

CCS64 V3.1

1 October 2006

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Disclaimer

This program is released as SHAREWARE and therefore freely distributable, although you may not charge anyone for more than the actual cost of distribution. The meaning of shareware is that if you are using the program regularly, you should strongly consider to register the program. With registering means that you are actually buying the product.

The installation and use of this product is done completely under your own responsibility. Under no circumstances should the producers of this product be held responsible for any damages or costs, that this product in any way could cause you or your equipment.

Introduction

Welcome to the world of CCS64. This a software emulator of the Commodore 64 computer. You may say this is not the first program trying to emulate the C64. But this is planned to be the finale C64 emulator. I have worked in several years with this product, studying the C64 into its innermost secrets. This shareware version should run perfectly with all games or demos, even those using the 1541 disk drive.

Registration

As this is SHAREWARE, if you like and use this program you are supposed to register it. Of course you then will get a registered version of this program with additional features and bonuses. At the moment the register fee is 30 USD, or equal amount in EURO, GBP or SEK. Credit cards or CHEQUES can NOT be used. Please consult your local post office or bank for proper ways of sending money to Sweden.

To register you send cash money, together with your name, address and/or e-mail to:

Per Håkan Sundell
Berghemsgatan 6
SE-431 37 MÖLNDAL
SWEDEN

Or use the register utility for Kagi, [register.exe](#) .

Or you can transfer the money directly to my bank account. Please pay via Eurogiro or SWIFT to our (Sundell Consulting) account number 607 85 52-4 with Postgirot Bank

AB (publ) S-105 06 Stockholm, Sweden. SWIFT address: PGSI SESS.

You can also register on-line using VISA credit card at <http://order.kagi.com/?QRN>.

Note that registered users are entitled to unlimited number of updates of CCS64 without any further costs. The product will be continuously updated as long as there is any features or bugs to be fixed. This means that you could safely register now, even if some special feature is not ready yet, as you will not miss the update when that special feature is ready.

System Requirements

WIN32 version:

Supported operating systems:

- Windows 98/ME/2000/XP with DirectX v9.0 or later.

Hardware requirements:

- Pentium processor or better.
- 16 Mb of internal memory.
- SVGA graphics.

Additional support:

- Windows compatible sound card.
- Windows compatible joystick.
- Windows compatible mouse.
- HardSID sound add-on card.

Information

Emulation compatibility:

C64 main console:

- 99.9% CPU 6510, MMU 82S100. All imaginable programs should work. The emulation of CPU is cycle exact and considers all strange side-effects.
- 99.9% VIC 6566/6567/6569. All imaginable graphics modes and effect should work. The emulation of VIC is pixel exact and considers all strange effects, both known and unknown, as it emulates the inner workings of the VIC chip.
- SID 6581/8581. Nearly perfect regarding the digital core emulation. Approximated emulation regarding the filter emulation and analog amplifier output. The emulation of SID is cycle exact and constructs fully synthetic samples in 8 or 16 bits resolution.

- 99.9% CIA 6526. All features of the I/O circuits. The emulation of CIA is cycle exact.
- Keyboard. All keys including Restore.

1541 disk drive:

- 99.9% CPU 6502. All imaginable programs should work. The emulation of CPU is cycle exact and considers all strange side-effects.
- 99.9% VIA 6522. All features of the I/O circuits. The emulation of VIA is cycle exact.
- 99% GCR Read/Write electronics. Handles different densities and all kind of synchronization patterns.
- Head step motor. Handles 84 half-tracks.
- Disk rotation motor.

C2N cassette recorder:

- Read/Write electronics. The pulse generation is cycle exact.
- Tape motor.
- Play button sense.

Printer equipment:

- Printer at serial port with device number from 4 to 7 emulated at kernel level. Normal file operation from BASIC should work.

