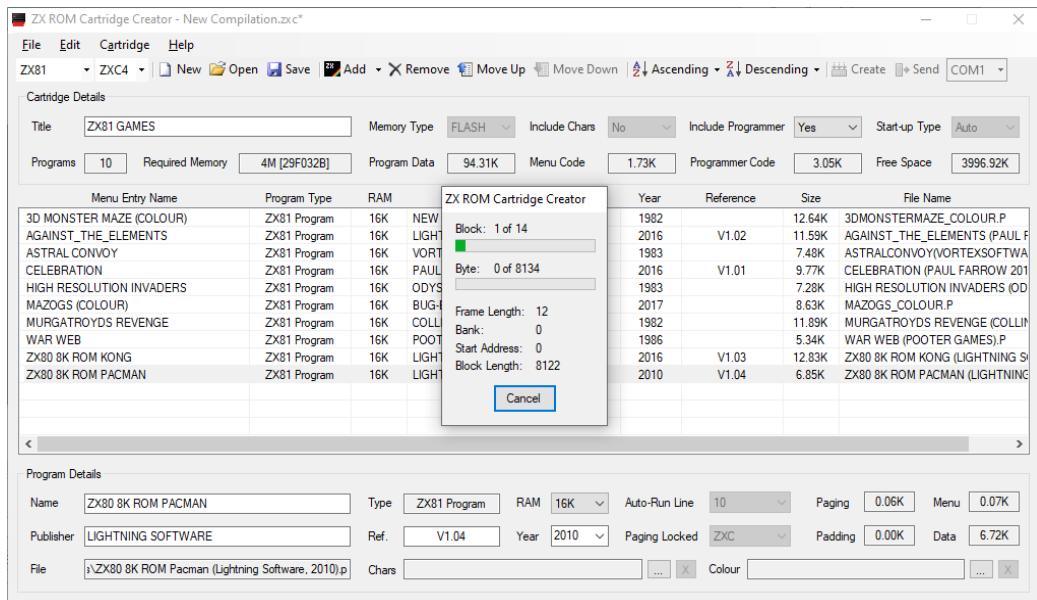
- As the data is received, the ZX81 will display a pattern very reminiscent of that seen when saving to cassette. The exact pattern displayed varying based on the actual data being received.
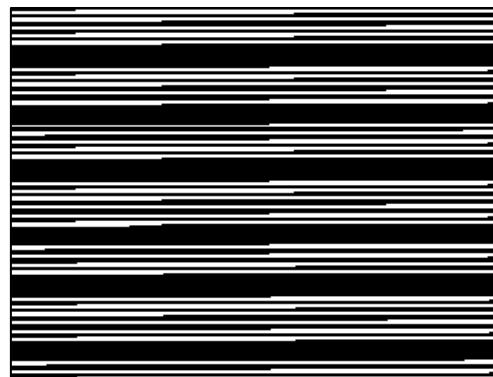
- The ZX81 will display a confirmation message once it has received the block.
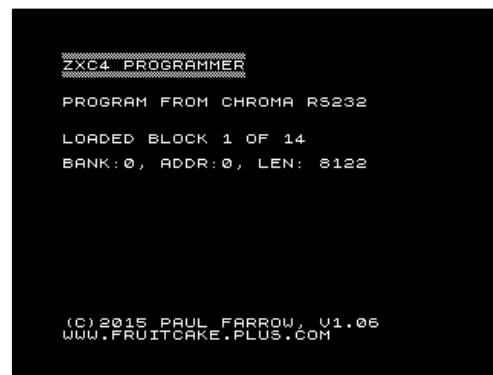
- The ZX81 will then indicate that it is about to program the block into the ZXC4.

