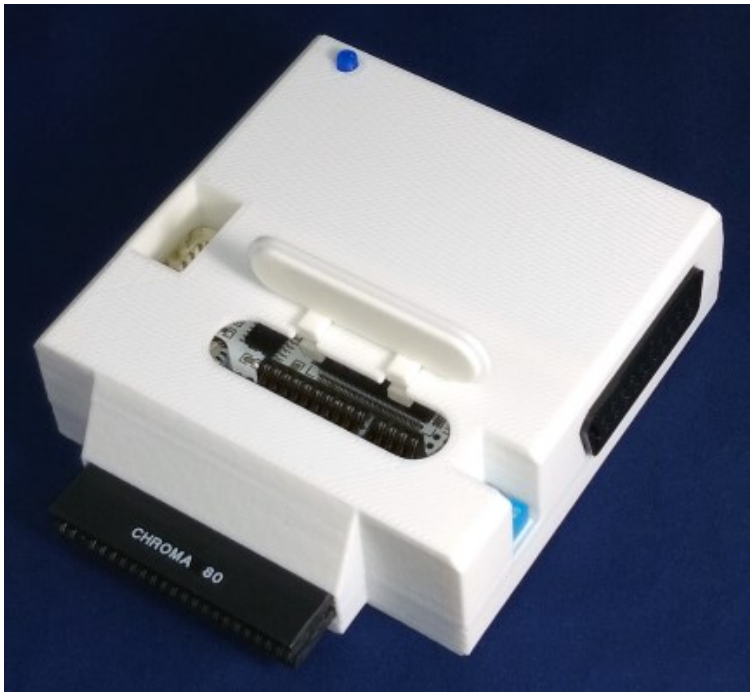
Chroma 80

Getting Started Guide

V1.4



Introduction

This document provides the basic information required to get the Chroma 80 interface set up and includes a step-by-step example on how to program a simple compilation of ZX80 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 ZX80 pages at www.fruitcake.plus.com.

Chroma 80 Suitability

Chroma 80 is only suitable for use with the following ZX80 configurations:

- A ZX80 fitted with the original 4K integer only BASIC ROM.
- A ZX80 fitted with the official Sinclair 8K floating point BASIC ROM upgrade, i.e. ZX81 ROM.
- A ZX80 fitted with the official Sinclair 8K floating point BASIC ROM upgrade along with the SLOW mode board produced by CompShop Ltd in 1981 (modern SLOW mode boards work probably ok with Chroma 80 but haven't been tried and so can't be guaranteed).

Pre-requisites and Precautions

The following important points will help ensure trouble free operations of Chroma 80.

- **Use a higher rated power supply of 1A or more.**
  The ZX80 came with either a 0.6A or a 0.7A power supply. The 0.6A power supply is not sufficient and should not be used for a ZX80 with a Chroma 80 interface connected. The 0.7A power supply is borderline suitable for a ZX80 with Chroma 80 interface but not if a ZXC4 or other device is connected. Modern design higher current rated power supplies sold especially for use with the ZX80 can be found on ebay and direct from various online sellers of Sinclair spares.

- **Clean the ZX80's expansion bus using isopropyl alcohol (isopropanol).**
  The ZX80'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 80, otherwise a poor electrical contact is likely to cause unreliable operation.

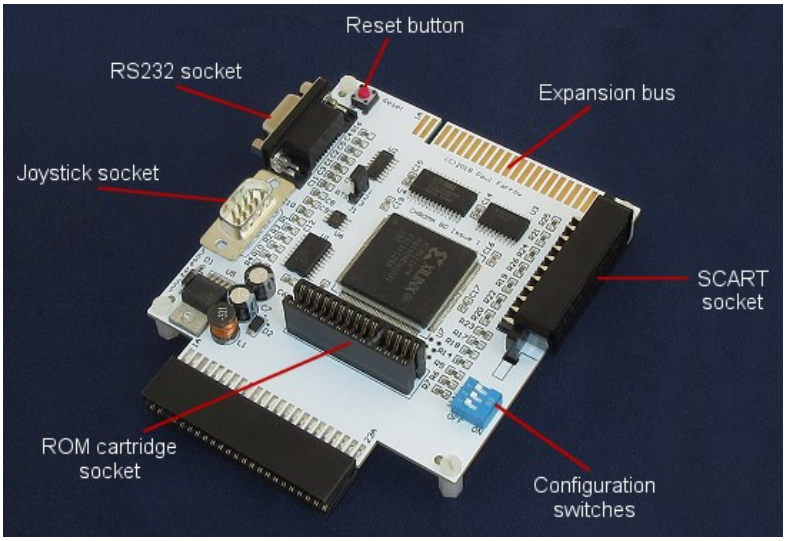
- **Only connect / remove Chroma 80 and a ZXC4 ROM cartridge with the power off to the ZX80.**
  Connecting or disconnecting with the power on seriously risks damaging the ZX80 and Chroma 80. Ideally also connect / disconnect all cables before powering on the ZX80 or TV.