C64 expansion port equipment:

- 1764 Ram Expansion Unit (REU). Configurable in steps from 128 Kb to 16 Mb. Emulation is cycle exact.
- ROM/RAM Cartridges with custom hardware. Besides from normal kind of cartridges, seventeen types of custom hardware are emulated.

C64 joystick port equipment:

- Digital joystick. Supports up to three fire buttons.
- Mouse C1351.
- Paddles.

1541 disk drive expansion:

- 99% Parallell cable connected between the C64 user port and the 1541 disk drive.
- RAM Expansion. Configurable at any size at locations \$2000-\$C000.

Combinations:

- Up to four connected 1541 disk drives.
- Can combine REU and normal cartridges.

User Interface:

- Control menu.
- PAL TV emulation.
- Graphics display with DirectX in either exclusive mode (fullscreen) or normal mode (window).
- Sound output for Windows-compatible sound card in quality up to the maximum the sound card manages.
- Sound output for HardSID sound add-on card using a variety of sound mix modes.
- Screen snap-shot, saves an image of the whole current C64 screen (maximum 504x312 pixels for PAL, 520x263 for NTSC) in 16, 256 or 16777216 colors.
- Joystick emulation, both with keys and real PC joysticks. Also supports joystick adapter that allows usage of original C64 joysticks.
- Cartridge emulation using file format .CRT. Currently supporting normal (plain ROM/RAM without I/O) types of cartridge and the following cartridges: Action Replay, KCS Power Cartridge, Final Cartridge I & III, Simons Basic, Ocean Games, Fun Play, Super Games, Atomic Power, Epyx Fastload, Westermann, Rex, C64 Game System, WarpSpeed, Dinamic, Zaxxon, Expert, Magic Desk, Super Snapshot 5, Comal 80, Magic Formel, Ross, Structured BASIC, and Dela-EP64.
- True tape emulation including turbotape and tape images (use originals on tape). Sorry but for the true tape images, it is a little hard to create them, as I use special hardware and program on my AMIGA computer, see the [CCS64 Homepage](#). But there are programs available for PC developed by other people, that could use a commercial PC to C2N connector or an high-quality audio sampling.
- Pause mode, where you could single-step screen frames and look at interlaced pictures.
- Freeze function, to save or restore the status of the emulator. This feature is under development so use with care...
- Machine code monitor. This feature is under development so use with care...
- Making wave-files from C64 music.
- Speed control.
- Maximum 1541 speed, when enabled the emulator gives the emulation of the 1541 100% priority while it is active with reading/writing.
- Speed-o-meter, 1541 status and C2N status display.
- Support for different ROM sets.
- Support for file images in formats .PRG/.P00/.T64/.TAP/.D64/.G41 and .G64.
- Multi-play over Internet of .T64/.D64/.PRG files using the Kaillera client.

Instructions

Starting

WIN32 version:

To start the program just run the file named CCS.EXE.

Using

To do anything meaningful you should enter the program menu by pressing the key F9.

To use PC joysticks you have to calibrate them first. Calibration is selected from the submenu Options/Input in the menu.

If you have any problems with the settings and want the factory default settings back, just delete the 'C64.CFG' configuration file and it will be restored next time you run CCS64.

Menu

To use the Menu press F9 and then use the cursor keys to select. Use cursor right or enter to enter a choice. Use escape to go back to the previous menu from a submenu. Use cursor up or down to change selection. Use cursor left or right to change a value. Where specified you could also use the functions keys. When a selection can be applied, enter can also be used.

In a directory listing you could also use PageUp or PageDown to scroll faster through the selections. To get directly to the first filename which starts with a specific letter, you could press CTRL+letter.

In some menus you could also select an option by pressing the first letter in the option name, like S for the option "Select disk".

Keyboard

The keyboard is emulated almost like a real C64 keyboard and follows the C64 keyboard layout, except for these keys:

C64 key	Emulation key
C= (Commodore)	Left CTRL
RUN/STOP	Escape
RESTORE	Page Up. Observe that you must HIT this key like on a real C64!
CLR/HOME	Home
Arrow Up	Delete
Pound	Insert
Control	Tab

The user interface uses the following keys during the emulation session.