ZXC4 PROGRAMMER

PROGRAM FROM CHROMA RS232

PROGRAMMING BLOCK 1 OF 14
BANK:0, ADDR:0, LEN: 8122

(C)2015 PAUL FARROW, V1.06
WWW.FRUITCAKE.PLUS.COM
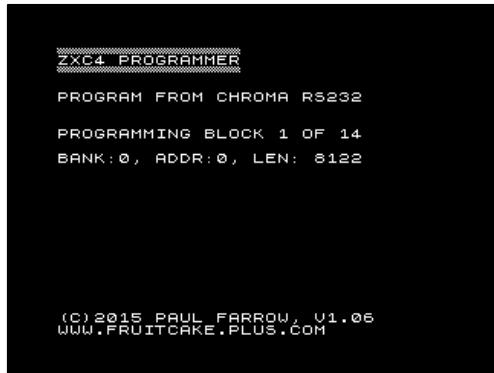
- The ZX81's screen then changes to black with short thin white lines across it, indicating that it is writing the data into the ZXC4.
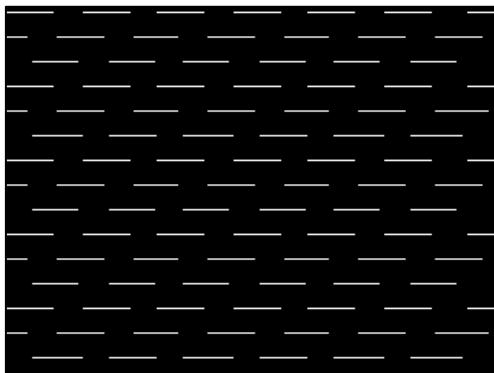
- The ZX81 confirms once the block has been programmed.

ZXC4 PROGRAMMER

PROGRAM FROM CHROMA RS232

PROGRAMMED BLOCK 1 OF 14
BANK:0, ADDR:0, LEN: 8122

(C)2015 PAUL FARROW, V1.06
WWW.FRUITCAKE.PLUS.COM
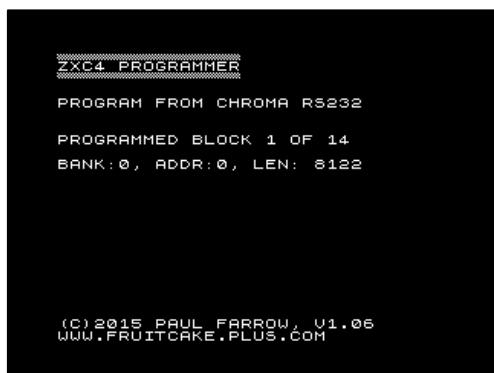
- The process then repeats for the remaining blocks.
- The ZX81 confirms once all blocks have been processed. The ZXC4 is now fully programmed.

ZXC4 PROGRAMMER

PROGRAM FROM CHROMA RS232

PROGRAMMED BLOCK 1 OF 14
BANK:0, ADDR:0, LEN: 8122

ROM PROGRAMMED SUCCESSFULLY
TO RUN THE INSTALLED APPLICATION
PRESS ANY KEY (BREAK WILL ABORT)

(C)2015 PAUL FARROW, V1.06
WWW.FRUITCAKE.PLUS.COM
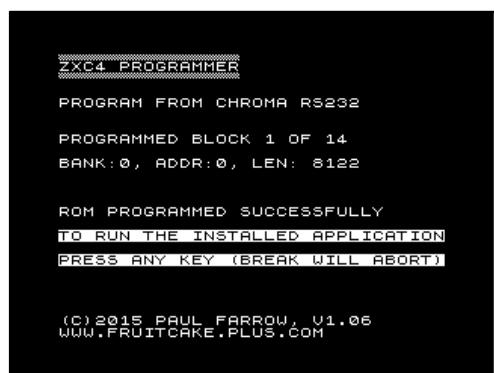
- Press a key to reset the ZX81.
- The compilation menu will automatically appear:
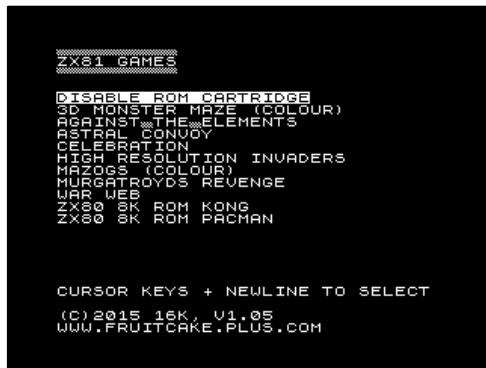
- Games can now be selected from the menu and run. After selecting a game, the ROM cartridge will be locked and it will not be possible to re-invoke the ROM cartridge menu until the ZX81 has been reset either using Chroma 81's reset button or by powering the ZX81 off and on again.
- The above process can be repeated whenever it desired to change the contents of the ZXC4. To re-access the Programmer menu, hold down keys SHIFT and 1 as Chroma 81's reset button is pressed or when powering on the ZX81.

