



**Vcc** 

A Tandy Color Computer 3 Emulator for Windows  
Cause we're still preoccupied  
with 1985



## Change Log

- VCC v2.1.07 Oct/2022
  - Introduction of the "VCC Debugger" - Mike Rajas
  - Updated manual - Bill Pierce & Mike Rojas
- VCC v2.1.06 Apr/2022
  - Finally added "Show Windows Mouse Pointer In VCC Screen" checkbox to the "Joystick" menu. Left unchecked, this will hide the Windows mouse pointer while the focus is in the VCC main screen. - EJ Jaquay
  - Several bug fixes in keymap editor - EJ Jaquay
  - Fixed a bug that could error copies from VHD 0 to VHD 1 - EJ Jaquay
  - Add RS & CocoMax3 Hirez interfaces (FINALLY!) - EJ Jaquay
  - Added feature to Hard Drive Insert mode to create a new VHD when specified name is not found - EJ Jaquay
  - Fixed a keyboard bug which was affecting the play of Tetris - EJ Jaquay
  - A few cosmetic changes to the "Config" menu - Bill Pierce & EJ Jaquay
  - Updated Manual - Bill Pierce
- VCC v2.1.0.x Jan/2022
  - Changes made to the KeyMap Editor - EJ Jaquay
  - Minor bug fixes - VCC Development Team
  - Updated manual with many typos fixed - David Johnson, Bill Pierce & EJ Jaquay
- VCC v2.1.0d ???/2021
  - Fixed bug which cause certain RSDOS word processors (EliteWord, VIP Writer, etc.) to skip every other line of text. - James Rye
  - Eliminated the "Allow Resize" checkbox as I feel it's redundant. You should always be able to resize. - Bill Pierce
  - Reset a few "default" values that had gotten changed. - Bill Pierce
  - Add a "Custom KeyMap Editor" for making custom keymaps. - EJ Jaquay
  - Mapped "BREAK" to "F12" (as well as "ESCAPE") to facilitate using <CNTRL><BRK> used by some games/applications. - Bill Pierce
  - Updated the Manual - Bill Pierce, EJ Jaquay
- VCC v2.1.0c Jan/2021
  - Added 2<sup>nd</sup> Hard Drive – EJ Jaquay
  - Fixed the ALT key problem – EJ Jaquay
  - Added F3 & F4 for decreasing/increasing CPU speed – Trey Tomes
  - Added "Remember Screen Size" to remember your custom screen size on each run – James Rye & Bill Pierce
  - Added the "Game Master Cart" (GMC) by John Linville – Chet Simpson
  - Fixed the border color bug – James Rye
  - Updated Manual – Bill Pierce
- VCC v2.1.0b Nov/2020
  - Added "Copy/Paste" Edit menu items for copying text from VCC screen and pasting text into VCC. - James Rye.
  - Improved Composite Palettes (not fixed, WIP). - James Rye.
  - Fixed "file paths" so that each type of file; vhd, dsk, cas, rom, dll, etc. has it's own pathlist" - James Rye.
  - Added "Flip Artifact Colors" to the config menu. - James Rye.
  - Added "Save Config" and "Load Config" to the "File" menu (previously disabled). – EJ Jaquay.
  - Also added the ability to load custom "\*.ini" files when running VCC in a Command Box – EJ Jaquay.
    - Both of these features allow "Custom ini" files for save different configurations.
  - Updated manual – Bill Pierce
- VCC v2.1.0a Oct/2020
  - Fixed VCC "ini" file to save in "user/home/appdata" to avoid permissions problem in Win7-10. - James Rye
  - Fixed "Force Aspect" to actually work in all modes but full screen mode. - James Ross
  - Updated manual to reflect changes.- Bill Pierce
- VCC v2.0.1f Aug/2020
  - Improved PMODE artifact color scheme, - Peter Westburg
- VCC v2.0.1e Dec/2019
  - Reverted "exit bug" fix as it caused VCC to hang in full screen mode – Bill Pierce.
- VCC v2.0.1d Dec/2019
  - Added "\*.ccc" to the program pak extensions. "Exit bug" fixed. Several "cosmetic" changes – Bill Pierce.
- VCC v.2.0.1c Dec/2019
  - Completed 6309 opcodes that were missing or incorrect – Walter Zambotti.
  - Updated manual – Bill Pierce
- VCC v2.0.1b June/2016
  - Several "Edited" releases under same versions. Some "cosmetic" changes to dialogs.
- VCC v2.0.1b June/2016
  - Minor syntax changes to achieve working build for VS2015 – Wes Gayle
- VCC v2.0.1a June/2016
  - Moved code to "MS Visual Studio 2015 Community" (No Release) - Gary Coulborne
- VCC v1.42c ??/2016
  - VCC source code released to "Open Source" by Joseph Forgeone.
  - GitHub repository created by Bill Pierce (No Release)
- VCC v1.43c ??/2015
  - Move the "Boisy/Becker" port to a cartridge format to eliminate crashes (never released) – Aaron Wolfe, David Ladd
- VCC v1.43b ??/2012
  - Added support for the "Boisy/Becker" interface for DriveWire4 (Binary Release Only) – Aaron Wolfe, David Ladd
- VCC v1.42 ??/2012
  - Source code acquired for VCC by Aaron Wolfe, David Ladd, & Bill Pierce (No Release)
- VCC v1.42 ??/????
  - Last known release from original author Joseph Forgeone



# Welcome to VCC

(Virtual Color Computer)

The Color Computer 3 was the last of a line of micro-computers designed by, and distributed through Radio Shack stores, released in 1986, it developed a rather large and loyal following that continues to this day. Some of the system's specs are as follows.

- 64k system memory, 128K via bank switching.
- 512K upgrade available from Radio Shack as well as 1, 2, & 8 meg memory upgrades from 3rdparty vendors.
- 32, 40, and 80 column hardware text modes.
- Hi-res graphics resolutions up to 320x225 at 16 colors and 640 x 225 at 4 colors.
- Clock speeds of 0.89 and 1.78 MHz. Software selectable.
- Super Extended Color Basic ROM.
- Color Computer 2 compatibility mode.

Unfortunately in 1991 Tandy decided to discontinue the line.

Strangely lack of support didn't seem to deter the fans. Third party vendors stepped in to fill the void. New products were and are still being developed. Today you can buy 512k memory cards, IDE and SCSI hard disk interfaces and faster, more powerful CPUs in the HD63B09E. There is even a free user supported Multi-tasking Multi-User OS (NitrOS9) available for this poor little 2 decade old 8 bit machine.

VCC is a Tandy © Color Computer 3 emulator that runs on the Windows© operating system (Windows XP or greater). It attempts to simulate the hardware that comprised this system. As such it allows software written for this 30+ year old computer to run on modern hardware. Please take a moment to read this guide to discover some of the features and yes shortcomings of this emulator.

If you have ever used an emulator before you should have no trouble understanding most of VCC's functions, however there are some differences that you should be aware of. VCC not only attempts to emulate the hardware of the coco3 but also its organization. As such VCC only emulates the Coco 3 with no peripherals. Expansion is possible via a system of run-time loadable plug-ins that emulate the various add-in card that were/are available. Sort of an Emulator within an Emulator. See the section on Loadable Modules for an explanation of this.

Joseph Forgeone (Original VCC Author)

## ***Copyrights***

All code that comprises this emulator was written by Joseph Forgeone and is under the “GPL3” license with the following exceptions:

The RGB to composite color conversion algorithm, Floppy disk CRC algorithm and the 32x16 font set were stole.... umm borrowed! from M.E.S.S. The MESS source was also a valuable source of technical information, without which, this emulator would not be as good as it is today.

The “Becker Port” implementation was patched by Aaron Wolfe and David Ladd, giving “VCC 1.4.3b” the ability to communicate to the host PC via the DriveWire4 protocol and since then, in VCC 2.0.1, the Becker Port was moved to a cartridge emulation “becker.dll” and must be loaded into the MPI.

The “MS Visual Studio 2015 Community” port of the old “MS Visual C++ 6” sources was done by Gary Coulborne (Thanks Gary!) and is allowing VCC to now move forward on the more “modern” versions of Windows.

Various bugs cropped up in the move from VS6 to VS2015, and Wes Gale stepped in to lend a hand at getting the code usable.

The HD6309 code was unfinished and incomplete and was finally put in place by Walter Zambotti

There have been various enhancements and bug fixes by Bill Pierce, Gary Coulborne, Wes Gale, Walter Zambotti, James Ross, Peter Westburg, James Rye, EJ Jaquay and Trey Tomes.

VCC is maintained by the VCCE Open Source Project Team:

### Administrators:

Joe Forgeone (absent)

Bill Pierce

EJ Jaquay

Gary Coulborne (absent)

Wes Gale (absent)

### Programming Contributors:

Walter Zambotti

James Ross

Peter Westburg (R.I.P.)

James Rye

EJ Jaquay

Trey Tomes

### VCC Manual, Repository Maintenance, Packaging & Distribution:

Bill Pierce

### Inspiration and Continued Support:

The Tandy Color Computer Community

We welcome anyone interested in programming & enhancement of the VCCE project. Contact me on the “Color Computer” FaceBook group with your ideas and we will determine if it fits the direction we are headed with the VCC project.

Bill Pierce

The home of “VCC” is:

<https://github.com/VCCE/VCC/releases>

Where you will find the latest binary downloads as well as the sources for VCC.

## Forward

VCC version 1.4.2 was originally written by Joseph Forgeone. In or about 2012, several of the Coco Community had contacted Joseph about VCC since he hadn't updated the software in several years. Joseph informed us that he would like to release the VCC source files to the public as an "Open Source Project" so that it could be enhanced by others. His desire was to remove the Tandy ROMs (for copyright reasons) and make small changes in his copyrights before releasing the sources. He told us he should have it ready for release in a couple of months. As a "token of good faith", he offered to send us the sources to "play with" until he made his release. After that, Joseph seemed to disappear from the map. He had not replied to many emails nor could any posts be found on any of the forums as he was a regular on some Coco forums. He seemed to have disappeared into thin air.

As the events above describe, several of us ended up with sources to VCC. No, we could not release these sources without Joseph's permission. But in frustration of the situation, holders of the sources started "playing" with them as Joseph had suggested. The main goal being to add support for the Becker Port system developed by Gary Becker as well as to fix a few minor known bugs. Since Joseph could no longer be contacted, the decision was made to release some changes to VCC only in "binary" form in executable packages therefore keeping the sources from public view. Thus VCC 1.4.3b Beta w/Becker Port was born.

As the "Becker Port" patch eventually started causing a few *internal* problems in VCC, the Becker Port developers decided to move the port to an external "cartridge port" as a "Rom Cart", therefore removing all *internal* influences of the Becker Port from VCC. So now, to use the Becker Port, you must load the "becker.dll" into either VCC's cartridge slot or a slot in VCC's MPI. I find this new implementation of the Becker Port to be much more stable than the original version.

### ***ENTER JOSEPH FORGEONE...***

Several of the Coco community decided that after a couple of years of not hearing from Joseph (VCC author), that they would follow his intentions and release the VCC sources as an "Open Source Project". In doing so, we decided to make a public announcement in advance to allow anyone having claims to the copyrights of VCC to step up. Amazingly, the first person to reply was Joseph Forgeone!!

Not only did we get the "VCC Open Source Project" started, but we did so with Joseph on board and contributing to the project. We have now moved the VCC sources from the old "MS Visual Studio 6" programming environment into the "MS Visual Studio 2015 Community" programming suite which is a free download from the Microsoft website. The VCC sources can now be compiled in Windows 7, 8, & 10.

Needless to say, we now have new development of "VCC" which should be much more compatible with modern versions of Windows. There are new enhancements, bug fixes and there are plans to port the code to Linux and Mac operating systems.... The future is bright for VCC!!

This document is meant to be an enhanced version of Joseph's original VCC User's Manual with expanded content that was never added to the original manual as well as documentation of the new enhancements and bug fixes. Hopefully, it will cover a larger amount of information than Joseph's original document with more information on the operation of VCC. It is my goal to make VCC as easy to use as possible so that everyone can enjoy this package as much as I have, as I am an avid user of VCC as well as the "real" Color Computer 1, 2, & 3 hardware. As new developments are made on VCC, I hope to expand this manual as needed.