Key	Description
F9	Control menu. Always continues from the submenu from where you left.
F10	Control menu.
F11	Restores a frozen emulator state with the filename "freeze.c64".
F12	Freezes (saves) the emulator state with the filename "freeze.c64".
Print Screen	Captures the screen as a 16-bit color image.
Scroll Lock	Reinitialize screen mode. Sometime Windows manages to distort colors when switching between programs.

The user interface uses the following fast-keys during the emulation session and from the Menu.

Fast-Key	Description
Alt+8	Menu for 1541 device 8. Press twice for Status Menu.
Alt+9	Menu for 1541 device 9. Press twice for Status Menu.
Alt+0	Menu for 1541 device 10. Press twice for Status Menu.
Alt++	Menu for 1541 device 11. Press twice for Status Menu.
Alt+1	Menu for Tape device 1. Press twice for Status Menu.
Alt+Shft+8	Status Menu for 1541 device 8.
Alt+Shft+9	Status Menu for 1541 device 9.
Alt+Shft+0	Status Menu for 1541 device 10.
Alt+Shft++	Status Menu for 1541 device 11.
Alt+Shft+1	Status Menu for Tape device 1.
Alt+R	Reset (Soft).
Alt+Shft+R	Reset (Hard).
Alt+O	Options Menu.
Alt+V	Video Menu.
Alt+I	Input Menu.
Alt+M	MC (Machine Code) Monitor.
Alt+E	Special Menu.
Alt+S	Sound Menu.
Alt+C	Cartridge Menu.
Alt+T	State Menu.
Alt+F	Cartridge Freeze button.
Alt+P	Pause on/off. In pause mode you can press I to see the next interlaced frame, or N to step frames.
Alt+Shft+P	PAL TV filter emulation on/off.
Alt+Q / Alt+X	Quit.
Alt+F1	Save 16 color screen.
Alt+Shft+F1	Save PAL/RGB color screen.
Alt+F2	Save 256 color screen.
Alt+F3	Toggle Speed (100 - 500 %).
Alt+F4	Quit.
Alt+F5	Insert next .D64/.G64 disk image into device 8.
Alt+F6	Insert previous .D64/.G64 disk image into device 8.
Alt+F7	Select next input device/mode in C64 game port 1.
Alt+F8	Select next input device/mode in C64 game port 2.
Alt+F10	Exchange (switch) input device/mode settings between C64 game port 1 and 2.
Alt+F11	Loads a frozen emulator state from selectable filename.

Alt+F12	Saves a frozen emulator state to selectable filename.
Alt+Shft+F2	Screen-shot current text menu display.
Alt+Shft+F3	Toggles the warp speed (maximum emulation speed) option.

The default joystick emulation in keys is as follows:

C64 Joystick Port 1	Key
Up	Keypad %
Down	Keypad 5
Left	Keypad 7
Right	Keypad 9
Fire button 1	Right Alt (Alt Gr)
Fire button 2	
Fire button 3	

C64 Joystick Port 2	Key
Up	Keypad 8
Down	Keypad 2
Left	Keypad 4
Right	Keypad 6
Fire button 1	Right CTRL
Fire button 2	
Fire button 3	

Multi-Play Over Internet

From the main menu, enter the submenu of Device 1 or 8-11. Enter the directory that contains the .T64/.D64/.PRG files that you want to be able to use for multi-play over Internet. Use cursor up/down keys to position on the "." directory, then press F3. Using the Kaillera client you can now connect to a server and from there either create a new game or join an existing one. Remember to not start your created game until enough people have joined. If you join an existing game, the game will start as soon as the game creator has started. To be able to join an existing game, you have to have started the multi-play menu from a directory which contains exactly the same file as the one that the game creator has.

