AMSpiriT 2.0

User's Guide

Amstrad CPC & Amstrad Plus Emulator

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Version :	**2.00 RC1 / 07-2025**
Website :	**https://www.AMSpiriT.fr/**

1. INTRODUCTION

AMSpiriT is an Amstrad CPC emulator designed for Windows. It was developed based on documentation and technical information freely available on the internet, and has since evolved with the support of CPC community contributors — notably Serge QUERNE.

AMSpiriT aims to faithfully replicate the operation and philosophy of the Amstrad CPC 464, 664, and 6128 computers, as well as the 464 Plus and 6128 Plus models marketed in the mid-1980s, while providing a clean and intuitive interface.

AMSpiriT is freeware. It can be freely distributed for private use, but MUST NOT be used for advertising or commercial purposes. Any use of screenshots or promotional material on the internet must be requested in advance from the author.

The ROM images provided with AMSpiriT are the property of AMSTRAD PLC and Locomotive Software. Amstrad and Locomotive have kindly authorized their distribution in emulators but retain intellectual property rights over them.

AMSpiriT is currently in development phase, and many features are not yet implemented. To stay informed about the latest developments of the emulator, do not hesitate to visit the following post on the excellent “forum.system-cfg.com”:

https://forum.system-cfg.com/viewtopic.php?f=24&t=11535

Please feel free to communicate your enhancement requests or report any bugs encountered via the contact address provided above or on our AMSpiriT Discord server. I will endeavor to respond to your requests to the extent of my availability, technical skills, and personal preferences..

In any case, I hope that you will enjoy using this emulator on a daily basis as much as I enjoyed developing it.

Have fun :)

Table of Contents

2. CHARACTERISTICS

Development and Environment

AMSpiriT is developed in C/C++ for Windows, using the Microsoft Visual Studio development platform.

Compatibility with Windows versions:

AMSpiriT is fully compatible with Windows 10 and Windows 11. It has not been tested on versions prior to Windows 10, and compatibility outside of these operating systems cannot be guaranteed.

Processor versions:

AMSpiriT is distributed in two versions 64-bit (x64) and 32-bit (x86).

Windows specific APIs :

AMSpiriT uses Windows proprietary APIs (Direct2D and X-Audio2) for video display and sound playback.

Emulated components :

AMSpiriT closely emulates the main electronic components of the AMSTRAD CPC :

- **Zilog Z80A (CPU)** : Encoded in T-states signal for better accuracy.
- **Gate Array (Amstrad proprietary chip)**: Manages memory access, video rendering, and interrupts.
- **CRTC (Video Controller)**: Supports the five variants marketed by Amstrad.
- **FDC µFD765 (Floppy Disk Controller).**
- **AY-3-8912 PSG (Programmable Sound Generator).**
- **Intel PPI 8255A chip** : Serves as I/O interface to keyboard, PSG and cassette player.
- **ASIC (Amstrad proprietary chip - CPC Plus series)** : Emulation of advanced hardware effects.

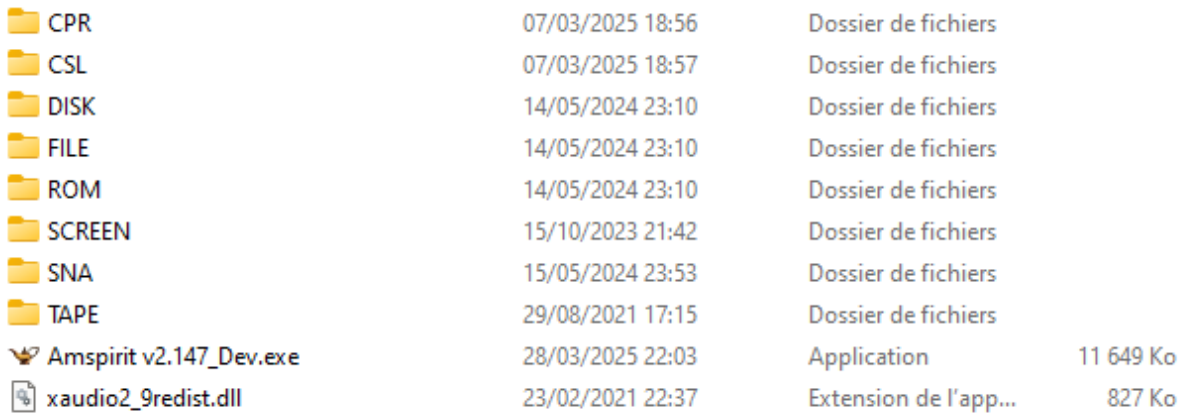
AMSpiriT comes ready to use with all the system and BASIC ROMs that have been marketed by AMSTRAD PLC and Locomotive Software. (English, French, Spanish and Danish ROMs).

Supported File Formats :

- **Cassette files** : WAV, CDT
- **Floppy Disk files** : DSK, eDSK, HFE, and IPF (read-only)
- **Cartridge files** : CPR (for CPC Plus systems)
- **Snapshot files** : SNA (restores previously saved machine states)
- **Binary files** (with AMSDOS headers) : BIN
- **Text files** : TXT (enables automatic copying of BASIC listings)
- **Script files**: CSL (CPC Script Language) allowing you to launch command scripts.

3. INSTALLATION

Once the archive is unzipped, the AMSpiriT installation directory contains the following files :



Installation directory structure

- **CPR folder** : Contains cartridge files, including “system” ROMs for CPC Plus models.
- **CSL folder** : Contains script files in CSL (CPC Script Language) format.
- **DISK folder** : Contains the disk image files (*.DSK, *.IPF, *.HFE).
- **FILE folder** : contains various auxiliary files (*.TXT, *.BIN).
- **ROM folder** : Contains the system and BASIC ROMs for the Amstrad CPC (excluding Plus series).
- **SCREEN folder**: Contains screenshots generated by the emulator.
- **SNA folder** : Contains the « memory image » files (*.SNA).
- **TAPE folder** : Contains the cassette image files (*.WAV, *.CDT).

Execution

The AMSpiriT emulator can be run by double-clicking on the corresponding file. It does not modify the registry and can be used on any media.