As one last note: VCC *will always be* in a BETA state and by no means is a finished product. As of this release, quite a few things have been changed from the original. There are still many bugs to be worked out and enhancements to be added. It is this very reason the VCC Color Computer 3 emulator has been released as an open source project in hopes that outside contributors and/or programmers will get involved and help this become the best Color Computer 3 emulator available!

Enjoy ☺  
Bill Pierce

## Introduction

VCC is a move forward in the Color Computer 3 emulation. The emulator covers many aspects of the Color Computer 3 hardware. The author has tried to keep the “look and feel” of the real machine while maintaining a sense of a newer and better machine. There may be a few bugs lurking in the remnants of the old C code, but for the most part, the emulation is still one of the best Coco 3 emulations available. Currently, work is underway to convert VCC to *multi-platform* software, enabling VCC to be run on Windows, Mac, Linux and possibly even Mobile Devices. If this is accomplished, we will have a Coco 3 emulator available for most *modern* systems.

## System Requirements

Currently, VCC runs only under Microsoft Windows but has been successfully installed on Linux systems using the Wine Windows emulation package for Linux as well as “Winebottle” on Mac. I do not know too much about these installations, but I am told they work well.

The Windows requirements are:

1. Microsoft Windows XP SP2 or greater (Windows Vista, 7, 8, & 10 are supported).
2. A Hard Drive large enough for the Windows OS and the VCC installation (2.5 meg) as well as space for any Coco “.dsk” (virtual floppy disk images) and “.vhd” (virtual hard drive images) files you plan to be using. Also you will need space for DriveWire4 if you are planning to use this system as well. Today’s *modern* computers have no problem with storage space with their large capacity storage systems.
3. On older Windows systems (XP), I suggest at least 512 meg of memory. On newer systems (Vista and greater), I suggest at least 1 gigabyte or memory, and 4 gigs for heavy users, especially if using DriveWire4.
4. DirectX 9 or greater. Most Windows PC graphics systems will work well with VCC. (some newer versions of Windows may need the “DirectX 9 runtime” dll).
5. If you are using VCC with DriveWire4, an internet connection is also desirable (but not mandatory). We’ll get into this later.

## VCC Installation

VCC is distributed in a self-installing executable package. Just “double click” the “VCC setup.exe” and follow the prompts. Windows will install all components and provide a Desktop icon for starting VCC.

If you want to install VCC in a different location than the default, choose the “Custom” option when installing, otherwise, VCC will normally install to “C:\Program Files (x86)\VCC” on your hard drive.

## Setting up and Configuring VCC

VCC allows several setup configurations with RGB or Composite monitor emulation, 6809 or 6309 CPU, from 128k to 8 megabytes of memory, and many others. In these next sections I will try to step through each option and explain its function.

**NOTE:** In previous versions of VCC running under Windows 7, 8, & 10, the user was forced to run VCC in “Administrator Mode” to allow VCC to maintain it’s configuration file due to permissions changes in the newer versions of Windows. Hopefully we now have that problem solved and VCC will no longer need to be given administrator rights to work properly. Please let us know on the “Issues” page of our GitHub distribution site if there are any problems with this.

In fixing the permissions problem, VCC now stores it’s “vcc.ini” file under “User\%Home%\AppData\Roaming\VCC”, which allows VCC to update and keep it’s settings. We now have the ability to Load/Save “Custom” \*.ini files, so those with multiple VCC installations can load different configurations.

## *The VCC Installer*

The VCC team uses the “Inno Setup Compiler” & the “Inno Script Studio” to compile it’s installation system. The Inno system is an open source project and is used by literally thousands of software distributors including many commercial software houses. Care has been taken to make the VCC installation as easy as possible.

When first run, the VCC installer, like any other installer, requests the usual license agreement. After the license agreement, a text file is displayed, explaining a few of the distribution items contained in the package and how to use them. It is best, if you have not read this article, to do so now. You can click “Cancel” at any time to cancel the VCC installation.

Next you are given the chance to select your installation directory path. The default path is “C:\Program Files (x86)\VCC 2.x.xx”. To install to a different directory, click the “Browse” button to the right and select your directory. You will need at least 2.5 meg available for installation. Click “Next” and VCC is set to install in the directory displayed.

The next dialog let’s you choose the components to be installed. Checking/Unchecking the boxes determines which components the installer will use. These choices are:

- X VCC 2.x.xx Coco 3 Emulator
  - X Support File for the VCC 2.x.xx Coco 3 6809-6309 Emulator
- X Vcc 2.x.xx Color Computer 3 Manuals
  - X Welcome to VCC 2.x.xx

Basically, you want to install all files, as all the first category are needed, and the manual includes any updates to the current version being installed. This manual will be installed to “Documents\Coco Manuals”. Clicking “Next” continues the installation.

The next dialog allows you to select the name of your “Start Menu” group in which the VCC shortcut will reside. This also determines the name given to your VCC shortcut. Unless you have more than one installation of VCC, I suggest this be left “as is”. Click “Next” to continue.

This dialog lets you select if you want a “Desktop Shortcut” or not. The shortcut will be named using the above selected name. Click “Next” to continue.

This final dialog is your last chance to cancel, or change your VCC setup. A review of your previous choices are shown to make sure this is what you want.

Clicking “Back” will of course take you back to previous dialogs, allowing you to make changes to your setup. Once you click “Install”, the installer will install the VCC files in the manner you have chosen.

In the installation, if another VCC folder of the same name is present, the installer will overwrite any previously installed files with the new installation and your old version of VCC will be updated. Any old “Configurations” from the previous version will be maintained.

Before the installation proceeds, you may or may not be greeted by a standard Windows permission dialog asking if you to allow this installation to proceed. Just click “Allow” or “OK” (based on your Windows version) and installation will continue.

The VCC Color Computer 3 installation is complete.

## ***VCC 2.x.xx Installation Zip File***

Alternately, you can download the VCC 2.x.xx zip file and install VCC as you please. This file will unzip to your desired folder and you will have to manually copy files to any destination you choose. The VCC Development Team is not responsible for installations installed in this manner and you're on your own.

## ***VCC Installation Package Contents***

The VCC installation package & VCC Zip Package contain these files:

VCC 2.x.xx Coco 3 Emulator (Installed to the VCC program folder)

Vcc.exe	(The VCC emulator itself)
wimgtool-os9.exe	(OS9 Disk Utility)
wimgtool-rsdos.exe	(RSDOS Disk Utility)
becker.dll	(Becker Port Cartridge for DriveWire4)
fd502.dll	(Tandy FD-502 Disk Controller)
harddisk.dll	(Generic Hard Drive Controller)
mpi.dll	(Tandy Multi-Pak Interface)
orch90.dll	(Orchestra90cc Program Pack)
Ramdisk.dll	(256k External Ram Disk Cartridge)
SuperIDE.dll	(Cloud9 IDE Hard Drive Controller)
GMC.dll	(Game Master Cart by John Linville)
coco3.rom	(the Coco 3 BASIC ROM, auto loaded)
disk11.rom	(the Disk BASIC Rom, used by the FD502.dll, auto loaded)
hdbdw3bc3 w-offset 5A000.rom	(Variant of the HDBDOS ROM, see ROM descriptions)
hdbdw3bc3.rom	(Variant of the HDBDOS ROM, see ROM descriptions)
hdbdw3bck w-offset 5A000.rom	(Variant of the HDBDOS ROM, see ROM descriptions)
hdbdw3bck.rom	(Variant of the HDBDOS ROM, see ROM descriptions)
hdbla.rom	(Variant of the HDBDOS ROM for SuperIDE, see ROM descriptions)
orch90.rom	(Orchestra90 ROM used by Orc90.dll, auto loaded)
rgbdos.rom	(RGBDOS ROM for VCC's harddisk.dll)
cyd_gmc.rom	(Optional demo rom for the GMC cart)
license.txt	(License Agreement)
ReadMe-2.x.xx.txt	(ReadMe file displayed in installation)

Vcc 2.x.xx Color Computer 3 Manuals (Installed to the user's "Documents\Coco Manuals" folder)

Welcome to VCC 2.x.xx.pdf (VCC User's Manual)

## ***Starting VCC:***

To start the VCC emulator, just double click the VCC icon on your Windows Desktop or click the VCC menu item in your Windows Start Menu.

Alternately, VCC can be started from a Windows Command box by CDing to the VCC installation folder and typing:

VCC.exe

## ***NEW Features for this Edition of VCC:***

- **Introduction of the VCC Debugger** by Mike Rojas

I would like to thank Mike Rojas for his great work on the VCC Debugger. This one has been a long time coming and I hope it will get even better in the future.

I would also like to thank James Rye, EJ Jaquay, & Trey Tomes personally for stepping up to help with the VCC project and their work on new features.

Bill P.

# VCC Quick Start Guide

## *Installation Defaults*

In response to many user requests, I am including this Quick Start Guide to get you up and running as fast as possible. Any description of components used in this guide can be found elsewhere in this manual. This guide is to get you started and *not* an explanation of it's components.

Unless you have a previous installation of VCC of the same name and location as this one, the VCC emulation will start as a Tandy Color Computer 3 just as you bought it from Radio Shack, which consists of:

### Color Computer 3 (Installation Defaults)

128k memory

PC Keyboard remapped to match the Coco 3 layout as close as we possibly could

Cassette Tape interface for load tape images (“\*.cas” & “\*.wav”)

Bitbanger (RS232) Port for printing listings to a PC file of your choice.

Through it's additional modules (“Cartridge” menu & DLL files) and configuration settings (“Configuration” menu), VCC can be set up to mimic a variety of custom Color Computer 3 setups. I'm sure you will find the settings to match your own desired configuration.

I will briefly step through the menus and show you your choices for configuring VCC to your own custom setup. Any changes you make are remembered and recalled each time you run VCC and any subsequent changes as well.

## *VCC's File Menu*

There is really nothing in the *File* menu that is involved in a VCC setup unless you already have a Custom *Config File* saved. I will run through the *File* menu functions briefly

- **File**
  - **[F9] Run** – Turns on the VCC Color Computer 3's emulation. If you have “Auto Start Emulation” check in the “Config/Misc” tab below, the VCC will start emulation on startup. Hitting F9 twice has the effect of turning the computer off, then on.
  - **Save Config (New)** – Saves you current configuration to the “VCC.ini” file or you can save a custom ini file of your own to recall at any time.
  - **Load Config (New)** – You can load any custom configuration file you may have saved. As the default, “VCC.ini” is loaded automatically on startup.
  - **[F9] Hard Reset** - Like turning you Coco 3 on or off. This will clear all memory when used.
  - **[F5] Soft Reset** – The same as hitting the reset button on your Coco 3.

## *VCC's Edit Menu (new)*

The *Edit* menu contains probably the most requested feature for VCC... **COPY & PASTE**, and it's finally HERE!

**NOTE: Copy and Paste ONLY work on the Coco 3's hardware text screens (both RSDOS and OS-9/NitrOS9). You CANNOT copy or paste from/to a Coco 3 graphics screen.**

- **Edit**
  - **Copy Text** – Clicking this item immediately copies *ALL* text on the VCC screen into your PC's clipboard for pasting into your PC text documents. (RSDOS & OS-9/NitrOS9)

- **Paste Text** – Click this item will paste any *raw* data in your PC’s clipboard onto your VCC’s screen as if you typed it in. Good for command line entries and works well in most text editor. This function does not work well pasting BASIC listings, see below. (RSDOS & OS-9/NitrOS9)
- **Paste BASIC Code (Merge)** – Clicking this will paste a BASIC listing from your PC’s clipboard onto VCC’s screen just as if you typed it, merging your file with any file that may already be in memory. It works very similar to DECB’s “MERGE” command. (RSDOS only)
- **Paste BASIC Code (with NEW)** - Clicking this item will first issue a **NEW** command, wiping any program in memory, the pasting the contents of your PC’s clipboard. (RSDOS only)

## ***VCC’s Configuration Menu***

After installation when you start VCC, you will be greeted with the familiar “green screen” and Tandy/Microsoft/Microware Extended BASIC logo. You have basically started a Tandy Color Computer 3 (Coco3) just as it came out the box with 128k and *nothing* attached. From here you have *many* choices and they all start with the “Configuration” & “Cartridge” menus at the top of the VCC Window.