- **Be careful not the damage the ZX80's case when connecting / disconnecting Chroma 80.**
  Chroma 80 will form a tight connection on the ZX80's expansion bus. Be careful how you hold the ZX80 to avoid damaging its case due to the force needed to connect / disconnect Chroma 80. Try to keep the interface as straight with the ZX80 as possible, wiggling it gently from side to side as necessary. After disconnecting Chroma 80, 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 80 with a ZX80.**
  Chroma 80 is not suitable for use with a ZX81 or non-identical clone of the ZX80 due to difference in timing of the expansion bus signals, and damage could occur to the computer or Chroma 80 as a result.

Chroma 80 Facilities

The hardware facilities provided by Chroma 80 are identified below.



Some of the hardware and software facilities provided by the Chroma 80 interface are permanently enabled, whereas others can be disabled via its configuration switches.

The permanently enabled facilities are:

- 16K RAM pack.
- WRX high resolution graphic support for the 16K RAM pack.
- 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 if the ZX80 has a SLOW mode board fitted.
Switch 2 Set this to ON to invert the screen to white on black.
Switch 3 Set this to ON to enable colour support, the RS232 socket, the Joystick socket and User Defined Graphics (UDG) support.

Using the Joystick Socket

The ZX80 never had a joystick connection standard that games supported. The ZX80 hardware does not allow a joystick interface to mimic the keyboard keys and so Chroma 80's joystick socket instead conforms to the Kempston format that became a standard on the ZX Spectrum. This means Chroma 80's joystick socket can only be utilised by newly written games aware of its existence. If a game provides support for a Kempston joystick then select this in order to use Chroma 80's joystick socket.

Programming a ZXC4 ROM Cartridge

Chroma 80'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 on a ZX80 fitted with either the 4K ROM or the 8K

ROM. 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 80's RS232 socket).
- The *ZX ROM Cartridge Creator* software downloaded from www.fruitcake.plus.com and installed on the Windows PC.

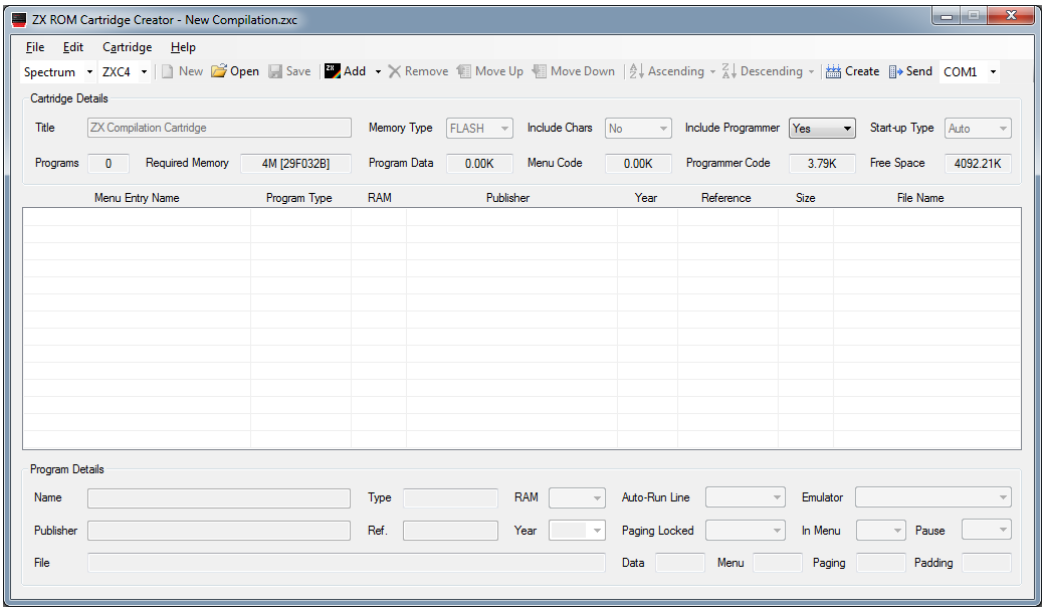
The programming process involves the following aspects:

- Prepare a compilation of programs to be installed into the ZXC4 ROM cartridge.
- Download the compilation data to the ZX80 for programming into the ZXC4.
- Invoking the menu system once the compilation has been programmed into the ZXC4 to allow running of the programs it contains.