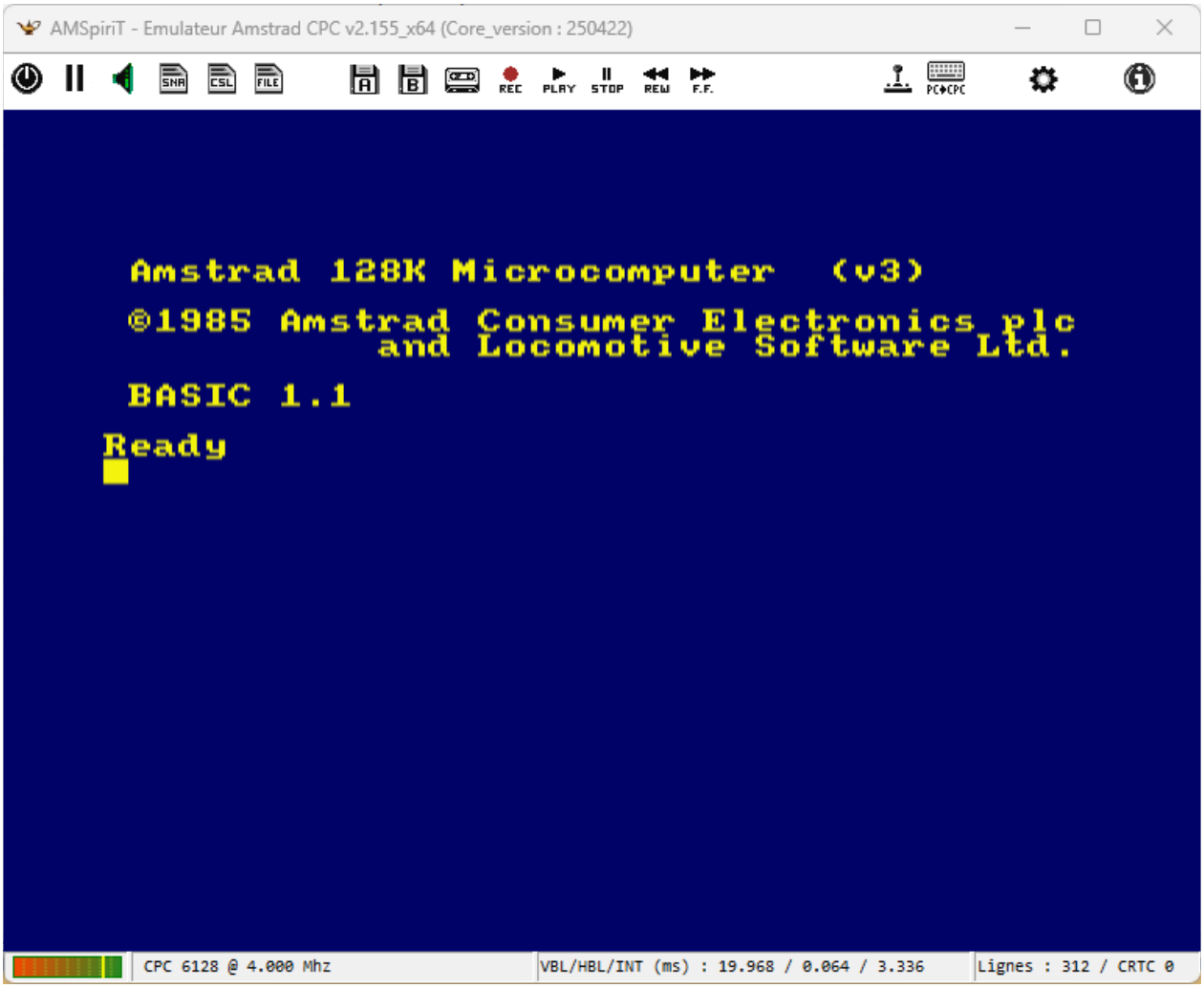
Additionally, the emulator can also be controlled via **command line.**

Settings management

A configuration file, **AMSpiriT_Config.txt**, is automatically updated each time the emulator is closed. This file can safely be deleted — it will be regenerated with the default settings.

4. MAIN WINDOW

When you first launch AMSpiriT, if no error message appears, the emulator's execution window should look like the image below.



The window is made up of 3 distinct parts :

- **A toolbar** consisting of a row of icons across the top.
- **The main window** emulating the AMSTRAD CPC display.
- **An information bar** on the bottom.

By default, AMSpiriT emulates the CPC 6128 in its UK version but it is possible to choose another CPC model among the different options offered.

By default, AMSpiriT starts in **windowed mode**. It is possible to switch to **full screen** (and go back to windowed mode) by pressing the **F12 key**.

5. MAIN TOOLBAR

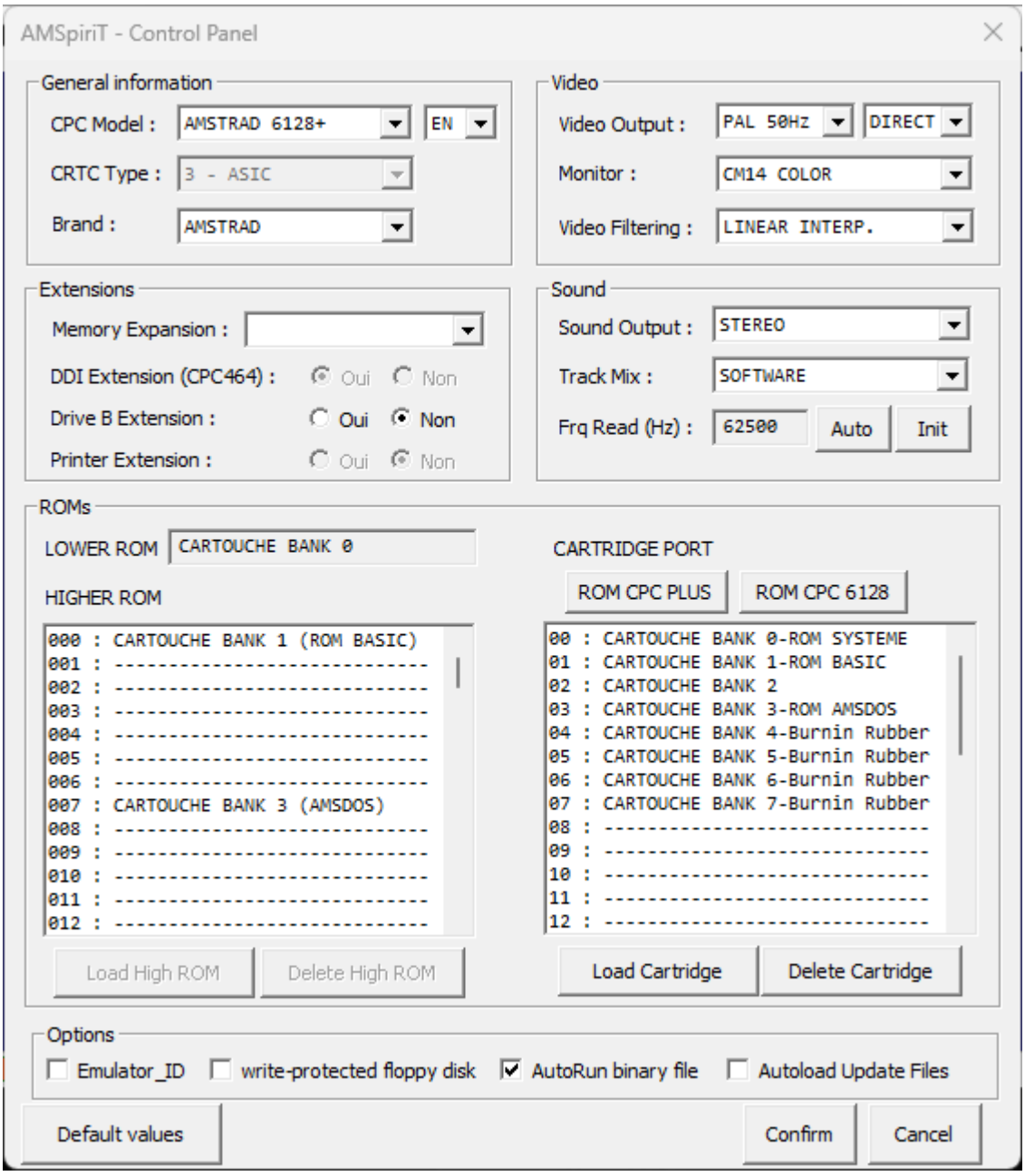
The toolbar allows you to control the behavior of the emulator. It consists of several icons whose functions are detailed below. You can right-click on most icons to access additional features.