First, you want to configure you Coco3 to the basic machine you desire, whether you run RSDOS or OS-9 or both, it really doesn’t matter. Maybe you want to emulate your actual Coco3 setup, or maybe you want to setup that *Dream* System you never had. This starts with the “Configuration” menu:

- **Configuration:**
  - **Flip Artifact Colors (New)**
  - **Config: (Tabs)**
    - **Audio**
    - **CPU**
    - **Display**
    - **Keyboard**
    - **Joysticks**
    - **Misc**
    - **Tape**
    - **Bitbanger**

Each tab having it’s own menu options and settings, which I will highlight below. Through these tabs, you’ll configure your Coco3 just like *you* want it. These settings reflect the *internal* settings/expansions of the Coco3. The *external hardware* will be done through the “Cartridge” menu in the next section.

NOTE:

Clicking “Apply” immediately sets the current settings for any altered setting, but remains in the config menu. Clicking “OK” will also set any altered settings but will leave the menu and return to the emulation window. Any feature marked with an “\*” will (after one of the above actions) reset the Coco3 emulation to a newly started Coco3 (w/new settings) and all memory contents will be erased. All other functions will not disturb your current machine state.

### ***Flip Artifact Colors (New):***

This will “flip” the PMODE artifact colors to the alternate set. Handy for games and such.

## CONFIG:

### *Audio:*

This tab can usually be left “as is” as it automatically recognizes your Windows computer defaults and should not have to be changed. However... there are those users who may have more than one audio output or card and may want to change these settings to suit their needs. Personally, as a musician & recording engineer, I have several sound options on my computer which makes this tab useful to me.

- **Sound**
  - **Output Device** – A drop down menu which shows your PC system’s choices in sound output devices. Most will use the “Primary Sound Drive” used by most Windows programs.
  - **Sound Quality** – Selects the available sound quality in kHz available for you selected device (above). Most will use “44100” kHz.

### *CPU:*

This tab allows you to select various Coco 3 system defaults such as memory, CPU type, and Overclocking.

- **Over-Clocking** – The slider will set the speed in which the CPU operates. Minimum is .87mhz/1.778mhz”, maximum is 202.938mhz. This can also be accessed via the <F3> & <F4> keys.
- **Memory Size\*** - Set the maximum amount of memory your Coco3 will be allowed to use.
  - **128k\*** - Emulates a stock Coco3 straight out of the box
  - **512k\*** - Emulates the 512k upgrade available through Tandy and many 3<sup>rd</sup> party vendors
  - **2048k\*** - Emulates the “Disto” 2 meg upgrade
  - **8192k\*** - Emulates Paul Barden’s 8 meg board
- **CPU\***
  - **Motorola MC6809 CPU\*** - Emulates the stock CPU installed in the Coco3.
  - **Hitachi HD6309 CPU\*** - Emulates the aftermarket Hitachi 6309 instruction/speed enhanced CPU.

### *Display:*

Allows you to set your VCC windowed PC display to match your choice of standard Coco 3 display types

- **[F6] Monitor Type:** - Allows you to choose your monitor type.
  - **RGB** – Selects an RGB color monitor such as the Tandy CM-8.
  - **Composite** – Selects a composite video monitor such as a color TV.
- **Frame Skip** – Number of frames to skip in rendering the Coco3 screen (I’ve seen no use for this and assume it was from the days of slower computers, we may remove it in the future).
- **Scan Lines** – Allows VCC to “blank” the odd scans to the screen (as a real Coco would).
- **Force Aspect** – Forces VCC to keep the screen in the proper proportions when resized. The “Full Screen” mode will NOT retain it’s aspect and will stretch.
- **Remember Screen Size (New)** – Allows you to resize the VCC window and exit, the VCC will remember your previous screen size and return to it the next time you run VCC.
- **[F8] Throttle Speed** – Turns off all speed restraints and allows VCC to run at the speed of the host PC, including the keyboard rollover which will cause pressed keys to multiply at unusable rates. Not of much use in my opinion, but each time I mention removing it, people say to keep it.

## ***Keyboard***

Allows you to remap your PC keyboard to different keymaps to emulate the layout of a real Coco 3 keyboard, or use it similar to an AT or PS/2 keyboard interface.

- **Keyboard Mapping** – Drop down menu of 4 keymap selections
  - **Coco (DECB)** – The PC keyboard is remapped to emulate the layout of an actual Coco 3 (as much as possible)
  - **Natural (OS-9)** – The PC keyboard is mapped “as is” with the exception of a few special keys
  - **Compact (OS-9)** – Same as above but mapped with consideration of laptop keyboards with compact key sets
  - **Custom** – Allows loading of "NEW" custom keymaps (see "KeyMap Editor")
- **Choose File** - Load a Custom KeyMap file
- **Edit** – Opens the NEW Custom KeyMap Editor

## ***Joysticks***

- **Left Joystick Input** – Push-button selection, customizes what will define the Left Joystick
  - **Audio** – Not available, originally was to be used to emulate 6 bit audio sampling through the Joystick port similar to some Coco software sampling packages.
  - **Joystick** – Allows selection of any joystick connected to the PC
  - **Mouse** – Selects the PC mouse as your joystick
  - **Keyboard** – “JoyKey”, Defines keys on the PC keyboard to be used as a 2 button joystick WARNING this will disable the use of these keys while “JoyKey” is in use.
    - **Left** – Select key to define Left joystick movement (default <Left Arrow>)
    - **Right** – Select key to define Right joystick movement (default <Right Arrow>)
    - **Up** – Select key to define Up joystick movement (default <Up Arrow>)
    - **Down** - Select key to define Down joystick movement (default <Down Arrow>)
    - **Fire 1** – Select key to define Fire button 1 (default <F1 key>)
    - **Fire 2** – Select key to define Fire button 2 (default <F2 key>)
  - **Emulation Type** - Allows the use of the Tandy & CocoMax3 hi-res interface emulation
    - **Standard** - Standard Tandy joystick emulation
    - **Tandy Hi-Res** - Tandy Hi-Res interface emulation
    - **CC Max** - CocoMax3 Hi-Res interface emulation
- **Right Joystick Input** – Push button selection, customizes what will define the Right Joystick
  - **Audio** – Not available, originally was to be used to emulate 6 bit audio sampling through the Joystick port similar to some Coco software sampling packages.
  - **Joystick** – Allows selection of any joystick connected to the PC
  - **Mouse** – Selects the PC mouse as your joystick
  - **Keyboard** – “JoyKey”, Defines keys on the PC keyboard to be used as a 2 button joystick WARNING this will disable the use of these keys while “JoyKey” is in use.
    - **Left** – Select key to define Left joystick movement (default <Left Arrow>)

- **Right** – Select key to define Right joystick movement (default <Right Arrow>)
- **Up** – Select key to define Up joystick movement (default <Up Arrow>)
- **Down** - Select key to define Down joystick movement (default <Down Arrow>)
- **Fire 1** – Select key to define Fire button 1 (default <F1 key>)
- **Fire 2** – Select key to define Fire button 2 (default <F2 key>)
- **Emulation Type** - Allows the use of the Tandy & CocoMax3 hi-res interface emulation
  - **Standard** - Standard Tandy joystick emulation
  - **Tandy Hi-Res** - Tandy Hi-Res interface emulation
  - **CC Max** - CocoMax3 Hi-Res interface emulation

**WARNING:** *If you set the Arrow Keys (or any other key for that matter) to act as Joysticks, those keys will be locked and unusable for anything other than joysticks during emulation.*

## MISC

Not much here but Cartridge emulation settings

- **Misc** – Cartridge default settings
  - **AutoStart Emulation** – Unchecked starts VCC in an “Off” state. You must press “F9” to turn the emulation on. Checked, VCC will start with the power “On”.
  - **AutoStart Cart** – Unchecked, program paks will not “autostart”. This simulates “taping” the cartridge detect pin on a cart. This is useful for using the Orchestra90 cart emulation for stereo sound. I did this same thing on my real Coco to use Orch90 for sound output back in the 80s. Checked, all carts will autostart as normal. When using the MPI (MultiPak Interface) module, the carts will only autostart when the MPI slot switch is set to the slot in which the cart is inserted.

## Tape

This tab is for the cassette tape emulation in VCC. As a note, the BASIC commands “MOTOR ON/OFF” and “AUDIO ON/OFF” do not affect the VCC tape recorder as on a real Coco.

- **Browse** – this button allows you to *browse* your PC for “.cas” or “.wav” files of recorded cassette tape format programs. The 2 types differ in their formats as follows:
  - **wav** - An 8 bit, 44.199 kHz audio recording of the actual cassette file. The file MUST be 8 bit & 44.199 kHz (see below).
  - **cas** - A specially encoded, digital representation of the program data. This format is much more compact than wav and loads much faster.
  - **WARNING: If you use “.wav” files, be warned!! If the “.wav” file is NOT recorded in “44,100 kHz, 8-bit”, VCC will mangle the file just by loading it, you don’t even have to “play” it. Most “standard” wave files are in 16-bit, 44,199 kHz. These will not work in VCC and even if you just browse to them and select them into the tape interface, VCC will try to convert them to 8-bit and ruin the file. This issue is being looked into. You were warned.**
- **Record** – Sets the tape emulation to record. The tape will stay on “pause” until you issue a “CSAVE” or “CSAVEM” command from basic.
- **Play** – Sets the tape player to “play” and as above, stays on pause until a “CLOAD” or “CLOADM” command is issued fro BASIC.
- **Stop** – This will stop the recorder just as on a real tape deck. It will not respond to any BASIC commands while stopped. The current “cas” or “wav” file remains in the buffer.
- **Eject** – This button closes then “unloads” the tape image from VCC. You will no longer have access to this image until it’s loaded again.
- **Rewind** – This will rewind the “tape” image to the beginning of the tape.

- **Mode** – Displays the current mode of the tape recorder (Play, Stop, Record Etc)
- **Counter** – Displays the position of the tape file just as a real tape counter would. Handy for tape images containing multiple programs

### ***BitBanger***

The BitBanger port is included as a means for VCC to print Coco text files to PC text file. There is no form of conversion and all transfers are in raw ASCII text

- **Open** – This button “opens” a selected capture file. Any data sent to the serial port will be sent to this file in raw ASCII format.
- **Close** – This closes the serial capture file.
- **Add LF to CR** – Checking this item will cause VCC to add a Line Feed character to every Carriage Return VCC encounters while sending data to the capture file. PC text files use CR/LF as a standard where the Coco uses CR alone.
- **Print Monitor Window** – Opens an extra window panel on your Windows desktop that will display any data sent to the bitbanger port

## VCC's Cartridge Menu

The "Cartridge" selection is an emulation of the Coco's cartridge slot in that here, you will insert ROM images or special (included) cartridge dll files emulating various Coco controller carts, such as, the Multipak Interface, Orchestra 90, the FD-502 disk controller, several HD controllers, and the Becker Port cart. Each cart emulation may or may not add items to the "Cartridge" menu. I will try to list these additions below. The full description of each cart emulation can be found in the "Loadable Modules" section:

*Inserting the mpi.dll module into the emulator cartridge slot results in the following menu:*

- **mpi.dll** - Tandy Multipak Interface. Allows insertion of up to 4 cart dlls
  - **MPI Slot 4** - Slot 4 of the MPI (duh!)
  - **MPI Slot 3** - Slot 3 of the MPI
  - **MPI Slot 2** - Slot 2 of the MPI
  - **MPI Slot 1** - Slot 1 of the MPI
  - **MPI Config** - Configures the MPI settings
    - **Slot 4** – Browse Cart images to loaded into Slot 4
    - **Slot 3** – Browse Cart images to loaded into Slot 3
    - **Slot 2** – Browse Cart images to loaded into Slot 2
    - **Slot 1** – Browse Cart images to loaded into Slot 1
    - **Slot Select** – Selects the Slot # to become the *active* Slot (this action may or may not reset the Coco 3 based on what cart is in the slot and your cartridge settings in the Misc tab)
    - **Persistent Pak Images (New)** – Allows VCC to *remember* what carts you have selected and reload them each time you run VCC. This function is still a little wonky, but works unless you remove the MPI and reinsert it.