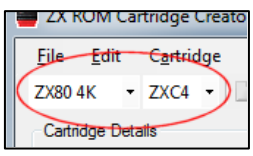
Preparing a Compilation

These instructions assume a ZX80 with the 4K ROM is being used, but the process for a ZX80 with the 8K ROM is fundamentally the same.

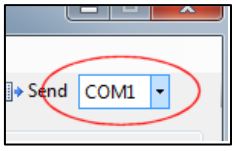
- Run the ZX ROM Cartridge Creator utility on the Windows PC.



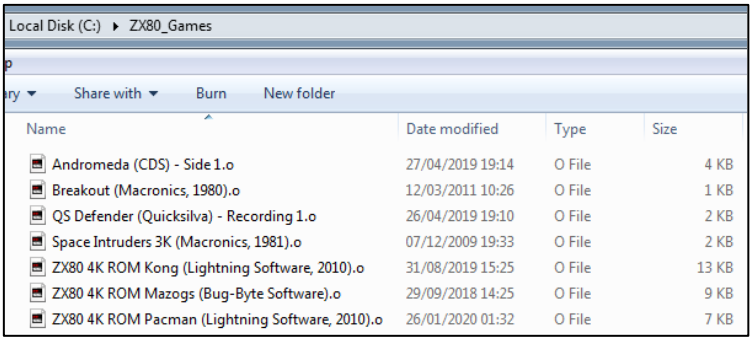
- Change the target computer from ***Spectrum*** to ***ZX80 4K*** (or select ***ZX80 8K*** if the ZX80 has the 8K ROM fitted).
- Leave the target ROM cartridge as ***ZXC4***.



- Select the COM port number corresponding to the RS232 socket on the PC that is connected to Chroma 80's RS232 socket (this setting is only applicable if your PC has multiple RS232 sockets).

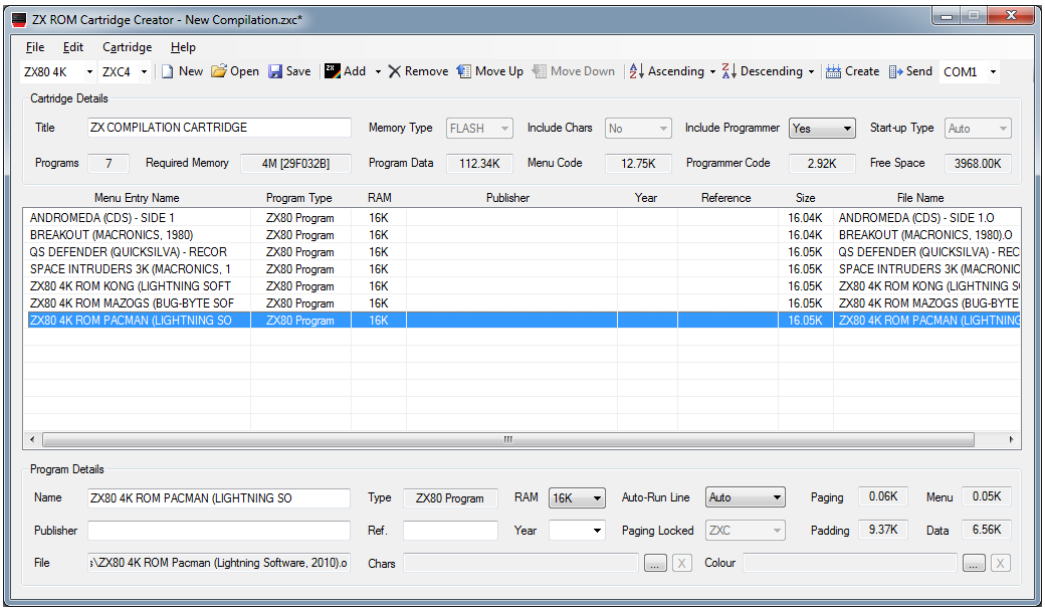


- Download the ZX80 programs to include in the ZXC4 compilation. For this example, the following 4K ROM games were downloaded from www.fruitcake.plus.com.