Description of the icons:

	Restart the emulator : “Hard Reset” with left-click or “Soft Reset” with right-click.
	Toggle Pause mode : When active, the icon turns red.
	Toggle sound : When muted, the icon turns red.
	Load (left-click) / Save (right click) a Snapshot file
	Load (left click) /save (right click) a Script file in CSL (CPC Script Language) format.
	Load Text files or Binary files.
	Load a cartridge image (**specific to the CPC Plus series**).
	Load a floppy image to Drive A (default drive).
	Load a floppy image to Drive B **(if the option is enabled).**
	Load a cassette image.
	Enables saving of a cassette recording
	Activates playback of a cassette recording
	Stops playback of a cassette recording
	Fast rewind on a cassette recording
	Fast forward a cassette recording
	Joystick configuration menu
	Toggle keyboard mapping
	Accessing the emulator control panel
	Emulator Info Menu

Emulator configuration menu

This icon opens the emulator's control panel, allowing users to adjust settings to their needs.



General Section

The General section allows you to configure the hardware characteristics of the CPC.

- **CPC Model :** This drop-down menu allows you to choose the AMSTRAD CPC model (464, 664 or 6128) as well as its version (English, French, Spanish or Danish). The corresponding ROMs will be automatically loaded into memory after your selection.
- **CRTC Type** : This drop-down menu allows you to choose from the four CRTC types implemented in AMSTRAD CPCs. Their behavior is almost identical in normal use. Only demos will allow you to distinguish one CRTC type from another. By default, type “0” is selected for CPC 464, 664, and 6128 models. For 464+ and 6128+ models, Type “3” is selected by default and is non-editable.
- **Brand** : this drop-down menu allows you to select the brand that will be displayed on the start screen.

Extensions

The “Extensions” area allows you to emulate the extensions present on the AMSTRAD CPC.

- **Memory Expansion** : drop-down menu allows you to emulate additional memory. 7 choices are available: **64 kB, 128 kB, 256 kB, 512 kB, 1024 kB, 2048 kB or 4096 kB**. It should be noted that on an Amstrad 6128, the 64 KB extension is already activated by default.
- **DDI extension** : specific to the AMSTRAD CPC 464 and 464 plus. It allows to emulate the presence of the floppy disk controller. This extension is useless on an Amstrad 664, 6128 and 6128 plus, which integrates it by default.

Video

The “Video” area allows you to select the characteristics of the video screen emulating the CPC.

- **Video Output**: This drop-down menu allows you to choose between "PAL" mode (50 Hz) and "NTSC" mode (60 Hz). The latter mode is not used in practice.
- **Display mode** :
    - **DIRECT** : Video rendering is included in the main emulation loop (recommended for older processors).
    - **THREAD** : Video rendering runs on a separate thread, offering better performance (recommended for modern processors).
- **Monitor** : This drop-down menu lets you choose between a color monitor and a monochrome monitor (green or black and white depending on the CPC model). For CRTC Type “4”, a specific monitor is provided to center the screen.
- **Video Filtering:**
    - **Linear interpolation (enabled by default) :** Applies hardware filtering adjacent colors, creating a smoothing effect on pixels.
    - **No filtering :** Displays a raw, crisp image with no blur between pixels.

Audio configuration

The “Sound” area allows you to select the characteristics of the CPC sound emulation.

- **Sound Output** : This drop-down menu allows you to choose between “MONO” and “STEREO” mode (default).
- **Track Mix** : The CPC has 3 sound tracks that are mixed when sound is played back to the speakers.
    - **Software (par défaut)** : Mix the 3 tracks into one via a software mixer before sending the resulting sound signal to the PC's sound card.
    - **Hardware** : the 3 tracks are mixed directly by the PC's sound card. This last mode seems to give a less convincing sound rendering than the software mode which is to be preferred.
- **Frq Read** : Allows you to adjust the sound buffer playback frequency. By default, the sound buffer is played at a frequency of 62.5 kHz. On some PCs with multi-core processors, there may be periodic "crackling" in the sound due to the fact that the CPC emulation speed is not exactly set to 4,000 MHz.
    - **« Auto button » :** allows you to set a sound buffer playback frequency in phase with the actual CPC emulation frequency.
    - **« Init button » :** Reset the playback frequency to 62.5 kHz.

ROM and Cartridge Management

Additional ROMs can be added depending on the CPC model used :

- Amstrad CPC 464, 664 and 6128 : up to 255 additional ROM slots available,
- Amstrad CPC 464+ et 6128+ : up to 128 ROM slots available,

Each ROM can be a maximum of 16 KB in size and must be in “.ROM” format.

Loading and removing ROMs :

- To add a ROM: Double-click on the desired slot or use the “Load Upper ROM” button.
- To remove a ROM (except system ROM) : Click on “Remove Upper ROM » button.

Cartridge Management (CPC Plus)

The "CPC Plus" series uses cartridge files (“CPR” format), which are automatically executed when the emulator starts.

- To add a cartridge : Click on « Load Cartridge » button.
- To remove a cartridge : Click on « Remove Cartridge » button.

System ROM selection : By default, the system ROM is preselected when choosing a CPC Plus model, but you can select a different default ROM by clicking on “CPC Plus ROM” or “CPC 6128 ROM”.

Options :

Emulator Identification

The « Emulator_ID » checkbox allows a CPC program to identify AMSpiriT. Some CPC emulators use the #FEFE port to provide a method of identifying a CPC emulator specifically. CPC programs can use this identifier to detect an emulator and adjust their behavior accordingly.

- **Checked** : the returned value will be **#78** for AMSpiriT.
- **Unchecked** : the returned value will be #FF (like a real CPC).

By default, this feature is disabled in AMSpiriT.

For more information : https://www.cpcwiki.eu/index.php/Emulator_IDs

Write-protected floppy disk

The "Write-protected floppy disk" checkbox allows you to decide whether files of type "floppy disk" should be write-protected when loaded by AMSpiriT.

- **Checked** : the files will be write-protected.
- **Unchecked**: File write protection will not be applied.

Automatic Loading of Binary Files

The « **AutoRun Binary Files** » checkbox determines whether binary files (*.BIN) loaded by AMSpiriT should be automatically executed after being loaded into memory.

- **Checked :** Binary files are immediately executed after loading. If an execution address is specified in the file, the BASIC command `CALL &xxxx` is displayed on screen and the file is launched.
- **Unchecked** : Binary files are only loaded into memory without being executed.

Automatic Reloading of Modified Files

The « **AutoLoad Modified Files** » checkbox automatically reloads snapshot files (SNA) or disk images already loaded in the emulator after they have been updated.

- **Checked** : Snapshot files are immediately executed after being modified, which triggers a reset of the emulator. Disk images are reloaded after being modified.
- **Unchecked**: Disables automatic reloading of files after they have been modified.

Loading a Floppy Image

Loading and Status Indication

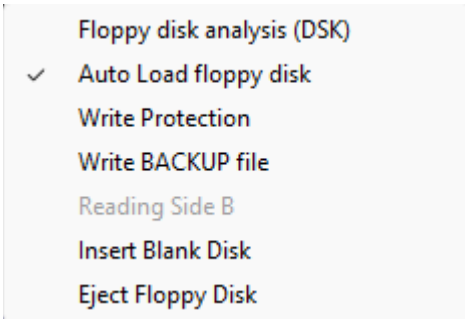
This icon allows you to load a floppy disk image in « DSK », « HFE » ou « IPF » format. Once a valid file is loaded, the icon changes its appearance to indicate the presence of a floppy disk.

Description of the icons :

	Indicates that a floppy disk is present.
	**Yellow icon :** Indicates that the floppy drive motor is running.
	**Green icon :** Indicates a read operation on the floppy disk.
	**Red icon :** Indicates a write operation on the floppy disk.