*Inserting these cart images into the MPI slots or the Cartridge slot results in the following menu additions:*

- **fd502.dll** - Tandy FD-502 Disk controller
  - **FD-502 Drive 0** - Insert virtual disk images (.dsk) into the drive slots
  - **FD-502 Drive 1** - “
  - **FD-502 Drive 2** - “
  - **FD-502 Drive 3** - “
  - **FD-502 Config** - Configuration utilities for the FD-502 controller
    - **DOS Image** – Selects what DOS rom is to be used
      - **External ROM Image** – Loads an external DOS ROM (HDBDOS, RGBDOS, etc)
      - **Disk BASIC** – Use the DECB ROM
      - **RGB DOS** – Uses the included RGBDOS ROM for use with “harddisk.dll”
    - **OverClock Disk Drive** – Checked, allows VCC to use it's virtual drives at PC speeds. Unchecked, simulates normal Coco drive speeds. (default is ON)
    - **Persistent Disk Images** – Forces VCC to load the last disk used when booting VCC (default is ON)
    - **Clock at 0xFF50-51** – Moves the RTC port to \$FF50-\$FF51 for use with some Hard Drive controllers (default is On)
    - **Physical Disks** – Originally meant to use the old FDRAWREAD driver for Windows that allowed VCC to read/write to real Coco floppy disks. I doubt any modern PC's can access these disks any longer due to a change in format with the introduction of the High Density 1.44meg floppy disk. This function most likely be removed in the future.
      - **A** – Selects Physical Drive A
      - **B** – Selects Physical Drive B

- **External Disk ROM Image** – Selects the External Disk ROM image to use as an alternative Disk Operating System.
    - **Browse** – Browse to select the desired External Disk ROM Image to be used
- **harddisk.dll** - Hard drive emulation
  - **Hard Drive 0** - Insert hard drive images (.vhd) here.
  - **Hard Drive 1 (New)** – Insert hard drive images (.vhd) here.
- **SuperIDE.dll** - Glenside IDE / SuperIDE emulation for using CF card images
  - **IDE Master** - Insert CF (master) card image here (.img)
  - **IDE Slave** - Insert 2nd (slave) CF card image here
  - **IDE Config** - IDE interface configuration settings
    - **Base Address** – Base port address used by the controller. Must NOT conflict with Clock address in FD502 Configuration
    - **Clock at 0xFF70** – RTC port address. Must NOT conflict with clock address in FD502 Configuration.
    - **Clock is Read-Only** – Unchecked allow the clock to be set by the OS.
  - **GMC.dll** – Emulates John Linville’s “Game Master Cart” (GMC) for custom game cart design with “Syd” type sound & music. **This Cart is still experimental, so please report any problems.**
    - **Select GMC ROM** – Select and insert the GMC compatible game/sound ROM.
- **becker.dll** - Becker Port emulation for DriveWire4 and TCP communication
  - **DriveWire Server** - Becker Port configuration for DW4
    - **Server Address** – DriveWire4 server address#
    - **Server Port** – DriveWire4 server port#

### *VCC's Debugger Menu*

The VCC "Debugger" is one of the latest additions to VCC, and is probably one of the 2nd or 3rd most requested features. With the Debugger, you can view the inner workings of the Color Computer 3 as you run software. This is great for debugging your projects or just viewing how it all works. There are four options for the Debugger:

- **Memory Display** - this displays the 64KB memory space that is visible to the processor. Even though the Coco 3 has a minimum of 128KB of RAM, only 64KB can be seen by the processor. The MMU is responsible for mapping the extra RAM into this 64KB workspace.
- **Processor State** - this displays the current state of the processor. Internal registers, Condition Code Register, stack/user pointers, and the program counter are updated in real time. In addition, you can halt, step, and run the processor at any time.
- **Breakpoints** - this window allows you to load an LWASM assembler listing and set breakpoints. This provides a source level debugging capability for a loaded program.
- **MMU Monitor** - this window will let you view all memory available to the machine and how it is being mapped into the 64KB memory space visible to the processor.

**NOTE:** Hopefully, the ability to edit memory contents will be added soon.

### *VCC's Help Menu*

This menu selection has only one choice:

- **About** - Displays the VCC “About Box” which contains the “Function Key” list and Copyright information.

## ***Quick Start Configurations***

Here are a few “Quick Start Configurations” of some standard Coco 3 setups you can use to get you started

### ***Gaming VCC***

A good setup for playing Coco 3 games under RSDOS.

- **Configuration:**
  - **Audio:** Use defaults
  - **CPU:**
    - **Overclocking:** Set to minimum
    - **Memory Size:** 512k (unless game requires more)
    - **CPU:** Some games will require the HD6309 (Nick Marantez’s “GunStar” for example), but most run fine with MC6809
  - **Display:**
    - **Monitor Type:** - Choice based on game requirements, most Coco 3 games will use RGB but some do require CMP
    - **Frame Skip:** Default
    - **Scan Lines:** – Unchecked unless you like the look of blanked odd scanlines
    - **Force Aspect:** Checked
    - **Throttle Speed:** - Checked
  - **Keyboard:**
    - **Keyboard Mapping:** - Coco (DECB), unless you are more comfortable with a PC keyboard setup, then use “Natural (OS-9)”
  - **Joysticks:** - Select the Joysticks of your choice
  - **Misc:**
    - **AutoStart Emulation:** – Checked
    - **AutoStart Cart:** – Checked
  - **Tape:** - Default unless using a tape based game
  - **BitBanger** – Defaults
- **Cartridge:** - Insert “mpi.dll”
  - **MPI:**
    - **Slot 4:** - Insert “fd502.dll”
    - **Slot 1:** - If using a cartridge based game, insert cart here
    - **MPI Config:** – If using a cart based game, move Slot selector slider to the slot in which the game is inserted, otherwise, set it to Slot 4 for the disk controller
  - **FD502:**
    - **FD-502 Drive 0:** - If using disk based game, insert game disk here unless otherwise instructed by the game. Some games can use Drive 1 as it’s “game data” disk.

**Press [F9] Twice to start emulation**

## ***Orchestra90cc VCC***

This setup is for using the Orchestra90cc Program Pak.

- **Configuration:**
  - **Audio:** Use defaults
  - **CPU:**
    - **Overclocking:** Set to minimum
    - **Memory Size:** 512k
    - **CPU:** - MC6809
  - **Display:**
    - **Monitor Type:** - RGB (doesn't really matter)
    - **Frame Skip:** Default
    - **Scan Lines:** – Unchecked unless you like the look of blanked odd scanlines
    - **Force Aspect:** Checked
    - **Throttle Speed:** - Checked
  - **Keyboard:**
    - **Keyboard Mapping:** - Coco (DECB), unless you are more comfortable with a PC keyboard setup, then use “Natural (OS-9)”
  - **Joysticks:** - None
  - **Misc:**
    - **AutoStart Emulation:** – Checked
    - **AutoStart Cart:** – Checked
  - **Tape:** - Default
  - **BitBanger** – Defaults
- **Cartridge:** - Insert “mpi.dll”
  - **MPI:**
    - **Slot 4:** - Insert “fd502.dll”
    - **Slot 1:** - Insert “orch90.dll”
    - **MPI Config:** – set it to Slot 1 for the Orchestra90cc Program Pak
  - **FD502:**
    - **FD-502 Drive 0:** - Insert music disks here

**(Orchestra90cc will only use Drive 0 for it's music disks. Disks must be formatted for RSDOS and ONLY used with Orchestra90)**

**Press [F9] Twice to start emulation**

## *OS-9/NitrOS9 VCC*

A basic VCC setup for using OS-9/NitrOS9 with a Hard Drive. I will not go into explaining making a bootdisk for this system, but they can be found on the internet or you can make your own.

- **Configuration:**
  - **Audio:** Use defaults
  - **CPU:**
    - **Overclocking:** Set to minimum unless PC speed is desired (not good for games)
    - **Memory Size:** 2048 (NitrOS9 can transparently use the 2 meg expansion)
    - **CPU:** If using the HD6309, you will want to Use the NitrOS9 6309 boot system, but if using the MC6809, you MUST use a 6809 NitrOS9/OS-9 boot system
  - **Display:**
    - **Monitor Type:** - RGB
    - **Frame Skip:** Default
    - **Scan Lines:** – Unchecked unless you like the look of blanked odd scanlines
    - **Force Aspect:** Checked
    - **Throttle Speed:** - Checked
  - **Keyboard:**
    - **Keyboard Mapping:** - use “Natural (OS-9) unless you like the old Coco key sequences used in OS-9.
  - **Joysticks:** - Select the Joysticks of your choice
  - **Misc:**
    - **AutoStart Emulation:** – Checked
    - **AutoStart Cart:** – Checked
  - **Tape:** - Default
  - **BitBanger** – Defaults
- **Cartridge:** - Insert “mpi.dll”
  - **MPI:**
    - **Slot 4:** - Insert “fd502.dll”
    - **Slot 3:** - Insert “harddisk.dll”
    - **MPI Config:** – set it to Slot 4 for the disk controller
  - **FD502:**
    - **FD-502 Drive 0:** - Insert OS-9/NitrOS9 boot disk, unless you have a harddrive boot system or are using HDBDOS and DriveWire4. I will not be explaining the OS-9 booting methods as that is available on the internet in many places. (See the “Links” section of this manual).
    - **FD-502 Config**
      - **DOS Image**
        - **External ROM Image** – Use if you want a Custom ROM or if you want DriveWire4 booting, use HDBDOS (explained in the ROM section). Images are loaded in the “Browse” box below.
        - **Disk Basic**- If you are not using DriveWire4, Disk Basic is probably your best choice
        - **RGBDOS** – An alternate DOS which can be used to boot OS-9/NitrOS9
      - **OverClock Disk Drive** – Checked (makes your floppy drives faster, unchecked if you want the old Coco speed drives)
      - **Persistent Drive Images** – (Checked)
      - **Clock at 0xFF50-51** – Checked
      - **External Disk ROM Image** – Use the “Browse” button for loading any “Custom” ROM is “DOS Image” is set to “External ROM Image
    - **Hard Drive**
      - **Hard Drive 0** – If using a hard drive, mount your OS-9/NitrOS9 hard drive image here.
      - **Hard Drive 1** – You can use this drive as your data or backup drive. Or, anything you want.

- **DriveWire Server**
  - **Server Address** – If using DriveWire4, set your DW4 server address here (See DriveWire4 section in this manual)
  - **Server Port** – If using DriveWire4, set your DW4 port setting here (See the DriveWire4 section in this manual).

**Press [F9] Twice to start emulation Then type “DOS” to start OS-9/NitrOS9**

### ***Game Master Cart (GMC)***

This setup is for using the GMC Program Pak.

- **Configuration:**
  - **Audio:** Use defaults
  - **CPU:**
    - **Overclocking:** Set to minimum
    - **Memory Size:** 512k
    - **CPU:** - MC6809
  - **Display:**
    - **Monitor Type:** - RGB (doesn't really matter)
    - **Frame Skip:** Default
    - **Scan Lines:** – Unchecked unless you like the look of blanked odd scanlines
    - **Force Aspect:** Checked
    - **Throttle Speed:** - Checked
  - **Keyboard:**
    - **Keyboard Mapping:** - Coco (DECB), unless you are more comfortable with a PC keyboard setup, then use “Natural (OS-9)
  - **Joysticks:** - None
  - **Misc:**
    - **AutoStart Emulation:** – Checked
    - **AutoStart Cart:** – Checked
  - **Tape:** - Default
  - **BitBanger** – Defaults
- **Cartridge:** - Insert “GMC.dll”
  - **Select GMC ROM** – Select the GMC compatible ROM to use with the GMC. Alone, the GMC does absolutely nothing.