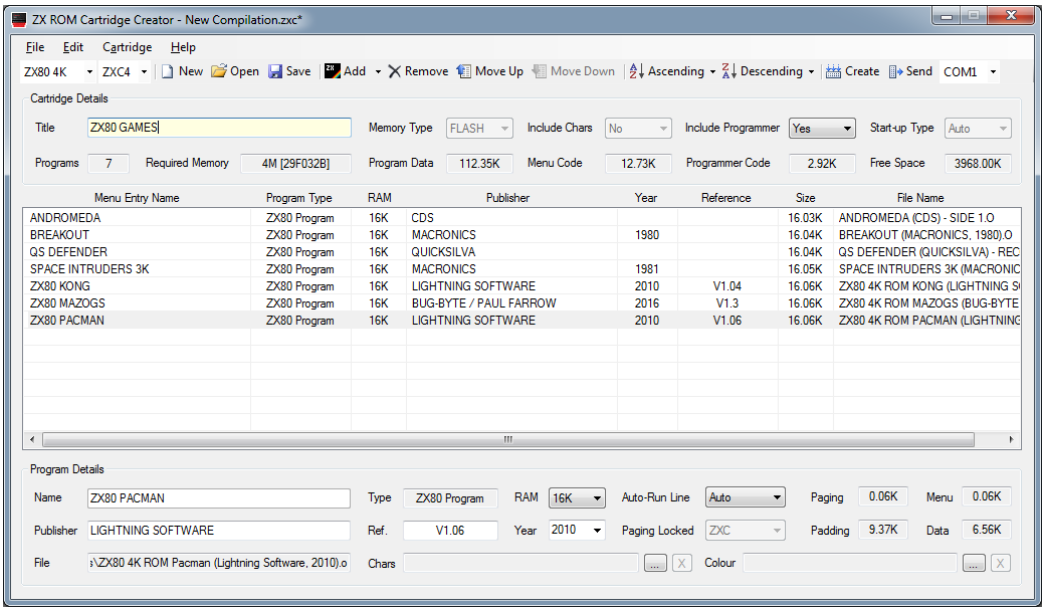
Note that programs for the 4K ROM will have file extension .o, and programs for the 8K ROM will have file extension .p or .p81. Unless you have a SLOW mode board fitted to your ZX80, only 8K ROM programs that are designed to run in FAST mode will be suitable.

- Open Windows Explorer on the PC and browse to the folder containing the ZX80 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 ZX80'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 ZX80. It can be edited as desired, e.g. ZX80 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 ZX80.
- For each game entry, optionally fill in the ***Publisher***, ***Ref*** and ***Year*** fields. These will appear at the bottom of the screen on the ZX80 when the menu is browsed through and simply provide more information to identify each program. Any text displayable by the ZX80 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.



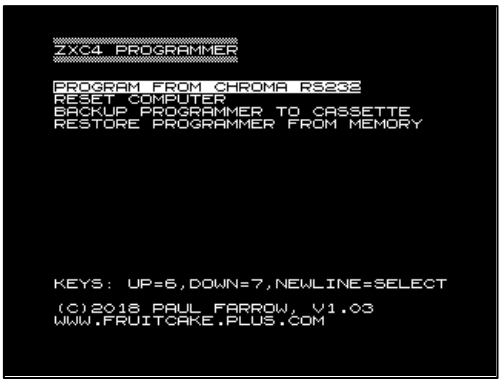
- For each game, it is recommended to leave the ***RAM*** field set to 16K unless there is a real necessity to change it lower, which will provide maximum program compatibility.
- Programs can be dragged and dropped to re-order them, with other facilities available from the menu toolbar to sort them 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. This is particularly useful for 4K ROM programs since the 4K ROM did not provide a built-in mechanism to allow this. The facility works by directly requesting the ROM to execute a GO TO command to the chosen line number. GO TO is used instead of RUN to ensure any variables held only in memory are preserved (a technique which many early programs used to save memory). 4K ROM programs that utilise the auto-run trick devised by Martin Korth will only present "Auto" as an option in the ***Auto-Run Line*** list. A few 4K ROM flicker-free games struggle being loaded via the ROM cartridge mechanism – some will only work if an auto-run line number is specified, whereas others will only work if a line number is not specified. Some trial and error may be needed to work out the best settings to use for each game.

Downloading the Compilation to the ZX80 for Writing into the ZXC4

The compilation data is sent over to the ZX80 as a number of blocks of 8K or less. These instructions assume a ZX80 with 4K ROM is used and that all of Chroma 80's switches are initially set to OFF.