Advanced Options

Right-clicking on the icon brings up a conceptual menu that gives you access to new options :



- **Floppy Disk Analysis (DSK)** : allows you to access the floppy disk analysis panel (in experimental version. Will not be detailed in this guide).
- **Auto Load floppy disk**: Allows you to automatically load the last loaded floppy disk file when starting the emulator.
- **Write Protection** : Allows you to protect or unprotect the disk file against writing.
- **Write BACKUP file** : Allows you to write changes to a "copy" floppy disk file of the original in order to protect the contents of the original against unwanted operations.
- **Read Side B** : Allows you to force reading on side B of the diskette for diskettes formatted on both sides (side A and B on the same DSK support).
- **Insert Blank Disk** : Creates a blank diskette formatted in the Standard AMSDOS format (9 sectors per track, single-sided).
- **Eject Floppy disk** : Allows you to unload a floppy image.

Loading a cassette image

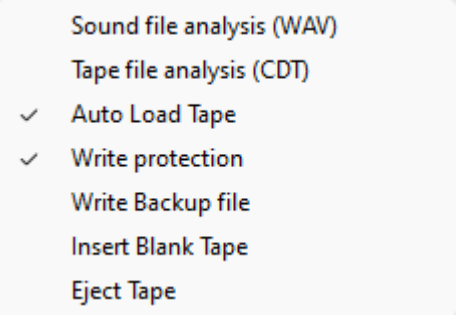
This icon allows you to load an image of a cassette recording in « WAV » or « CDT » format. Once a valid file is loaded, the icon changes appearance to indicate the presence of a cassette.

Description of the icons :

	Indicates a cassette is present.
	Yellow icon : Indicates that the cassette player motor is running.
	Green icon : Indicates a read operation on the cassette.
	Red icon : Indicates a write operation on the cassette.

AMSpiriT reads the audio stream on the fly as a real CPC would. It can therefore read protected or unprotected cassettes indistinctly.

Right-clicking on the icon brings up a popup menu that gives you access to new options :



- **Analyze sound file (WAV)** : Allows you to access the analysis panel of a sound recording in WAV format (in experimental version. Will not be detailed in this guide).
- **Cassette File Analysis (CDT)** : Allows you to access the analysis panel of a cassette file in CDT format (in experimental version. Will not be detailed in this guide).
- **Auto Load Cassette** : Allows the last loaded cassette file to be automatically loaded when the emulator starts.
- **Write Protection** : Allows you to protect or unprotect the cassette file against writing.
- **Write Backup file** : Allows you to write changes to a "copy" cassette file of the original in order to protect the contents of the original against unwanted operations.
- **Insert Blank Tape** : Create a “blank” cassette image..
- **Eject Cassette** : Allows you to unload a cassette image.

Using the Cassette Player

Like a real AMSTRAD CPC 464, playback of cassette recordings is done using the icons below :

Loading and displaying information

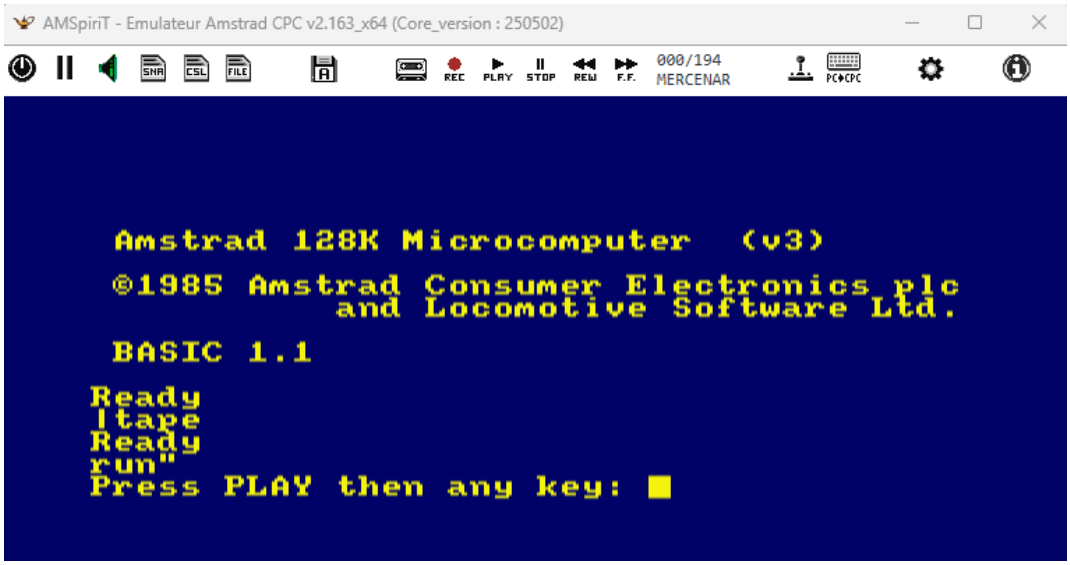
Once a cassette file is loaded, it is analyzed and the following information is displayed :

- **A counter** indicating the playback progress.
- **The name of the first file on the cassette,** displayed to the right of the control icons.

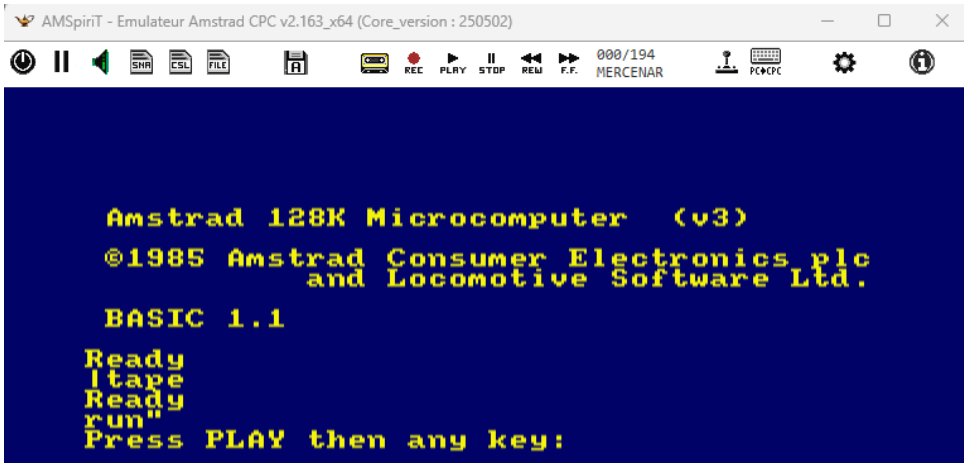
Playing a cassette file

The cassette file loading procedure faithfully reproduces the behavior of a real AMSTRAD CPC :

1. **Run the BASIC instruction :** First, type the command |TAPE if you're using a CPC 664 or 6128, then enter the command RUN".
2. **Wait for the system message:** When the message "Press PLAY then any key" appears.



3. **Yellow icon :** Press ENTER to start the cassette player motor. The cassette enters standby mode



4. **Click the PLAY icon,** which turns green as well as the cassette player icon.

5. **Playback begins...** The counter will start to increment until the file is fully loaded.