**Press [F9] Twice to start emulation**

This about covers some of the basic VCC setups. These are only basic setups. You will eventually tweak these settings to your preferred system. There are many more options to explore and many more combinations of setups that may suit your needs. All of these components and more are explained in more detail in the sections dedicated to those components.

Next we will cover each component in VCC with detailed explanations of each function as best we can. These components and functions allow you to custom configure VCC into the Color Computer 3 system that you remember or maybe the Color Computer system you dreamed of having.

Enjoy!

## The MenuBar

The MenuBar resides across the top of the VCC window. Here you'll find the various functions of the VCC emulator. All of VCC's options start here. No *command line* parameters are needed (or wanted).

The Menu choices and their options are:

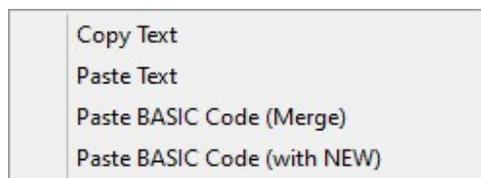
### *File, Edit, Configuration, Cartridge, & Help*

I will now break down these menus into their various components and attempt to explain their functions.

- **File** – These options are the basic operating functions of VCC

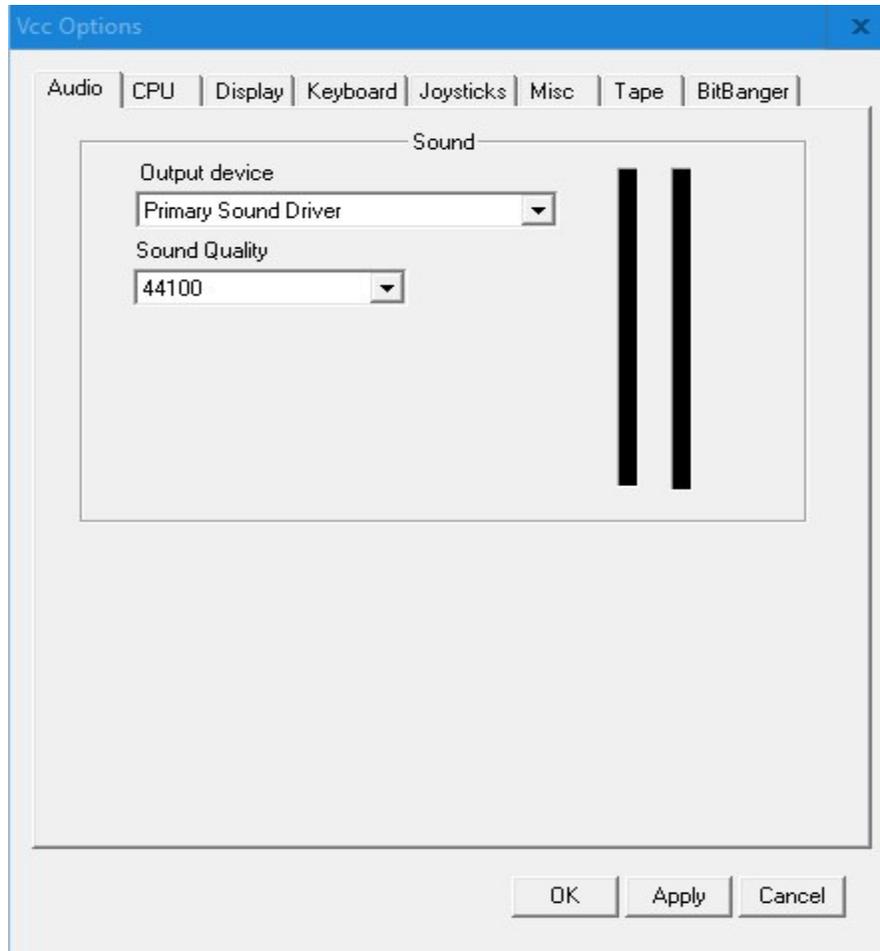


- **Run** – If the “Configuration/Config/Misc/AutoStart Emulation” box is unchecked, this selection will start the Coco 3 emulation. If the box is checked, emulation will start when VCC starts and this selection does nothing. Consider it a “Power Button” of sorts. This is also invoked by the “F9” function key on the PC keyboard.
  - **Save Config (\*\*NEW\*\*)** – Saves a “Custom INI” file with the current VCC configuration that can be loaded with the command below, or with command line options, or custom Windows “Shortcut” configuration.
  - **Load Config (\*\*NEW\*\*)** – Loads a “Custom INI” file that was saved with the above feature or maybe even one you have manually edited and saved.
  - **[F9] Hard Reset** – Hitting [F9] twice simulates switching the power to the Coco “Off” then “On” again. You must hit [F9] two times to complete the cycle. Anything in memory will be lost.
  - **[F5] Soft Reset** – Hitting [F5] simulates pressing the “Reset” button on a real Coco 3. The results are the same as a real Coco. Anything in memory will be preserved.
  - **Exit** – This ends the VCC emulation and returns you to Windows. Any unsaved data and or programs will be lost as the program ends with no prompts and control returns to the Windows OS.
- **Edit** – Editing options for VCC



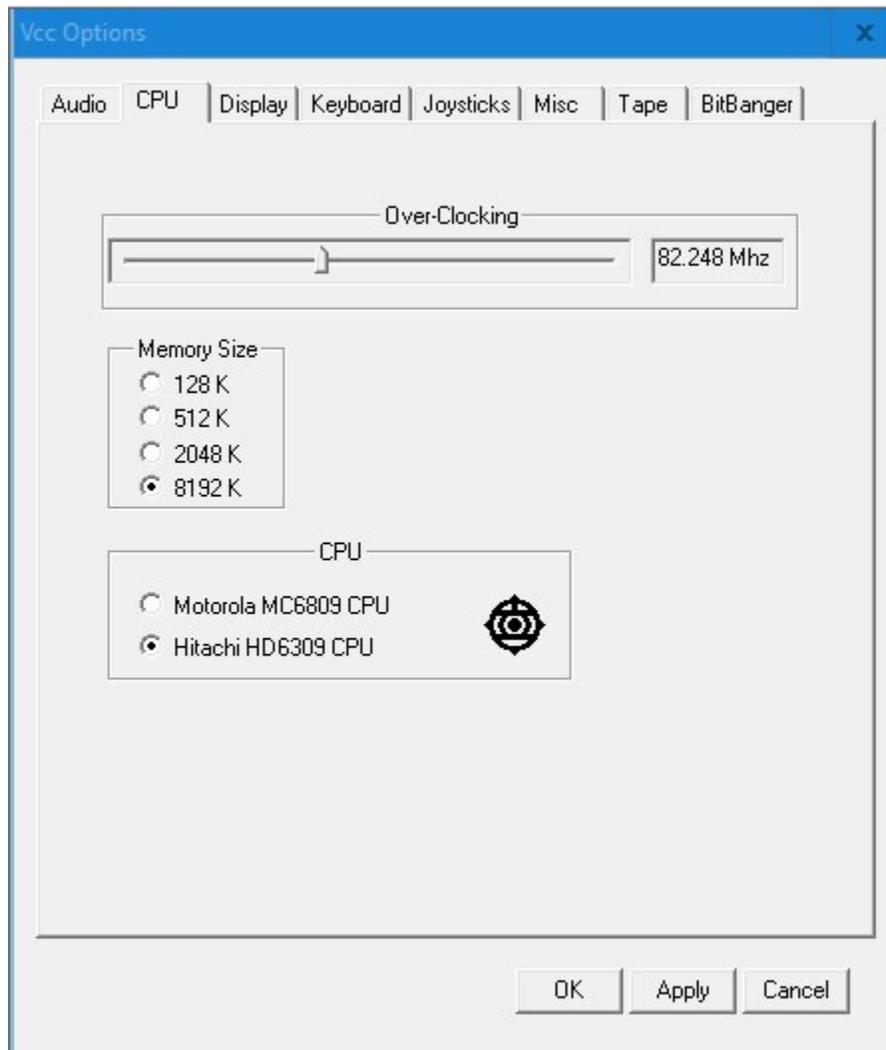
- **Copy Text:** Copies all text on the VCC/Coco screen (40 & 80 column modes are still being worked on)
- **Paste Text:** Pastes any text in the Windows clipboard into the VCC keyscan just as you would type it in.
- **Paste BASIC Code (merge):** Pastes BASIC text to the input buffer acting as a “MERGE” with any existing program in memory.
- **Paste BASIC Code (with NEW):** Pastes BASIC text to the input buffer, but first executing a “NEW” command, clearing the Coco 3 memory of any loaded program.

- **Configuration** – This menu tab contains only two items, but most “configuration” items reside here.
  - **Flip Artifact Colors** – Changes the PMODE artifact color set to the alternate color set without interrupting the emulation. Handy for Coco 2 games that come up in the wrong color set.
  - **Config** – This sub-menu contains a tabbed panel with most of the config items. On each of these panels, you must click “Apply” for your changes to take place. Clicking “OK” will also finalize your choices, but also exits the “Config” menu.
    - **Audio** – This controls VCC’s audio emulation.



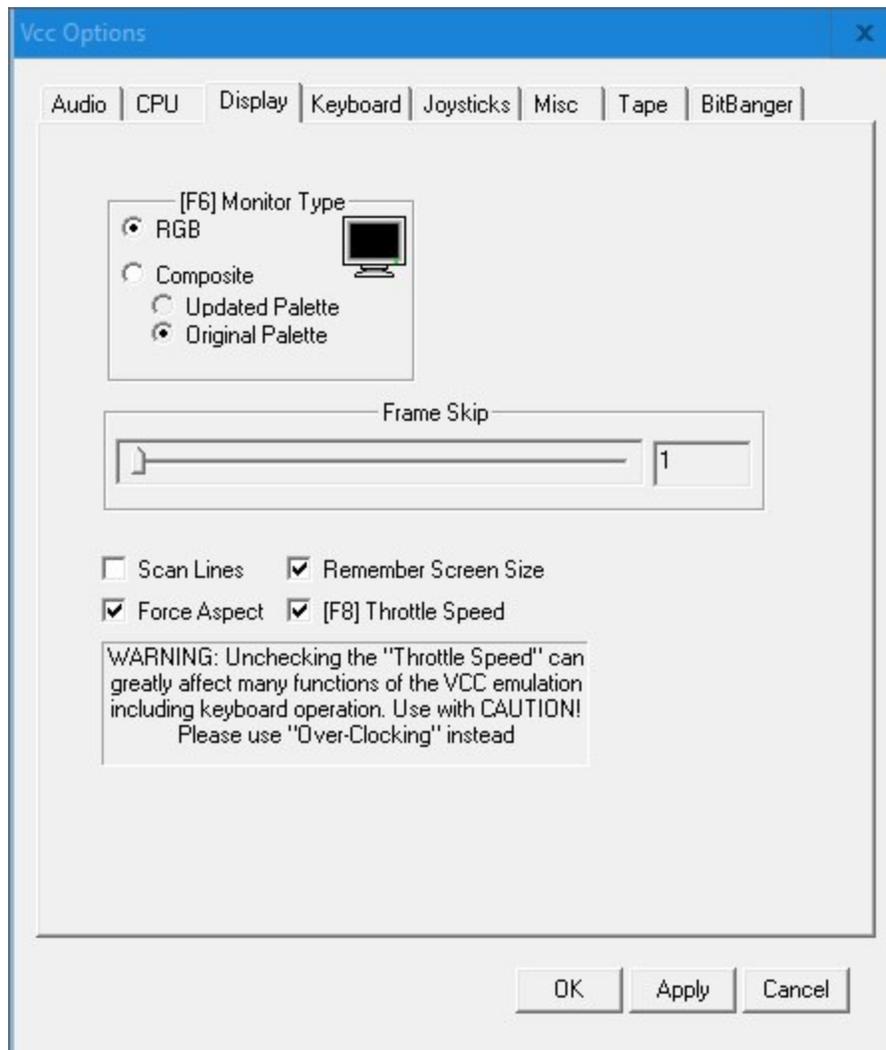
- **Sound** – VCC’s sound controls
  - **Output Device** – A pull down menu to select the Windows sound device for VCC to use for the Coco’s 6-bit DAC and Orchestra 90 sound output.
  - **Sound Quality** – Select the frequency resolution for your PC’s soundcard (normally 44100).
  - **VU Meters** (vertical bars to the right) – These meters are a visual representation of the sound volume in VCC

- **CPU** – This tab is where you select the CPU type used in VCC and the memory size of your Coco 3 emulation.