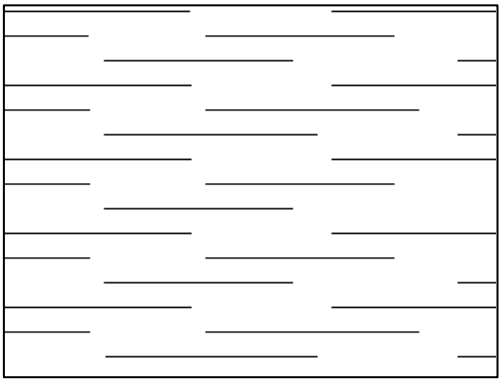
- Ensure the ZX80 is powered off.
- Connect the PC's RS232 socket to Chroma 80's RS232 socket (use an extension cable if required).
- Plug the ZXC4 into Chroma 80's ROM cartridge socket.

- Set switch 3 of Chroma 80 to ON.
- Power on the ZX80. The standard K cursor will appear.
- Invoke the ZXC4 Programmer utility by typing in the command appropriate to the ROM type:
  4K ROM: **RANDOMISE USR(32642)**
  8K ROM: **RAND USR 32642**

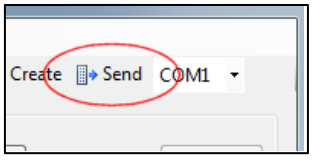


- Press NEWLINE to select **PROGRAM FROM CHROMA RS232**.
- The ZX80 will display that it wants to receive the first block of data.

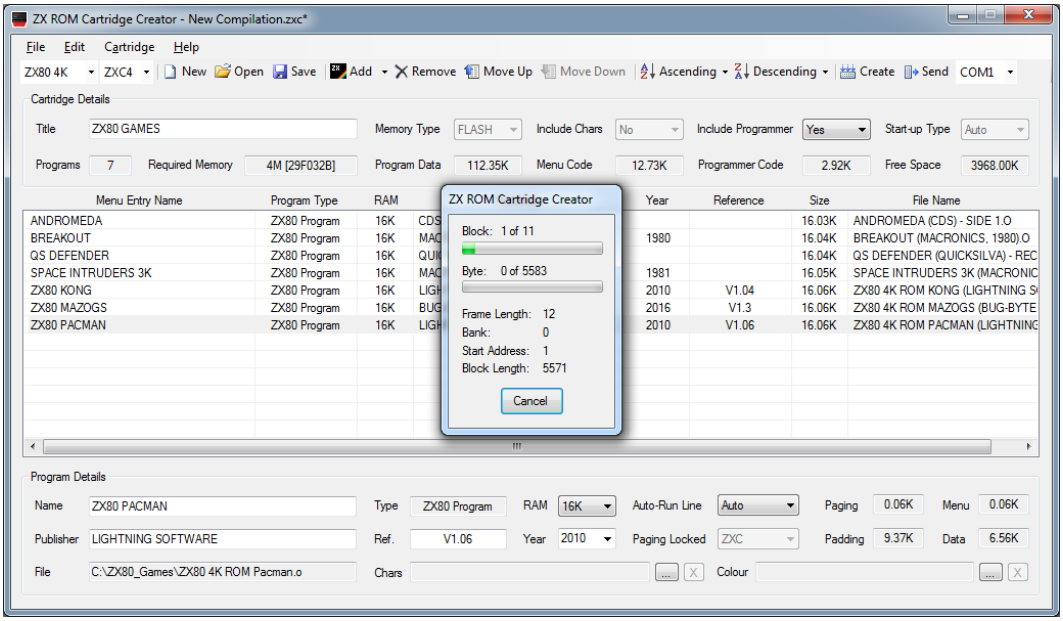
- The ZX80's screen then changes to white with thin black lines across it, indicating that it is waiting to receive data.



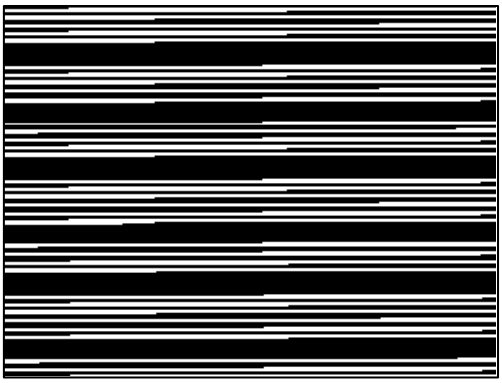
- On the ZX ROM Cartridge Creator, click the Send button.