Enhancing Games with Colour

Existing games can be enhanced using Chroma 81 by superimposing colour on top of every character without the need to change the actual games. Each character code can be assigned its own individual ink and paper colours for the 8 lines that make up the character through the use of colourisation definition files. Although it is possible to create your own colourisation definition files (as explained later), this introduction simply uses pre-prepared files.

- Download colourisation definition files from www.fruitcake.plus.com.

- Highlight a program to assign a colourisation definition file to, then click the Browse button next to the *Colour* field and select the colourisation definition file to apply. Entries that have been assigned a colourisation definition file are displayed in red text within the ZX ROM Cartridge Creator.
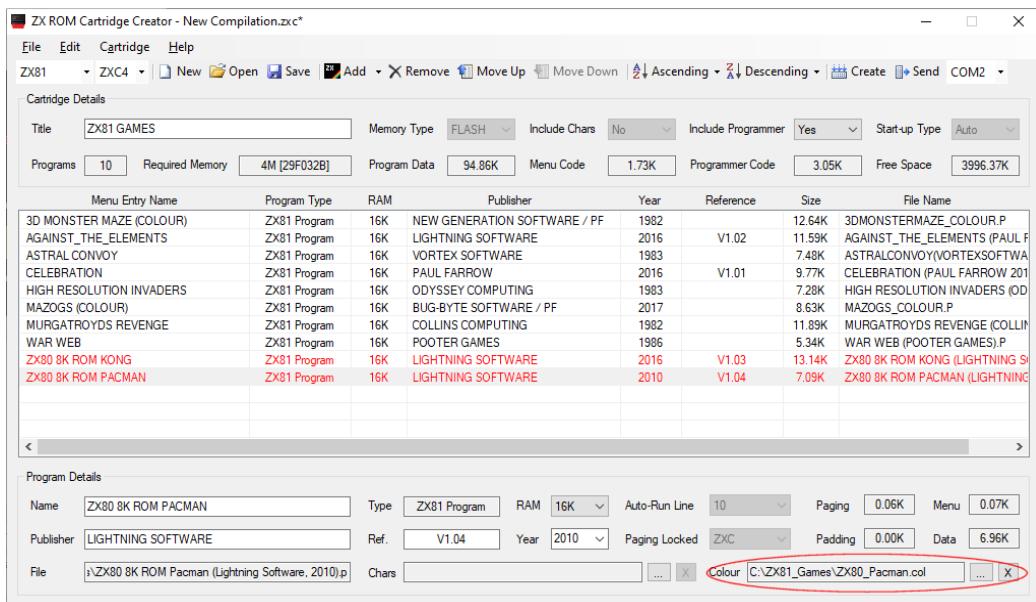
- Send the compilation to the ZX81 and program it into the ZXC4 as before. Once programmed, reset the ZX81 and the compilation menu will appear. When a game with a colourisation definition file assigned to it is run, the option is given to apply the colours to the game or to run it in its original black and white form.
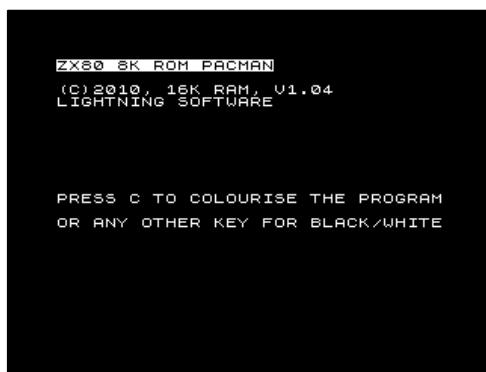

- Press C to set up the colourisation and the game run.