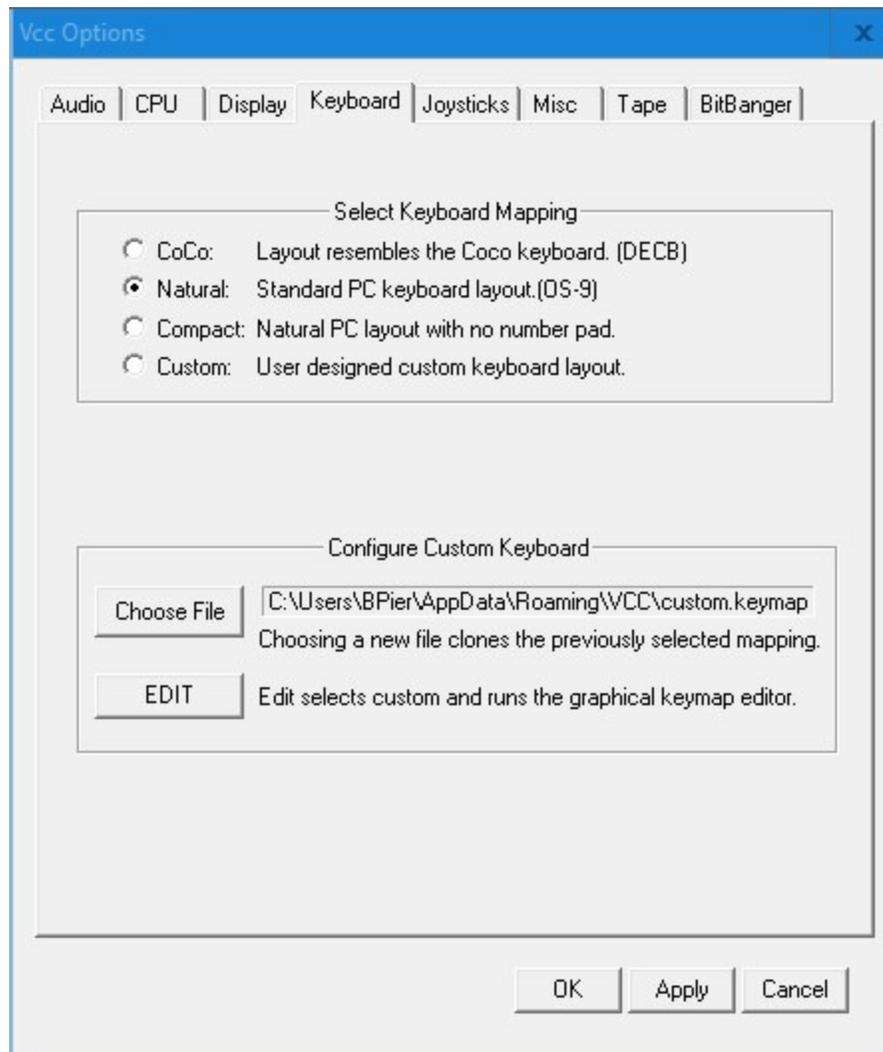
- **Over-Clocking** – Speeds up the CPU cycle speed but does not affect the internal clock speed. This can speed up text scrolling and graphics functions as well as some aspects of disk access. The slider can be adjusted from 1.78 MHZ (normal Coco 3 speed) to 202.938 MHZ which is ridiculously fast. Over-clocking the CPU to extremely high speeds may not work well on older PCs. Use with caution. This can *now* be accessed using the F3 & F4 keys. F3 will decrease the speed, and F4 will increase the speed.
- **Memory Size** – Select the memory size for your Coco 3 emulation
  - **128 K** – The stock Coco 3 memory size.
  - **512 K** – Emulates a Coco with the 512k upgrade
  - **2048 K** – Emulates Disto’s 2 meg memory board
  - **8192 K** – Emulates Paul T. Barton’s 8 meg memory board
- **CPU** – This option allows CPU selection for your Coco 3
  - **Motorola MC6809** – The standard Color Computer 6809 CPU
  - **Hitachi HD6309** – Emulates use of Hitachi’s HD68B09 CPU. Slightly faster than the 6809 with an enhanced instruction set. This CPU was a popular mod for Coco users in the early 1990s.

- **Display** – Here you set the display type of your Coco 3 emulation.



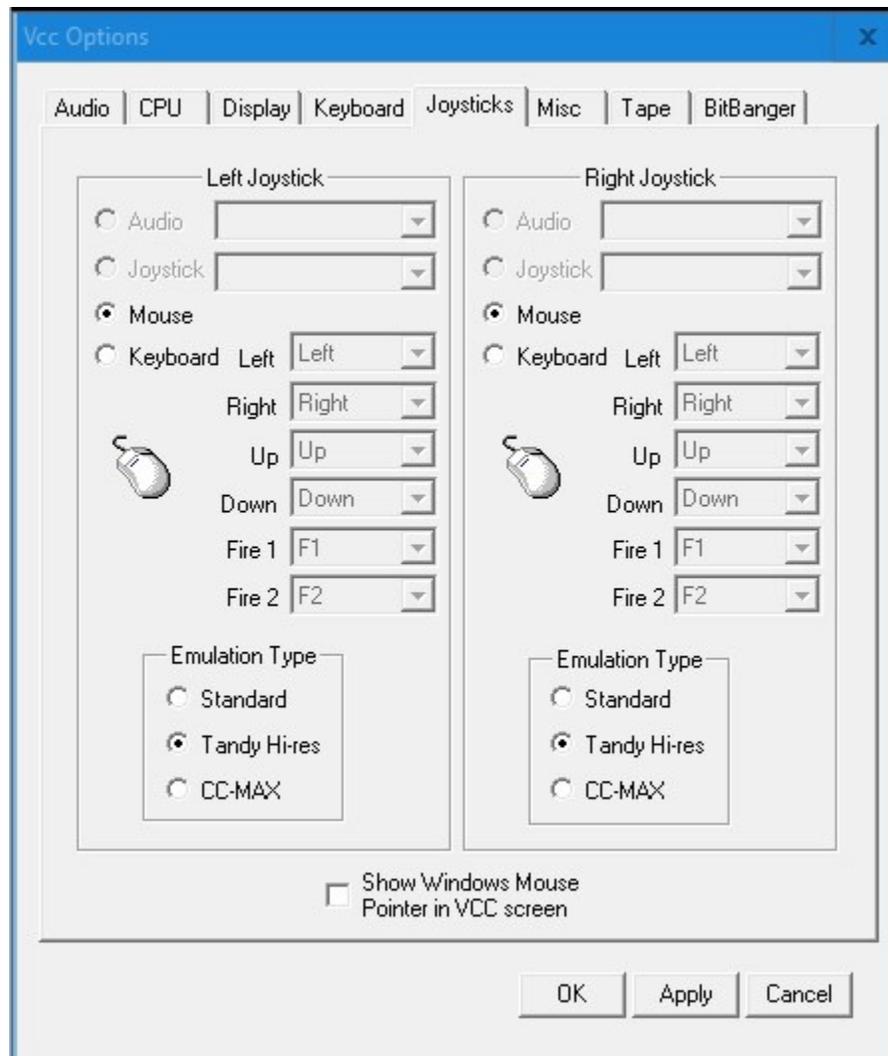
- **[F6] Monitor Type** – Select the monitor type you want to emulate.
  - **RGB** – Emulates the use of the Tandy CM-8 RGB monitor
  - **Composite** – Emulates the use of a composite monitor or TV. Mostly used when “artifact colors” are desired.
- **Frame Skip** – Selects how many frames to skip in the video scans. Mostly used for older, slower PCs with cheap graphics cards.
- **Scan Lines** – used to simulate the scan lines seen in a TV display.
- **Force Aspect** – We’ve finally fixed this feature which will maintain the Color Computer’s screen aspect when stretched or enlarged. As of this writing, the “Full Screen” mode will NOT retain it’s aspect and will stretch the full width of your computer screen. Italso may affect other windows you may have open. We hope to have this resolved soon.
- **Remember Screen Size (New)** – VCC will now remember your current screen size from one run to the next. No more resizing the screen each time you run VCC. Unchecking this box will force VCC to always start in the default 640x480 mode, but still allows The window to be resized as needed.
- **[F8] Throttle Speed** – Unchecking this box allows VCC to run at the full speed of the host PC. This is *not* desirable in most situations, but does have its uses. In most cases, Unchecking this will cause *double & triple* keystrokes.

- **Keyboard** – Only one selection resides in this tab



- - **Select Keyboard Mapping** – Here you select “Basic” or “OS-9” keyboard emulation. (see the “VCC Keyboard Map” section for actual keymaps)
    - **Coco** your PC’s keyboard is mapped in a layout similar to an actual Coco 3 keyboard (DECB).
    - **Natural** your PC’s keyboard is in its “normal” state with the exception of a few special keys (later).
    - **Compact** same as above (PC), but with a few keys altered to compensate for missing keys on laptops and hopefully in the future... IPads and Android devices.
    - **Custom** – Allows loading of "NEW" custom keymaps (see "KeyMap Editor")
  - **Configure Custom Keyboard** – Allows the loading of custom keymaps or editing/creating new keymaps
    - **Choose File** - Load and existing keymap file.
    - **Edit** - Edit or create a custom keymap file

- **Joysticks** – This tab contains controls for using the mouse or keyboard as Coco joysticks.



○

**Left Joystick Input** – Set's the left joystick emulation.

- **Audio** – Disabled. In the future, this is hoped to be used as on the real Color Computer 3 as an *audio input* for recording digital 6 bit audio just as on the real machine.
- **Joystick** – This option will only be available if you have a real PC type joystick plugged into your PC. Your Joystick should available through the pull down menu.
- **Mouse** – Allows use of the PC's mouse as the left Coco 3 joystick.
- **Keyboard** – Allows the user to select custom keyboard keys as the various joystick directional controls.
- **Left Emulation Type** - Selectable joystick type emulations
  - **Standard** - Standard Tandy joystick emulation
  - **Tandy Hi-Res** - Tandy Hi-Res interface emulation
  - **CC Maxx** - CocoMax3 interface emulation
- **Right Joystick Input** – Same as above but for the right Coco 3 joystick port.
- **Right Emulation Type** – Same as above but for the right joystick
- **Show Windows Mouse Pointer in VCC Screen**

- **Misc** – Set the cartridge emulation type.