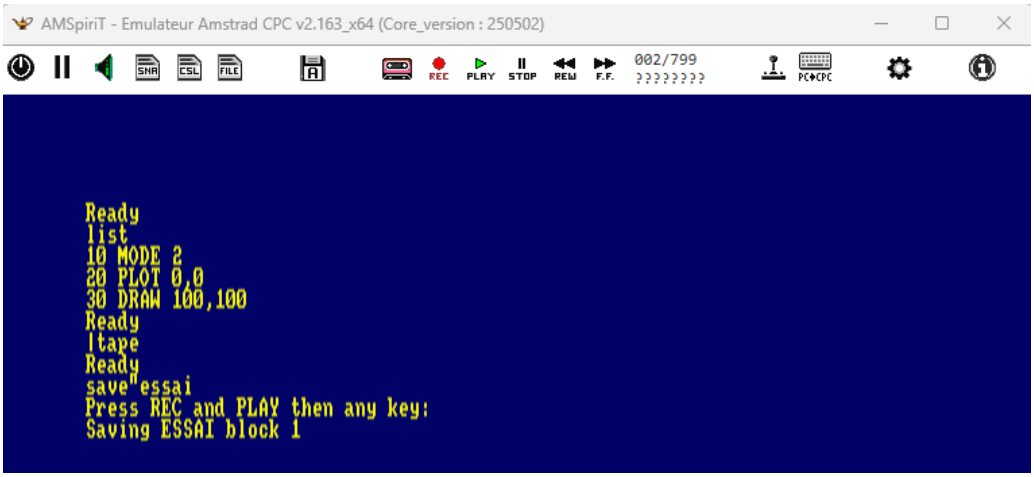
Recording a cassette file

By default the cassette is **write-protected**. Don't forget to unprotect it first (right-click on the cassette icon) otherwise the "REC" icon will remain blocked and recording will not take place.

Recording procedure :

1. **Run the BASIC instruction :** First, type the command |TAPE if you're using a CPC 664 or 6128, then enter the command SAVE"XXXX".
2. **Wait for the system message :** Once the message "Press REC and PLAY then any key" is displayed, you must click on the "REC" and "PLAY" icons.

3. **The "REC" and "PLAY" icons** which turn red and green respectively.
4. **Start the cassette player motor** by pressing the ENTER key and begin recording.



5. **Recording progress :** The counter increments until the writing process is complete.
6. **Stop recording :** Click the STOP icon to finalize the process.

Playback and recording features

AMSpiriT allows you to stop, fast-forward, or rewind in fast mode while playing back a cassette file.

Description of icons when using a cassette recording :

	The PLAY icon turns green when the sound recording is playing.
	The REC icon turns red when sound recording writing is enabled. The cassette file must first be write-unprotected.
	The STOP icon turns red after 2 clicks on it. This feature will be used in conjunction with “Fast Forward” and “Rewind”.
	The Fast Forward icon turns green when fast forwarding through the recording. In combination with the red STOP button, it allows you to go directly to the next file on the cassette
	The Rewind icon turns green when rewinding the recording. In combination with the red "STOP" button, it allows you to go directly to the previous file on the cassette.

Audio playback and handling of protected files

AMSpiriT faithfully reproduces the CPC's audio behavior during cassette read/write operations, emitting sound in real time..

In case of loading protected "commercial" games, the file name will not necessarily be readable. In this case, "????????" will appear under the counter.

Joystick management

Joystick detection and configuration

AMSpiriT can detect the presence of a joystick as soon as it is connected to a PC. In this case, the icon changes color and becomes green. The joystick is then active.

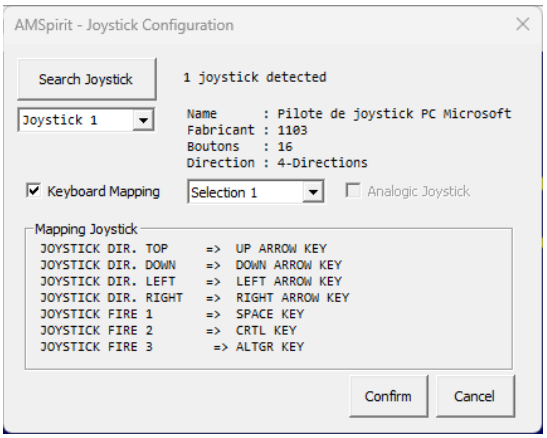
Joystick recognition check

To know if the joystick is recognized correctly, use the joystick or press the "FIRE" keys, the characters "arrows", "X", "Z" should appear on the screen as below.

Joystick configuration panel

By clicking the joystick icon, a configuration panel is displayed. This panel allows you to :

- Identify the joysticks connected to the PC.
- Select the joystick to be used with the emulator.



Keyboard mapping option

If you don't have a joystick, the "Keyboard Mapping" checkbox allows you to associate a keyboard key with each joystick action. Two default mapping options are available.

Mapping can be activated directly by right-clicking on the Joystick icon or by pressing the PC's **F9 function key**.

In this case the joystick icon will look like this :

Keyboard configuration

Automatic keyboard mapping

By default AMSpiriT enables automatic keyboard mapping by default so that entering text on the emulator is as seamless as possible, regardless of the selected ROM country.

If the character typed on PC exists on CPC keyboard, it will be displayed on screen, otherwise no character will be displayed.

Note :
The CPC's COPY key, which has no equivalent on our modern keyboards, is mapped to the PC's ALT key.

Disable automatic mapping

To disable automatic mapping, click on the following icon : 

If the country of the input keyboard (PC) is recognized by the emulator, the mapping will be disabled and for each key typed on the PC keyboard the character corresponding to the key placed in the same location on AMSTRAD CPC will be displayed).

For the moment the PC keyboards supported are :

- **French**
- **American (USA)**
- **English (UK)**
- **Spanish**
- **Danish**
- **German**
- **Italian**
- **Portuguese**
- **Swiss**
- **Belgian**
- **Canadian**

Additional keyboards can be integrated upon request.

The displayed icon will be changed as follows : 

Keyboard clash or ghost key effect

When certain key combinations are pressed simultaneously, a phenomenon known as "keyboard clash" or "ghosting" can occur, causing an unintended key to appear on screen. This behavior is due to the hardware architecture of the Amstrad CPC keyboards.

In the AMSpiriT emulator, this effect is reproduced when keyboard mapping is disabled, providing a faithful emulation of the original hardware behavior.

Snapshot File Management

AMSpiriT supports reading and saving snapshot files in the SNA format, which contain a copy of the emulator's internal memory at a given moment.

- **Loading a snapshot**: Clicking on the icon or pressing the F4 key allows you to load a snapshot file.
- **Saving a snapshot**: Right-clicking on the icon or pressing SHIFT + F4 allows you to save a snapshot file (in the AMSpiriT SNA directory).

AMSpiriT supports versions **V1**, **V2**, and **V3** of the **SNA** standard, ensuring compatibility with snapshots from other emulators.

Snapshots generated by AMSpiriT adhere to version V2 of the SNA standard for classic CPC models and version V3 for the CPC Plus range.

AMSpiriT adds a specific "SPRT" chunk to the snapshot file, containing its internal variables as well as disk images, cassette, additional ROMs, and RAMs. This additional data allows for the complete reconstruction of an AMSpiriT memory image, identical to what it was at the time the snapshot was created.

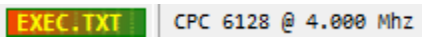
Miscellaneous File Management

AMSpiriT supports reading text files in **TXT** format and binary files in **BIN** format.

Reading a Text File

Reading a text file allows the automatic writing of the text contained in the file into the CPC's BASIC editor. It avoids the tedious typing of a file written in BASIC, for example.

- **Loading the text file**: A text file can be loaded by clicking on the File icon.
- **Executing the text file**: When the text is being entered into the BASIC editor, the message "EXEC.TXT" flashes in the status bar.