During the Multiplay session, no menu setting can be reached. Therefore, remember to set correct settings for input devices etcetera before entering the multi-play menu. The multi-play session is ended by pressing either F9 or the F10 keys.

The following fast-keys work and are distributed to all players:

Alt+F5	Insert next .D64/.G64 disk image into device 8.
Alt+F6	Insert previous .D64/.G64 disk image into device 8.

The following fast-keys work and are only local to the current player:

Alt+F7	Select next input device/mode in C64 game port 1.
Alt+F8	Select next input device/mode in C64 game port 2.
Alt+F10	Exchange (switch) input device/mode settings between C64 game port 1 and 2.

Tape Device Noise - Raw-Tape (TAP) Files

You can listen to the tape drive noise that would be generated whilst loading raw-tape (TAP) files. This can be fun or just help pass the time away! Simply perform the following steps:

- Set the SID volume to the maximum. Type POKE 54296,15.
- Issue the BASIC LOAD command. Type LOAD.
- Select the desired raw-tape (TAP) file.

Additional Windows/Graphical Enhancements

The following additional enhancements have been made that take advantage specifically of the Windows/DirectX environment/functionality and other graphical techniques:

- The ability to select a custom re-refresh rate for graphics. This depends upon the support for this in your graphics card/driver.
- The ability to rotate the graphics through 90, 180, or 270 degrees.
- Various graphical filters - Scale (based upon Scale2x), Scan-Lines, and Anti-Alias. These work in all graphical resolutions.
- Drag-and-drop support for program files, which automatically performs a default load/run of the image file dragged-and-dropped. Only works in windowed mode.
- For any valid Commodore 64 file format that is associated with CCS64 in the Windows Registry, double-clicking on that Commodore 64 format file will automatically start it within CCS64.

MC (Machine Code) Monitor

The native MC Monitor can be invoked either from the Menu or by using the fast-key. As the monitor is native it doesn't affect the current emulated program in any way, all memory is untouched - unless you do a change yourself, that is. The monitor is exited with the Escape key. The following commands are supported:

Command syntax	Description
A <xxxx> <mnemonic>	Assemble. Example: A 1000 LDA #\$09

BANK [<xx>]	Bank change 0-7 for different C64 MMU maps, 8-11 for 1541.
B	Show breakpoints.
BA <xxxx>[-<yyyy>] [RWX] [<xx>[-<yy>]]	Adds breakpoint at the specified address [xxxx] or within the specified address range [xxxx-yyyy]. It is triggered when the address [xxxx] or anywhere within the address range [xxx - yyyy] is Read from, Written to, or Executed. Default is any access triggers the breakpoint. Example: BA D012 W F7-FF - This will only trigger the breakpoint whenever a program writes a value between F7 to FF to address D012.
BR <xx>	Remove the specified breakpoint. Example: BR 0 - This will remove the first breakpoint.
C <xxxx> <yyyy> <zzzz>	Compare memory.
CD [<path>]	Changes directory to the specified path or prints the current working directory if no path is specified. MS-DOS path-names can be used and Long path-names can be used (if the Long path-name is enclosed in " signs). The / sign can be used instead of the \ sign.
D <xxxx> [<yyyy>]	Disassemble.
DIR [<path>]	Displays the contents of the directory path specified or prints the contents of the current working directory if no path is specified. MS-DOS path-names can be used and Long path-names can be used (if the Long path-name is enclosed in " signs). The / sign can be used instead of the \ sign. Directory listings can be interrupted by pressing <ESC>.
F <xxxx> <yyyy> <xx> ...	Fill memory with hex values or ascii strings. Example: F 1000 2000 "HELLO" 0D 0A
HD <xxxx> <yyyy> <string>	Hunt disassembly output textually for patterns. Wildcards are expressed with *. Example: HD A000 B000 "LDA*\$*Y"
H <xxxx> <yyyy> <xx> ...	Hunt memory for hex values, ascii and wilds(XX). Example: H 1000 2000 10 XX "LEVEL"
I <xxxx> [<yyyy>]	Interpret memory as ascii.
L "<filename>" <xxxx> [<yyyy>]	Loads memory from binary file (not .prg). Example: L "Hack" 0800 1000
LP "<filename>" <xxxx> [<yyyy>]	Loads memory from binary program file (.prg). Example: LP "Hack.prg"
M <xxxx>	Shows memory as hex values.