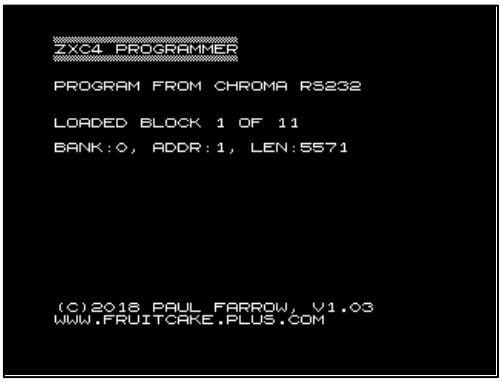
- The ZX ROM Cartridge Creator will display a progress dialog showing details about the block currently being sent.



- As the data is received, the ZX80 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.

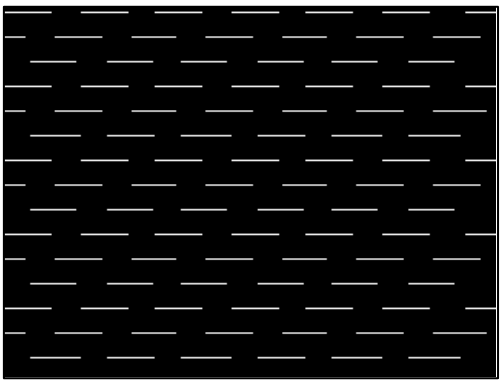


- The ZX80 will display a confirmation message once it has received the block.

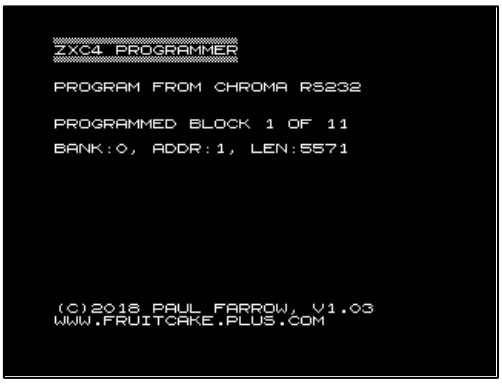


- The ZX80 will then indicate that it is about to program the block into the ZXC4.

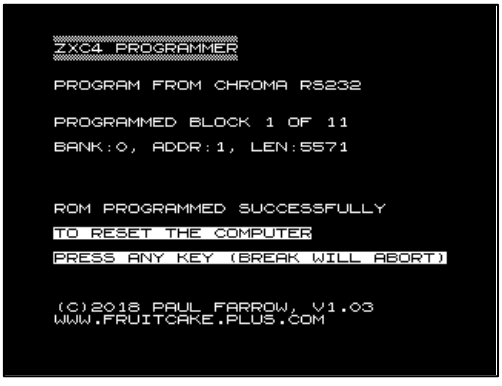
- The ZX80's screen then changes to black with short thin white lines across it, indicating that it is writing the data into the ZXC4.



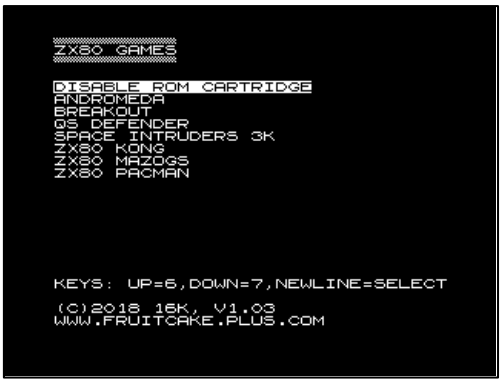
- The ZX80 confirms once the block has been programmed.



- The process then repeats for the remaining blocks.
- The ZX80 confirms once all blocks have been processed. The ZXC4 is now fully programmed.



- Press a key to reset the ZX80.
- Invoke the compilation menu by typing in the command appropriate to the ROM type:
  4K ROM: **RANDOMISE USR(32640)**
  8K ROM: **RAND USR 32640**

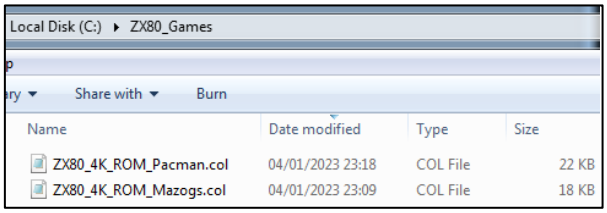


- Games can now be selected from the menu and run. After selecting a game, the ROM cartridge will be locked and it will not be possible to re-invoke the ROM cartridge menu (or ZXC4 Programmer utility) until the ZX80 has been reset either using Chroma 80's reset button or by powering the ZX80 off and on again.
- The above process can be repeated whenever it desired to change the contents of the ZXC4.