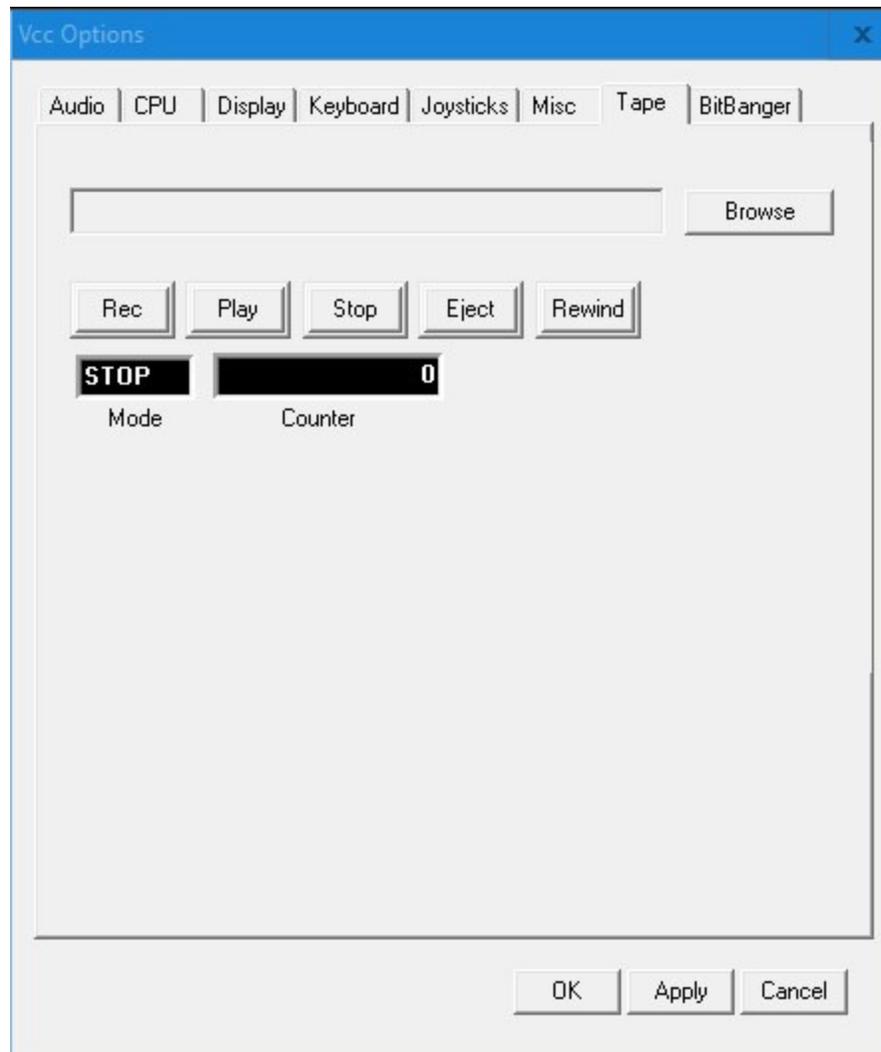


○

#### Misc

- **AutoStart Emulation** – Unchecked starts VCC in an “Off” state. You must press “F9” to turn the emulation on. Checked, VCC will start with the power “On”.
- **AutoStart Cart** – Unchecked, program paks will not “autostart”. This simulates “taping” the cartridge detect pin on a cart. This is useful for using the Orchestra90 cart emulation for stereo sound. I did this same thing on my real Cocom to use Orch90 for sound output back in the 80s. Checked, all carts will autostart as normal. When using the MPI (MultiPak Interface) module, the carts will only autostart when the MPI slot switch is set to the slot in which the cart is inserted.

- **Tape** – This tab is for the cassette tape emulation in VCC. As a note, the BASIC commands “MOTOR ON/OFF” and “AUDIO ON/OFF” do not affect the VCC tape recorder as on a real Cocomputer.



○

**Browse** – this button allows you to *browse* your PC for “.cas” or “.wav” files of recorded cassette tape format programs. The 2 types differ in their formats as follows:

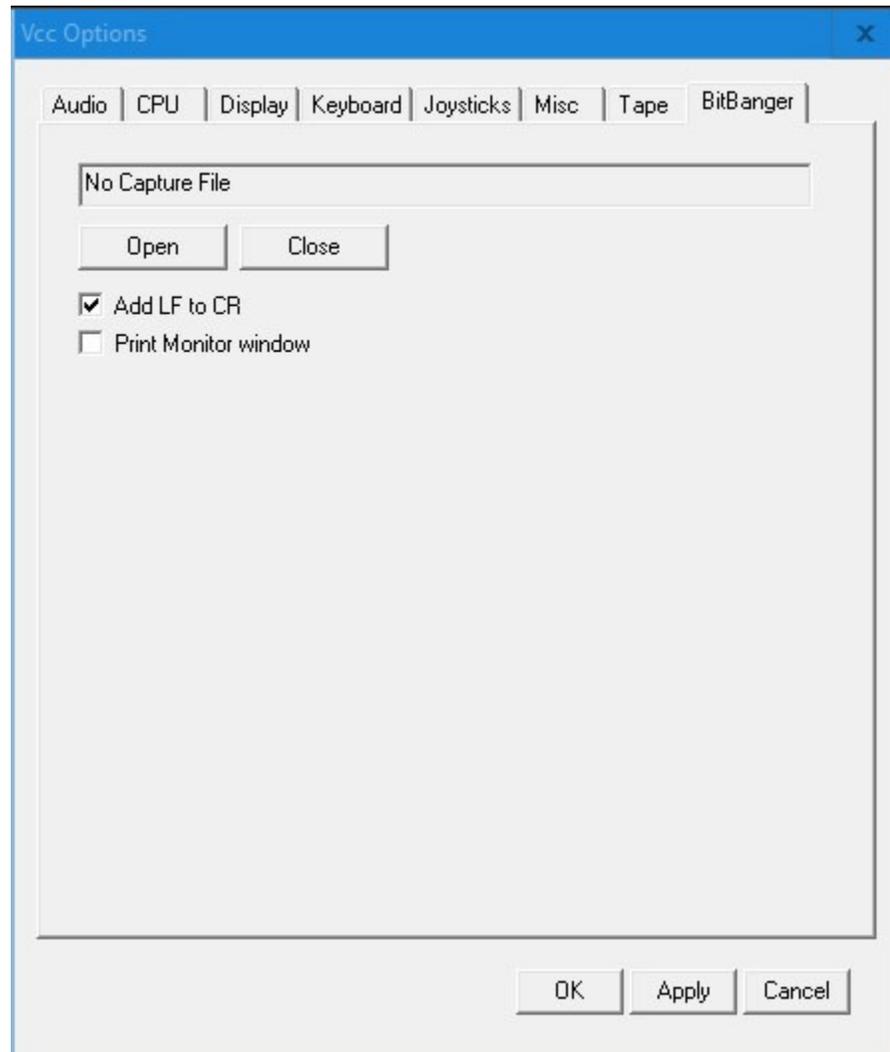
**wav** - An 8 bit, 44.199 kHz audio recording of the actual cassette file. The file **MUST** be 8 bit & 44.199 kHz (see below).

**cas** - A specially encoded, digital representation of the program data. This format is much more compact than wav and loads much faster.

**WARNING:** If you use “.wav” files, be warned, if the “.wav” file is *not* recorded in “8-bit, 44,100 kHz”, VCC may mangle the file just by loading it, you don’t even have to “play” it. Most “standard” wave files are in 16-bit, 44,199 kHz. These will not work in VCC and even if you just browse to them and select them into the tape interface, VCC will try to convert them to 8-bit and ruin the file. This issue is being looked into. You were warned.

- **Record** – Sets the tape emulation to record. The tape will stay on “pause” until you issue a “CSAVE” or “CSAVEM” command from basic.
- **Play** – Sets the tape player to “play” and as above, stays on pause until a “CLOAD” or “CLOADM” command is issued from BASIC.

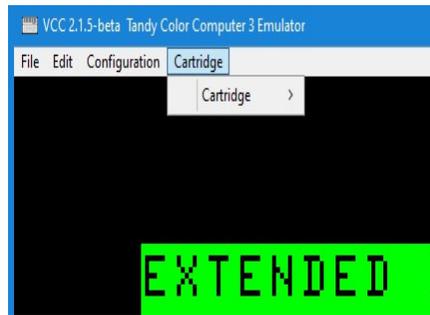
- **Stop** – This will stop the recorder just as on a real tape deck. It will not respond to any BASIC commands while stopped. The current “cas” or “wav” file remains in the buffer.
  - **Eject** – This button closes then “unloads” the tape file from VCC. You will no longer have access to this file until it’s loaded again.
  - **Rewind** – This will rewind the “tape” file to the beginning of the tape.
- **BitBanger** – This tab is the emulated “serial” port on the VCC Coco 3.



- **Open** – This button “opens” a selected capture file. Any data sent to the serial port will be sent to this file in raw ASCII format.
- **Close** – This closes the serial capture file.
- **Add LF to CR** – Checking this item will cause VCC to add a Line Feed character to every Carriage Return VCC encounters while sending data to the capture file. PC text files use CR/LF as a standard where the Coco uses CR alone.
- **Print Monitor Window** – Opens an extra window panel on your Windows desktop that will display any data sent to the bitbanger port.

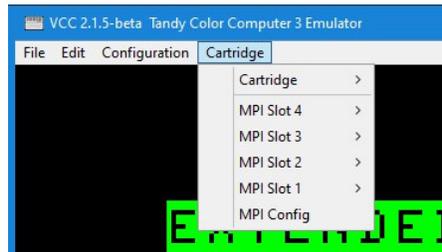
**NOTE:** The “DriveWire4” server features that were available here in “VCC 1.43b” have now been moved to the “Becker.dll” rom cart emulation. To access the DW4/Becker Port features , you must insert the Becker cart into the cartridge slot or a slot in the MPI (Multi Pak Interface).

- **Cartridge** - The “Cartridge” selection is an emulation of the Coco’s cartridge slot in that here, you will insert ROM images or special (included) cartridge dll files emulating various Coco controller carts, such as, the Multipak Interface, Orchestra 90, the FD-502 disk controller, several HD controllers, and the Becker Port cart. *Each cart emulation may or may not add items to the “Cartridge” menu.* I will try to list these additions below. The full description of each cart emulation can be found in the “Loadable Modules” section:

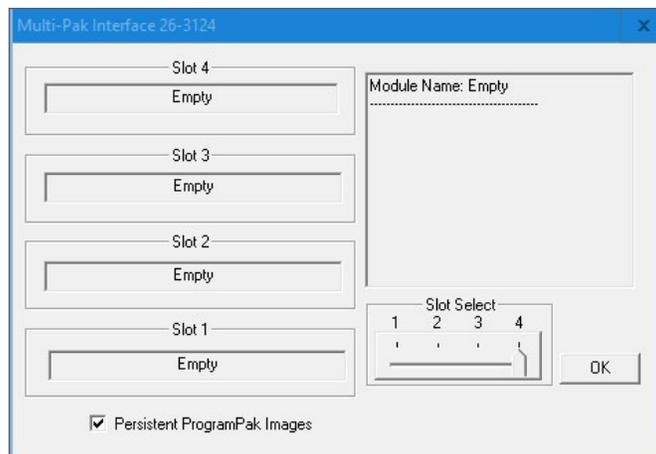


*Inserting the mpi.dll module into the emulator cartridge slot results in the following menu:*

- **mpi.dll** - Tandy Multipak Interface. Allows insertion of up to 4 cart dlls



- MPI Slot 4 - Slot 4 of the MPI (duh!)
- **MPI Slot 3** - Slot 3 of the MPI
- **MPI Slot 2** - Slot 2 of the MPI
- **MPI Slot 1** - Slot 1 of the MPI
- **MPI Config** - Configures the MPI settings

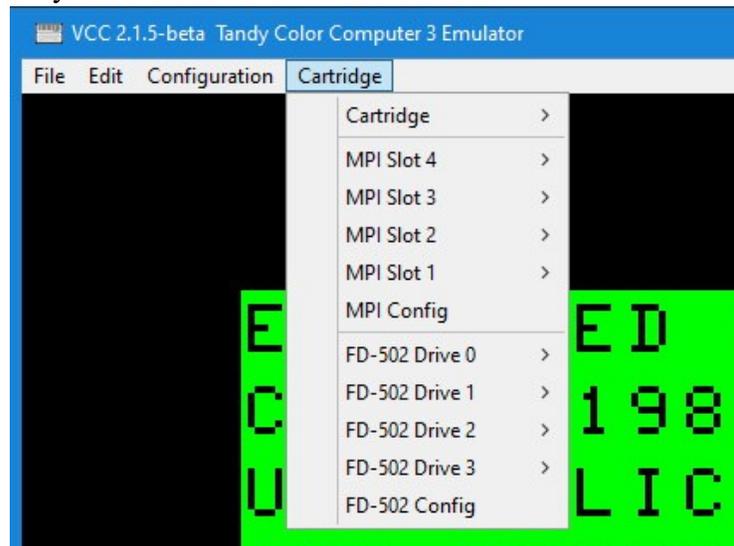


- Slot 4 – Browse Cart images to loaded into Slot 4
- **Slot 3** – Browse Cart images to loaded into Slot 3
- **Slot 2** – Browse Cart images to loaded into Slot 2
- **Slot 1** – Browse Cart images to loaded into Slot 1

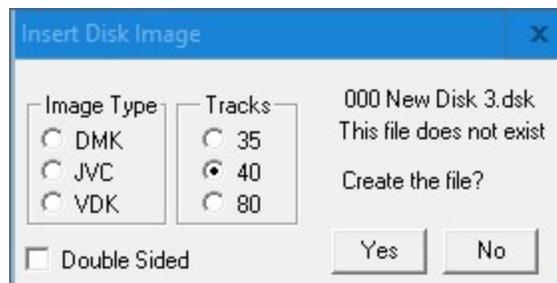
- **Slot Select** – Selects the Slot # to become the *active* Slot (this action may or may not reset the Coco 3 based on what cart is in the slot and your cartridge settings in the Misc tab)
- **Persistent Pak Images (New)** – Allows VCC to *remember* what carts you have selected and reload them each time you run VCC. This function is still a little wonky, but works unless you remove the MPI and reinsert it.