[<yyyy>]	
P <xx>	Printer redirect. Redirects output of next D or M commands to the specified printer device (04-07).
Q <xxxx>	Quicktraces until the PC reaches a certain address.
R <reg> <xx..> ...	Register. Changes the contents of the named CPU register. Example: R PC FCE2 A 0 - This will set the PC to FCE2 and A to 0.
S "<filename>" <xxxx> <yyyy>	Saves memory to binary file (not .prg). Example: S "Picture" 2000 3F40
SP "<filename>" <xxxx> <yyyy>	Saves memory to binary program file (.prg). Example: SP "Demo.prg" 2000 3F40
T <xxxx> <yyyy> <zzzz>	Transfer memory. Copies the contents of a memory region into another.
W [<xxxx>]	Traces with singlestep.
X	Exits monitor.
: <xxxx> <xx> ...	Changes memory from hex values.
, <xxxx> <xx> ...	Changes memory from disassemble hex values.
* [<xx>]	Bank change 0-7 for different C64 MMU maps, 8-11 for 1541.
? <expression>	Evaluate a numeric expression and display the result in decimal and hexadecimal. The syntax of the expression is as follows: expr ::= hexnr '\$' hexnr '#' decnr '-' expr expr '+' expr expr '-' expr expr '*' expr expr '/' expr expr '%' expr '(' expr ')' Example: ?23+(56%7+55*(#23-7/3))

Some of the commands that produces several lines of output, like the M command, can be manually continued by scrolling up/down with cursor keys to the screen limits, or using page up/down keys. To get a free line to enter a new command, just press enter.

You can also get up on-line help and status page by pressing the function keys F1 to F4.

- F1 - Help
- F2 - VIC Status
- F3 - CIA1 Status
- F4 - CIA2 Status

You can swap to one of the 8 different session screens by pressing the Alt key together with one of the keys 1 to 8.

- Alt + 1 - Session 1
- Alt + 2 - Session 2

...
Alt + 8 - Session 8

Command-Line Options

To get a syntax description of the current available command-line options, just run the program from a command-window with the argument "?".

Example:

CCS ?

This will probably give an output like: CCS [filename.
{prg/p00/p01/t64/d64/g41/tap/crt}[,index]] [-cfg filename] [-fastload] [-normalload] [-autorun] [-manualrun] [-window] [-hardsid id]

Explanation:

[] - means that this option is optional and has not to be given.

{opt1,opt2,...} - means one of the options.

filename.{prg/ p00/p01/ t64/ d64/ g41/ tap/ crt}[,index]	A filename that describes a disk/tape/cartridge image to be loaded at the start of CCS64. The optional index tells which individual file inside of a disk/tape images that should be loaded (default is the first one). Example: mygame.d64,3
-cfg filename	Change the filename of the config file to be used (default is c64.cfg).
-fastload	Turns on the fastload feature when loading from disk or tape file images. Can be less accurate.
-normalload	Turns on the most accurate emulation of the disk drive when loading from disk or tape file images.
-autorun	Automatically starts the program that are loaded at the start of CCS64.
-manualrun	Do not start the program that are loaded at the start of CCS64.
-window	Force the emulator to use the windowed mode of the DirectX graphics display.
-hardsid id	Select the correct id for the HardSID sound card.

Example:

CCS [C:\TheBestGames.D64,2](#) -window -autorun

- This will run CCS64 in windowed mode, and select the disk file image named TheBestGames.D64 as the current inserted floppy disk into disk drive with device 8, then load the 2nd file from the directory of that floppy disk and automatically start it.