Enhancing Games with Colour

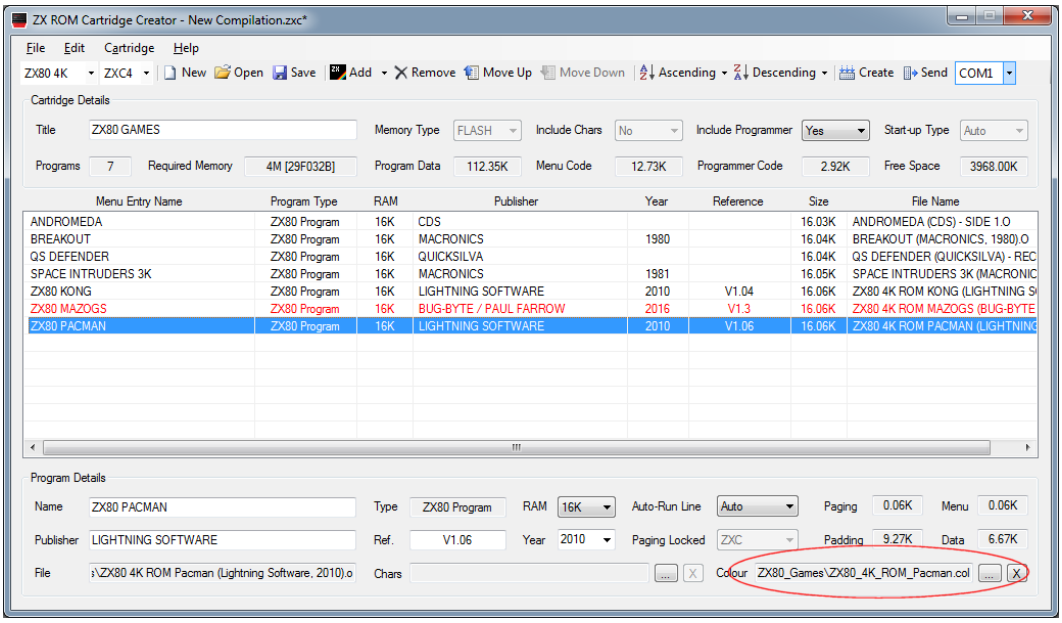
Existing games can be enhanced using Chroma 80 by superimposing colour on top of every character without the need to change the actual games. Each character code can be assigned its own individual ink and paper colours for the 8 lines that make up the character through the use of colourisation definition 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.

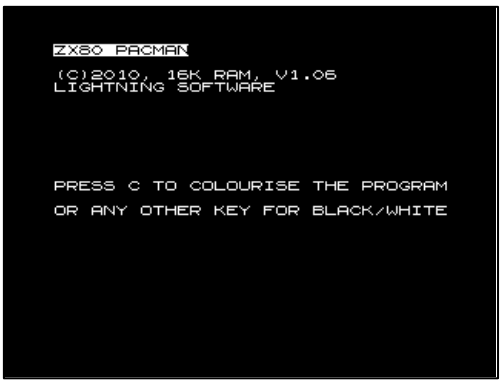


- Highlight a program to assign a colourisation definition file to, then click the browse button next to the ***Colour*** field and select the colourisation definition file to apply. Entries that have been

assigned a colourisation definition file are displayed in red text within the ZX ROM Cartridge Creator.



- Send the compilation to the ZX80 and program it into the ZXC4 as before. Once programmed, invoke the menu on the ZX80. 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.

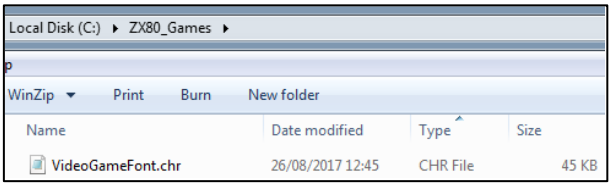


- Press C to set up the colourisation and the game runs.