Enhancing Games with User Defined Graphics (UDGs)

Existing games can be enhanced using Chroma 81 by redefining the appearance of every character. Quicksilva and CHR$128 UDG modes are supported. Each character code can be individually redefined through the use of character definition files. Although it is possible to create your own character definition files, this introduction simply uses pre-prepared files.

- Download character definition files from www.fruitcake.plus.com.
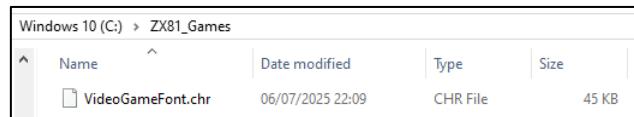
- Highlight a program to assign a character definition file to, then click the Browse button next to the *Chars* field and select the character definition file to apply. Entries that have been assigned a character definition file are displayed in blue text. An entry that has been assigned both a colourisation and a character definition file will be displayed in magenta text.
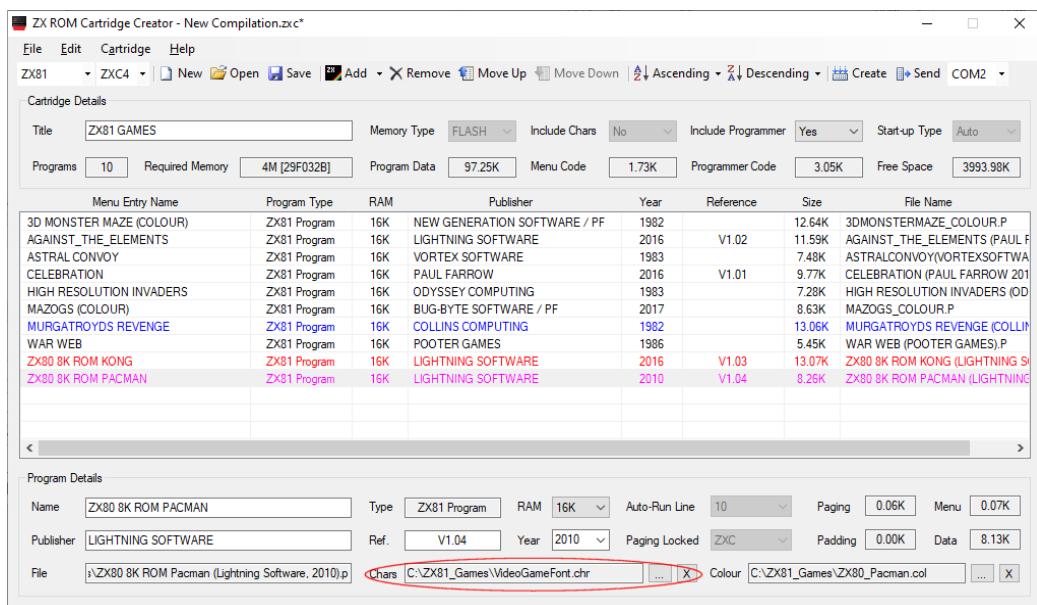
- Send the compilation to the ZX81 and program it into the ZXC4 as before. Once programmed, reset the ZX81 and the compilation menu will appear. When a game with a character definition file assigned to it is run, the option is given to apply the UDGs to the game or to display it using the standard Sinclair characters.
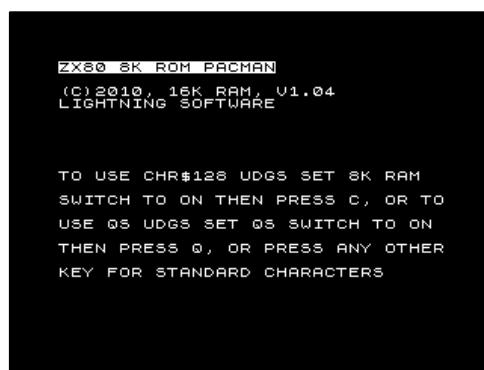
- Set switch 3 of Chroma 81 to ON to enable CHR$128 UDG mode.
- Press C to select to apply the UDGs and the game runs.

Creating Colourisation and Character Definition Files

It is possible to create your own colourisation and character definition files using the *Chroma Program Enhancement Creator*. The utility and full details on its use can be found on the ZX81 pages at www.fruitcake.plus.com.