Configuration

To change your configuration you could either use the program menu or

edit the configuration file 'C64.CFG' manually.

Parameter name	Description
SCREENMODE=	If you change to a mode that doesn't work (or look nice) on your equipment, immediately (this is VERY important, or your equipment can be damaged) quit CCS64. Screen modes are detected dynamically and are hardware/driver dependent.
SOUNDENABLE=	YES - Sound output on. NO - Sound output off.
SAMPLEFREQ=	11111, 22222, 45454, or any other value, if your sound card can manage it.
SAMPLEBITS=	16 - Tries to use 16 bits samples, otherwise uses 8. 8 - 8 bits samples.
LOADPATH=	The path where you have your C64 games and demos.
RGBCOLOR0= RGBCOLOR1= ... RGBCOLOR15=	The RGB color values that should be used for emulating the C64 colors.

Common Problems

Some times special games on .D64 images will behave badly when you use the 'Run (Fast)' or 'Boot (Fast)' feature (this is default). To solve this problems do like this, use the 'Run (Normal)' or 'Boot (Normal)' features instead; otherwise, perform the following:

- 1) Reset the C64.
- 2) Enter menu (1541 Device 8) and select the correct .D64 (Insert Disk)
- 3) From the BASIC type:
LOAD"*",8,1

If you do not have a CD-ROM in your CD-drive or a disk in your disk drive, the emulator will hang up if you select this device in the menu. So please, always be sure that you have an initialized (sometimes you have to wait some seconds after instering it) CD-ROM in your CD-drive before trying to use the CD device from the menu.

The option load as Turbo tape should only be used when you get a message like "PRESS PLAY ON TAPE" on your C64-screen, and you're sure about that the second part should be loaded as turbo tape. Otherwise nothing useful will happen.

Note that when your sampling the C64's audio output to a .WAV file, the sample rate and bit resolution will be the same as selected in the C64.CFG file.

Note that on a German keyboard, the keys Y and Z will have changed place when using under CCS64.

When you use the Screen-Shot function, the image will be saved as CCS0.BMP, CCS1.BMP, CCS2.BMP, and so on.

When you use the Sound Sampling function, the audio file will be saved as CCS0.WAV, CCS1.WAV, CCS2.WAV, and so on.

When you use the printer emulation, the output will be saved as PRINTER4.TXT, PRINTER5.TXT, and so on.

When you use the HardSID support, the "Channels 1-4 Burst" and "Channels 1-4 Buffered" modes are recommended for faster CPUs; the "Channels 1-3 Burst & Channel 4 Emulated" mode is recommended for slower CPUs.

If you have some problems with the configuration of CCS64, and want to go back to the default settings, just delete the C64.CFG file from the CCS64 installation directory.

Using the emulator under Windows with old and out-dated sound drivers can sometimes cause the system to hang or for there to be no sound at all.

Notes

The C64 and 1541 ROMs are (C) by Commodore Business Machines. If you don't want these original ROMs, you could replace the files KERNAL.ROM, BASIC.ROM, C1541.ROM and CHAR.ROM with alternative ROM images.

PAL TV filter emulation by John 'Graham' Selck and Philip 'Pepto' Timmermann.

SID filter emulation contributed by Michael Kleps.

CCS64 Keyboard Layout (PDF) document by Stilianos 'Stello' Doussis.

Contact Addresses

If you have any emulation problems or suggestions, please contact me. Note that I get a lot of e-mail, so you can not count on that I will reply to it. But of course I will read it.

E-Mail: <mailto:REMOVETHISphs@ccs64.com> (this e-mail address has been anti-spammed)

CCS64 Homepage: <http://www.computerbrains.com/ccs64>

Computerbrains Homepage: <http://www.computerbrains.com/>

Note that these addresses can change within near future, and when so have happened you most certainly can find my new addresses by searching the Internet.