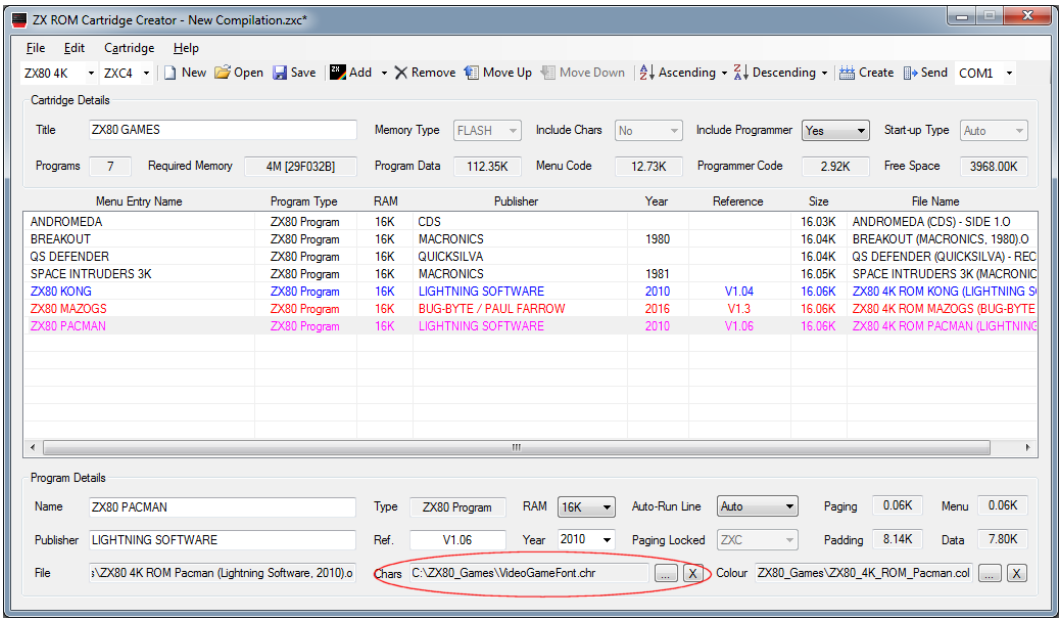
Enhancing Games with User Defined Graphics (UDGs)

Existing games can be enhanced using Chroma 80 by redefining the appearance of every character. 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.

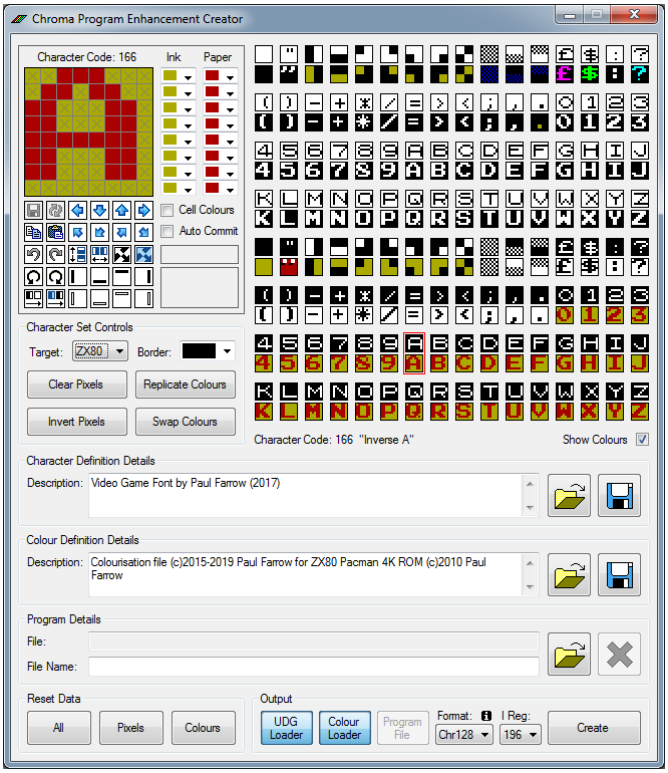


- Send the compilation to the ZX80 and program it into the ZXC4 as before. Once programmed, invoke the menu on the ZX80. When a game with a character definition file assigned to it is run, the option is given to apply the UDGs to the game or to display it using the standard Sinclair characters.

- Press U to select to apply the UDGs and the game run.

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 ZX80 pages at www.fruitcake.plus.com.



Switching the ZXC4 between a ZX80 with 4K ROM and 8K ROM

Once a compilation has been programmed into the ZXC4, the copy of the ZXC4 Programmer utility embedded within the ROM cartridge is specific to the ROM type of that compilation. For example, if a 4K ROM compilation has been programmed into the ZXC4 then the ZXC4 Programmer utility can only be launched using a ZX80 fitted with the 4K ROM. To subsequently switch the ZXC4 for use with a ZX80 fitted with the 8K ROM, create an 8K ROM compilation but use the ZXC4 Programmer utility running on the ZX80 with 4K ROM to program it into the ROM cartridge. The ZXC4 will then operate with the 8K ROM but no longer with the 4K ROM. This approach can also be performed to convert the ZXC4 back for use with the 4K ROM after programming it with a compilation for the 8K ROM.