- **Stop Execution**: To stop the processing of a text file in progress, press the **Escape** key.

Reading a Binary File

AMSpiriT supports reading binary files with AMSDOS headers while allowing their automatic execution.

- **Enabling AutoRun**: To automatically execute a binary file, check the "**AutoRun binary files**" option in the **Options** menu.

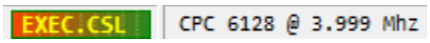
Script File Management

AMSpiriT supports the reading and recording of Script files in CSL format (*CPC Script Language*). These files allow controlling the emulator's actions through the execution of scripts composed of sequences of custom instructions. The specifications of the CSL format are available in the following document:

Standard CSL Specifications

Reading a Script File

- **Loading a script:** A script file can be loaded by clicking on the CSL icon or by pressing F3 key.
- **Executing the script**: When a script is being executed, the message "**EXEC.CSL**" flashes in the status bar.

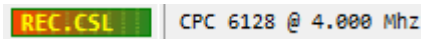


- **Error Handling:** If an error occurs, script execution is stopped immediately.
- **Manual Stop**: To stop a running script, press the **Escape** key, or right-click on the CSL icon and select "**STOP CSL**" from the dropdown menu.

Recording a Script File

AMSpiriT allows real-time recording of scripts by capturing keyboard interactions.

- **Starting Recording**: To start recording a script file (in the **SNA** directory), right-click on the CSL icon and select "Create CSL," or use the keyboard shortcut **SHIFT + F3.**
- **Recording Indicator:** During recording, the message "**REC.CSL**" flashes in the status bar**.**



- **Stopping the Recording**: To interrupt the process, right-click on the CSL icon and select "STOP CSL" from the dropdown menu.

Additional Option: Screenshot Management (SSM)

An advanced feature allows the automatic recording of screenshots when the **Z80** processor executes certain specific instructions. This option, which can be enabled via a right-click on the CSL icon ("**Enable SSM**"), is mainly used for non-regression tests and shaker tests developed by Longshot.

Timelapse Function

Timelapse function can ne handy if you want to debug a program, or simply finish a game, by going back up to 60 seconds in the past.

Pausing the Game

To suspend the execution of AMSpiriT, click on the "**Pause**" icon or press the "**F1**" key. When the pause is activated, the "**Pause**" icon turns red and a flashing message "**Pause**" appears in the status bar.

Using Timelapse Function

Once the emulator is paused, you can activate the "**Timelapse**" function, which allows you to go back up to 60 seconds before the pause was enabled. This feature is useful for revisiting a specific moment in the game.

- **Rewind Time**: Press the **left arrow** key.
- **Return toward the Present Time**: Press the **right arrow** key.

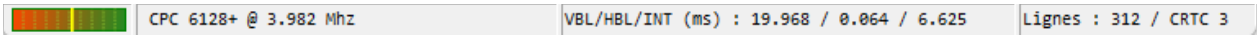
When using **Timelapse**, a message "**Rwd xx.xs**" appears in the status bar, indicating in seconds the amount of time you have gone back.

Resuming Emulation

To resume execution from the last breakpoint, press the "**F1**" key again or click on the "**Pause**" icon.

6. STATUS BAR

The status bar displays information about the operating status of the emulator. It is composed of 4 parts refreshed periodically.



You will find the following information:

Performance Indicator Panel

The performance panel displays a graphical representation of the CPU resource usage required for the optimal execution of AMSpiriT.

- **Optimal Performance Zone**: As long as the yellow line oscillates within the red-green zone, it means that the host PC has sufficient power to maintain optimal emulation speed.
- **Low Performance Alert**: When CPU resources become insufficient, the flashing message "**LOW.PERF**" appears, indicating a risk of slowdown.

- **Impact of Low Performance**: A decrease in resources leads to a slowdown in emulation, which can cause recurrent **sound glitches**.

CPC Model

The next section indicates the AMSTRAD CPC model being emulated, the extended RAM capacity (if the RAM extension is selected in the options menu), and its execution speed (in MHz).

Period of Synchronization Signals and Interruptions:

The third section transcribes the period of the synchronization signals HBL (Horizontal Blank), VBL (Vertical Blank), and interruptions. The values are expressed in milliseconds.

In the example above, a frame is displayed every 19.968 ms, or 50.1 frames per second, which is consistent with a PAL video output.

Number of Displayed Lines and CRTC Type:

The last section indicates the number of lines displayed on the screen as well as the type of CRTC currently in use. A PAL screen typically displays 312 lines per frame, but some demos may vary this number.

7. KEYBOARD SHORTCUTS

F1	Enables/Disables PAUSE of the emulator (and enables Timelapse function)
F2	Capture a screen image of AMSpiriT (in the SCREEN directory)
SHIFT F2	Capture a reduced screen image of AMSpiriT (without window decoration)
F3	Loads a CSL script file
SHIFT F3	Records a CSL Script file
F4	Loads a Snapshot file (SNA)
SHIFT F4	Saves a Snapshot file (SNA)
F5	Inserts and loads a floppy disk file (DSK, HFE or IPF) into Drive A
F6	Inserts and loads a floppy disk file (DSK, HFE or IPF) into Drive B
F7	Decreases audio level
F8	Increases audio level
F9	Enables/Disables the JOYSTICK (via keyboard mapping)
F10	Increases emulation speed to the max. Go back to normal speed when F10 key is released
SHIFT F10	Increases emulation speed to the max. Go back to normal speed when F10 key is pressed again
F11	Switching between color screen / monochrome screen modes
F12	Switching to FULL SCREEN mode / Windowed mode

8. COMMAND LINE

AMSpiriT can be run from a command line, in console mode for example, allowing to automate certain startup sequences. New commands will be gradually added as needed.

```
D:\Projets Visual C++\Emulateur AMSTRAD\Emulateur Amstrad CPC\x64\Release>"Emulateur Amstrad CPC" --joystick
```

Available commands:

--autorun	Automatically executes a Tape file or binary file
--cpc	CPC Model (0 = 464, 1 = 664, 2 = 6128, 4 = 6128+, 5 = 464+, 6 = GX4000)
--cpr=file	Loads a cartridge (CPC Plus)
--crtc=X	Sets the CRTC type at startup (X = 0, 1, 1b, 2, or 4) - Non-Plus CPC
--file=file	Loads a dsk, ipf, hfe, cdt, wav, sna, bin file (the path must be complete)
--csl=file	Loads a "Cpc Scripting Language" script file (the path must be complete)
--fullscreen	Runs AMSpiriT in full-screen mode
--joystick	Enables joystick (Keyboard mapping)
--keybPC	Keyboard in PC => CPC mapping mode
--keybCPC	Keyboard in CPC mode (no mapping)
--nojoystick	Disables joystick mapping
--mute	Disables sound
--romX=file_rom	Loads a ROM file into a slot X (X ranges from 1 to 15)
--run=Filename	Launches a program present on a diskette or a Rom.
--config-file=rep	Sets the AMSpiriT directory where the configuration file is located

9. ACKNOWLEDGMENTS

This emulator would certainly never have seen the light of day without the valuable contribution of the many AMSTRAD CPC enthusiasts who allowed me to glean and exchange a lot of technical information.

Major contributions

Special tribute to **Serge Querné** (@Longshot) of the famous **Logon System** group, whose extraordinary documentation work has significantly improved the quality of the emulator. Author of the **CRTC Compendium**, he has compiled technical data of unmatched precision, verified and tested on various models of the **Amstrad CPC**. His daily support and the provision of custom test sets (including the famous **Shaker** test suite) have enabled the refinement of the emulation of different types of **CRTC**, including obscure and poorly documented features. **CRTC compendium** can be downloaded here: Logon System

Development Support

- **Stéphane SIKORA (@Siko)** : for creating the official AMSpiriT internet portal: https://www.AMSpiriT.fr/ and for his participation in the future AMSpiriT cross-platform development project.
- **Cédric QUETIER (@CED)** : For creating the visuals for the AMSpiriT website and icons.
- **Carlos PARDO (@Made)** : For creating AMSpiriT 2.0 visuals
- **CPC Discord communities** : Thanks also to all the kind members present on various CPC discord channels, (@CheshireCat, @BDCIron, @Candy, @Floboune, @Overflow, @FredCrazy, @tronic, @Ricolaoz, @LDIR_Hector, @darkSteph, @LordHeavy, @Doctor_Plissken, @Lzamu, @hlide…).for their support and interest in this project which now goes beyond the simple framework of solo development.
- **SYSTEM-CFG Forum**: Thanks to the members of the FORUM.SYSTEM-CFG forum whom I thank enormously for their encouragement and their contributions to the improvement of the emulator: @lone (author of the CPC SugarBox emulator), @markerror, @sebiohazard, @Zebulon…

This project has been enriched through continuous research and exchanges within the community. If some names have been inadvertently omitted, please know that I am deeply grateful to all. Also, I've surfed the internet a lot to retrieve all the relevant information :

- QUASAR.NET : http://quasar.cpcscene.net/
- BALTASAR STUDIO : https://baltazarstudios.com/zilog-z80-undocumented-behavior/
- AMSTRAD CPC MEMOIRE ECRITE (ACME) : https://acpc.me/#
- GRIMWARE : https://www.grimware.org
- LES SUCRES EN MORCEAU : http://cpc.sylvestre.org
- CPC POWER : https://www.cpc-power.com/
- CPC RULEZ : https://cpcrulez.fr/
- FORUM CPC WIKI : https://www.cpcwiki.eu/forum/index.php
- FORUM FORUM.SYSTEM-CFG : https://forum.system-cfg.com/index.php

10. The Future of AMSpiriT

Thanks to feedback from the community, the quality of AMSpiriT's emulation is refined with each new iteration. Although it can never replace an actual machine, the goal is to make its behavior faithful enough to become indistinguishable from an Amstrad CPC computer. After **7 years of development**, AMSpiriT continues to evolve with the goal of achieving emulation as faithful as possible across the entire **CPC** range.

Finalization of the Emulation Engine

In recent years, efforts have been focused on the emulation engine ("Core"). With support for the CPC Plus range, this development phase is now almost complete, marking the end of the first stage of the AMSpiriT project.

Next Steps

The future of the project is turning towards:

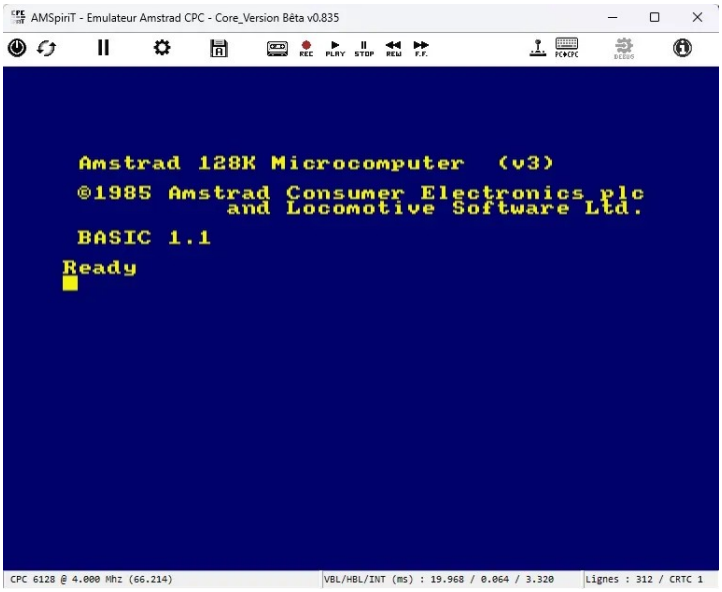
- **Multi-platform expansion**, allowing for increased accessibility.
- The addition of new **development/debug features** to meet the needs of developers.

Linux Version

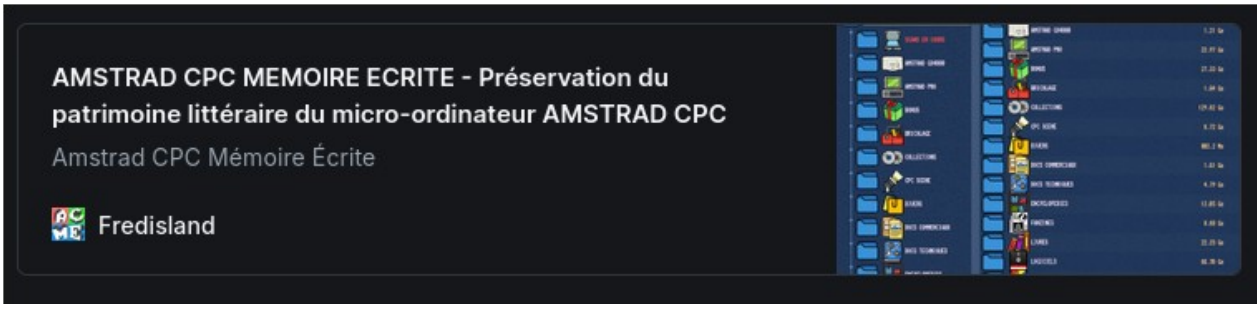
A Linux version (Linux-Lite) is currently under development and will be available “soon”. A big thank you to Stéphane SIKORA (@siko) for his work on this much-anticipated adaptation.

11. QUICK START

A CPC emulator is not as easy to use compared to game console emulators as it requires to type commands on the keyboard. It is therefore strongly recommended to download and read carefully the AMSTRAD CPC user guide to find out how it works before launching the emulator for the first time.



AMSTRAD guides are easily downloadable on the internet and especially on the wonderful ACME site which contains a huge amount of all books and documentation published about AMSTRAD CPC computers, in many languages.



Running Programs

The first thing you probably want to do is to play some games or watch demos. You can find a lot of applications/floppy discs images on many websites, like CPC POWER:

Once you have found your favorite game, and downloaded the corresponding fie, you can copy it into the "DSK" directory if it is a floppy image, or to the "TAPE" directory if it is a tape image. This is not mandatory, but it will make it easier to find these files.

Running a program from a floppy disk

To run a program on a floppy disk image, it must first be loaded into memory. Click on "Floppy disk" icon, then select a file. Note you can simply drag and drop a DSK file onto the emulator window to open it.

Once a DSK file is selected, simply type the BASIC command "CAT": It should display a catalogue with all files stored on the disk. Then type the command *RUN "filename"* to launch the appropriate program (usually the main program file starts with a dash (ex; "-disk"))

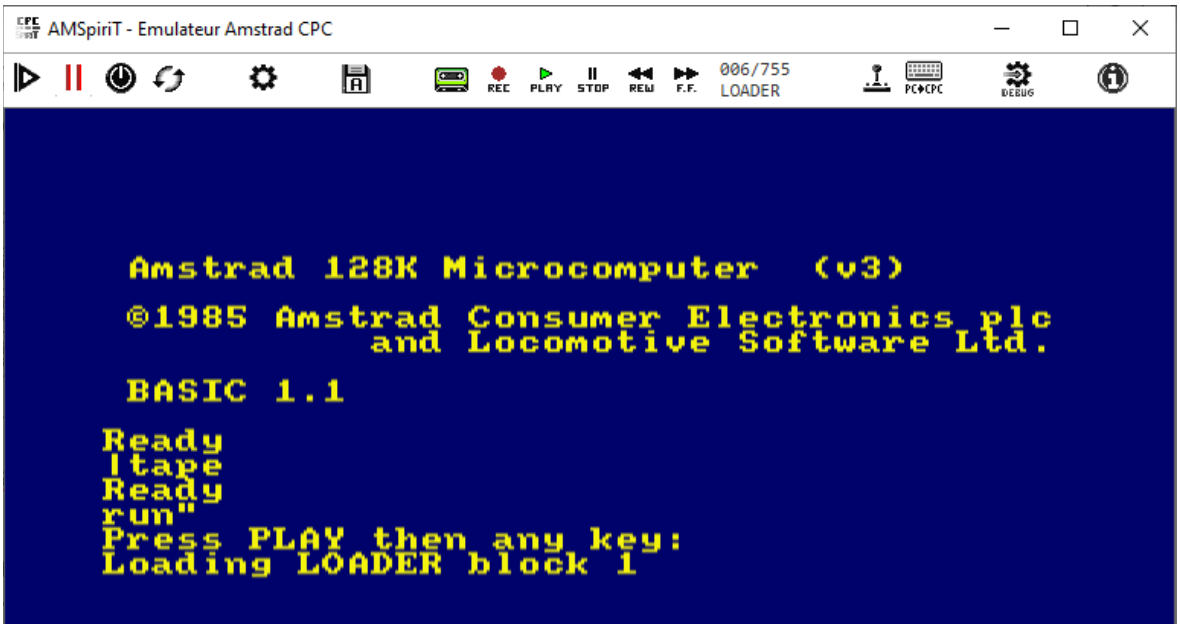
If the catalogue is not displayed, the floppy disk might be formatted in "CPM" format. You can then type the command "|CPM" to try to run the program.

Running a program on tape

To run a program on tape, you must first load it into memory by clicking on the "Tape" icon, as you'd do with disk images.

If the emulated CPC model is an AMSTRAD CPC 664 or 6128, you will have to type the BASIC command "|TAPE" to activate the cassette drive command. On an AMSTRAD CPC 464 this is not necessary because the cassette player is the default storage support.

You will then have to type the BASIC command "RUN" and a message 'Press PLAY Then any key' will be displayed. After pressing ENTER key, click on "PLAY" icon. The file should start loading, you will hear some sound and a message "Loading xxxx" will be displayed.



Please note that the playback speed of the tape recording is the same as on a real CPC, i.e. very slow. So please be patient while waiting for the loading to finish.

12. CHANGE LOG

v2.00b

July 2025

- Full Emulation of the **CPC Plus range** (464, 6128, GX4000)
  - Emulation of all ASIC functions
  - Support for the monochrome monitor (MM12)
  - Support for the analog joystick
  - Management of cartridge files (.CPR)
- Support for an additional floppy disk drive (B)
- New **timelapse** function, allowing to go backward
- Support for **writing CSL** script files
- Various fixes for the emulation of CRTCs 0, 1, 2, and 4
- Improvement of CTM emulation
- Improvement of FDC emulation
- Optimization of the emulation engine
- Support for keyboard Clash
- Addition of new command-line commands
- Improvement of support for additional ROMs
- Various ergonomic improvements

v1.01 RC

April 2024

- Various fixes for CRTC 0, 1, and 2 (thx to Fred_Crazy)
- CRTC 4: Support for split-border
- Fix for a memory corruption bug
- Fix for a joystick detection bug
- Better support for CDT files
- Various ergonomic improvements

v1.00 RC

April 2024

- Management of files in **HFE and IPF** formats (read-only)
- Management of binary files (.bin) (with AMSDOS header)
- Support for RAM extensions up to 4 MB
- Fix for a bug in the PSG command registers
- Improvement of Z80 emulation
- Improvement of FDC timings
- Enhanced support for external ROMs
- Addition of new command-line commands
- Support for new regional keyboards
- Various ergonomic and aesthetic adjustments

v0.967b

December 2023

- Improvement of the floppy disk drive emulation
- Various fixes for CRTCs 1, 2 (meow mode), and 4
- Support for accented characters in .txt files
- Support for Emulator-ID
- Aesthetic modifications

v0.953b

October 2023

- Management of **snapshot files** (.SNA)
- Management of **Script (.CSL) and text (.txt)** files
- Various fixes (CTM, FDC, PSG, and CRTC 0/1 emulation)
- Improved support for e-dsk
- Enhanced management of Additional ROMs
- CPU load optimization: mono or multi-thread option
- Addition of Drag and Drop functionality

v0.863b

May 2023

- Various fixes on FDC, CRTC, and PSG emulation
- Improved management of Additional ROMs
- Command-line handling

v0.845b

April 2023

- Complete emulation of **CRTC type "4"** (pre-ASIC)
- Addition of Additional ROM management
- Improved CTM emulation (CSYNC signal management)
- Export of the AMSpiriT Core into a dedicated library
- Correction of HSYNC signal management (all CRTCs)
- CDT File: Added support for BLOCK_ID 0x15: Direct Recording

v0.704b

September 2022

- Various fixes in CRTC 0, 1, and 2 emulation
- Adjustment of R52 update timing (Gate Array)
- Ergonomic modifications (icons / added English language)
- Code optimization

v0.677b

August 2022

- Complete emulation of **CRTC type "2"**
- Various fixes in CRTC 0 and 1 emulation
- Emulation of FDC write functions (WRITE DATA/ID)
- Emulation of "Cassette" file writing
- Minor fixes in FDC emulation (motor management)
- Advancements in CTM emulation (wave effects)

	• Ability to take screenshots (F2/F3 keys)
v0.590b April 2022	• Complete **rewrite of CRTC 0 and 1 emulation** • Code based on @Longshot's **CRTC compendium** • Universal code, without any patches • Integration of interlace management • In-depth **rewrite of GA** emulation • **Pixel processing at 16 MHz** • Fix of mode 2 rendering (1-pixel advance) • Fix on the GA interrupt register • Improved PPI emulation • Correction on Z80 emulation (OTIR OTDR instructions)
v0.473b December 2021	• Correction of Z80 instruction timing • Fix for CRTC emulation Correction of Z80 instruction timing • Fix for CRTC emulation
v0.466b November 2021	• Correction of FDC "READ DIAGNOSTIC" function • Fix for cassette loading bug in full-screen mode • Addition of keyboard shortcuts (F1 - F5 and F9 keys)
v0.465b November 2021	• Support for Windows 11 • Fix for a bug in PSG register access • Various bug fixes (video resolution change) • Addition of a full-screen mode (F12 key) • Addition of option to read side B of a double-sided floppy disk • Addition of video display method option • Improvement of floppy disk controller emulation • Improvement of keyboard emulation • Various improvements (control panels)
v0.429b September 2021	• Improvement of high-frequency sound emulation (> 20kHz) • Optimization of CDT to WAV format conversion
v0.425b3 September 2021	• Added XAUDIO2 compatibility with Windows 7 and Windows 8
v0.425b2 August 2021	• Code improvement (memory allocation test) • Activate joystick mapping even if joystick is already connected
v0.425b August 2021	• First public release