○ *Inserting these cart images into the MPI slots or the Cartridge slot results in the following menu additions:*

- **fd502.dll** - Tandy FD-502 Disk controller

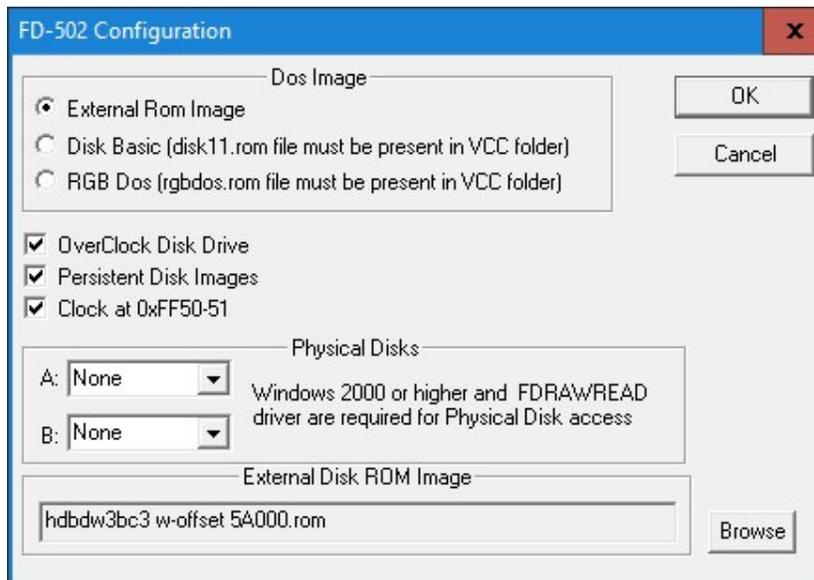


- **FD-502 Drive 0** - Manage virtual disk images (.dsk) in the drive slots
  - **Insert** - Insert an a disk image from your PC's folders
    - Optionally, typing a name into any Drive "Insert" selection when there is no disk of that name in your folder, will bring up the "Disk Insert Image" menu in which you can create a new disk of that name.



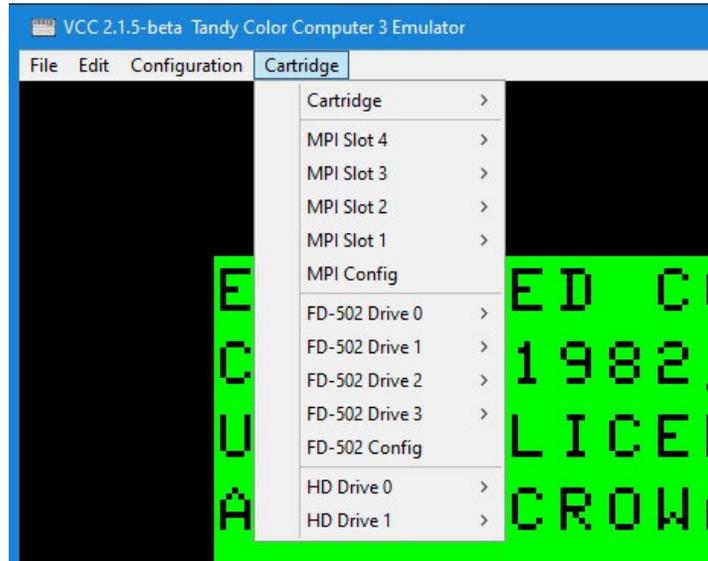
- **Image Type** - Select the virtual disk image type
  - **DMK** - DMK virtual disk image type
  - **JVC** - JVC virtual disk imagetype (preferred)
  - **VDK** - VDK virtual disk image type
- **Tracks** - Select the number of tracks on your virtual disk image
  - **35** - Creates a 35 track virtual disk image
  - **40** - Creates a 40 track virtual disk image
  - **80** - Creates an 80 track virtual disk image
- **Double Sided** - Checking/unchecking this determines if your virtual disk image is single or double sided
- **Eject** - Eject the current disk image

- **FD-502 Drive 1** - "Same as above"
- **FD-502 Drive 2** - "Same as above"
- **FD-502 Drive 3** - "Same as above"
- **FD-502 Config** - Configuration utilities for the FD-502 controller

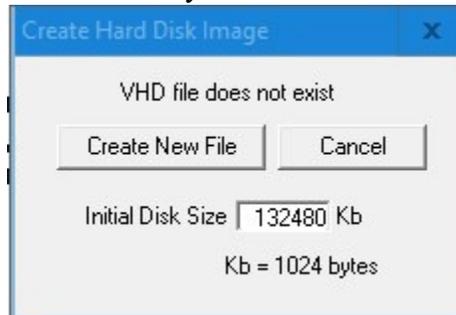


- **DOS Image** – Selects what DOS rom is to be used
  - **External ROM Image** – Loads an external DOS ROM (HDBDOS, RGBDOS, etc)
  - **Disk BASIC** – Use the DECB ROM
  - **RGB DOS** – Uses the included RGBDOS ROM for use with “harddisk.dll”
  - **OverClock Disk Drive** – Checked, allows VCC to use it’s virtual drives at PC speeds. Unchecked, simulates normal Coco drive speeds. (default is ON)
  - **Persistent Disk Images** – Forces VCC to load the last disk used when booting VCC (default is ON)
  - **Clock at 0xFF50-51** – Moves the RTC port to \$FF50-\$FF51 for use with some Hard Drive controllers (default is On)
  - **Physical Disks** – Originally meant to use the old FDRAWREAD driver for Windows that allowed VCC to read/write to real Coco floppy disks. I doubt any modern PC’s can access these disks any longer due to a change in format with the introduction of the High Density 1.44meg floppy disk. This function most likely be removed in the future.
    - **A** – Selects Physical Drive A
    - **B** – Selects Physical Drive B
  - **External Disk ROM Image** – Selects the External Disk ROM image to use as an alternative Disk Operating System.
  - **Browse** – Browse to select the desired External Disk ROM Image to be used

- **harddisk.dll** - Hard drive emulation

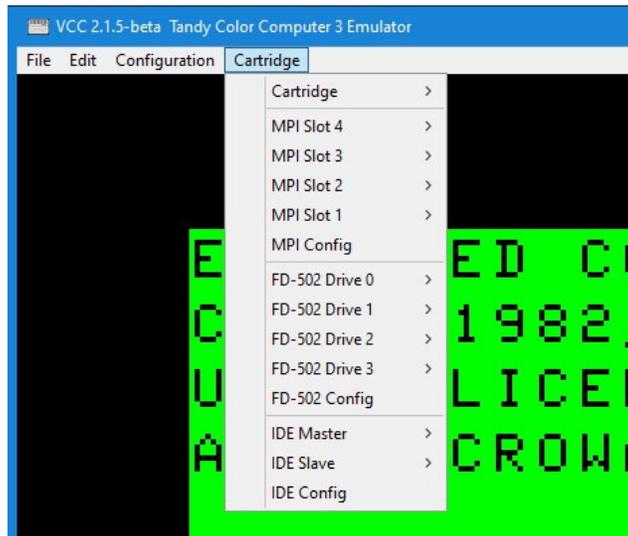


- **Hard Drive 0** - Manage hard drive images (.vhd) here
  - **Insert** - Select a VHD image to mount
    - Optionally, typing a name into any VHD "Insert" selection when there is no disk of that name in your folder, will bring up the "Create Hard Disk Image" menu in which you can create a new VHD of that name.

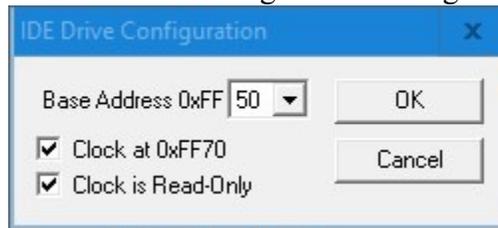


- **Create New File** - Creates the specified VHD at the specified size in the selected directory
- **Cancel** - Cancels the operation
- **Initial Disk Size** - Input the size (in Kilobytes) that you want for your VHD. The default size is 132,480k, which is the standard size for an HDBDOS HD with 256 RSDOS disks and a (approximately) 92meg OS-9 HD, with HDBDOS set at an offset of \$5A000. This size can be changed to any size you want, but remember to set your OS-9 HD driver to accomodate your VHD size.
- **Eject** - Eject the current VHD image
- **Hard Drive 1** - Same as above

- **SuperIDE.dll** - Glenside IDE / SuperIDE emulation for using CF card images



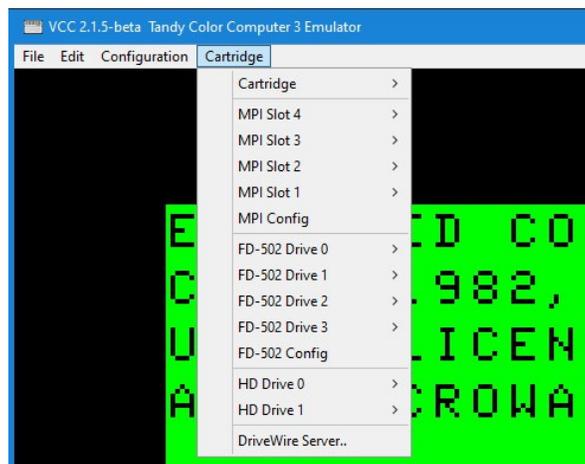
- IDE Master - Insert CF (master) card image here (.img)
- IDE Slave - Insert 2<sup>nd</sup> (slave) CF card image here
- IDE Config - IDE interface configuration settings



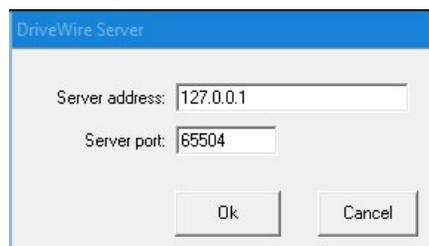
- orch90.dll - Orchestra 90 Music cart

- NONE

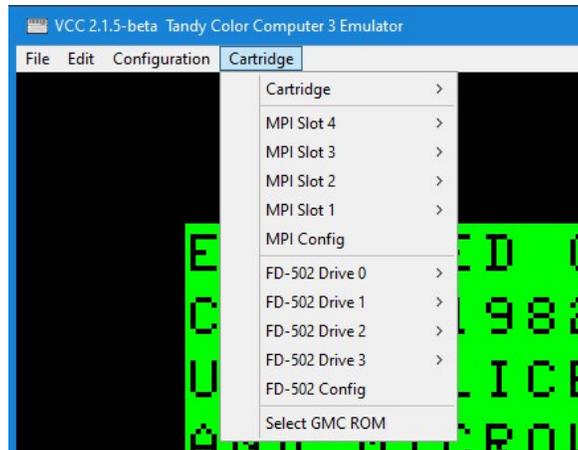
- **becker.dll** - Becker Port emulation for DriveWire4 and TCP communication



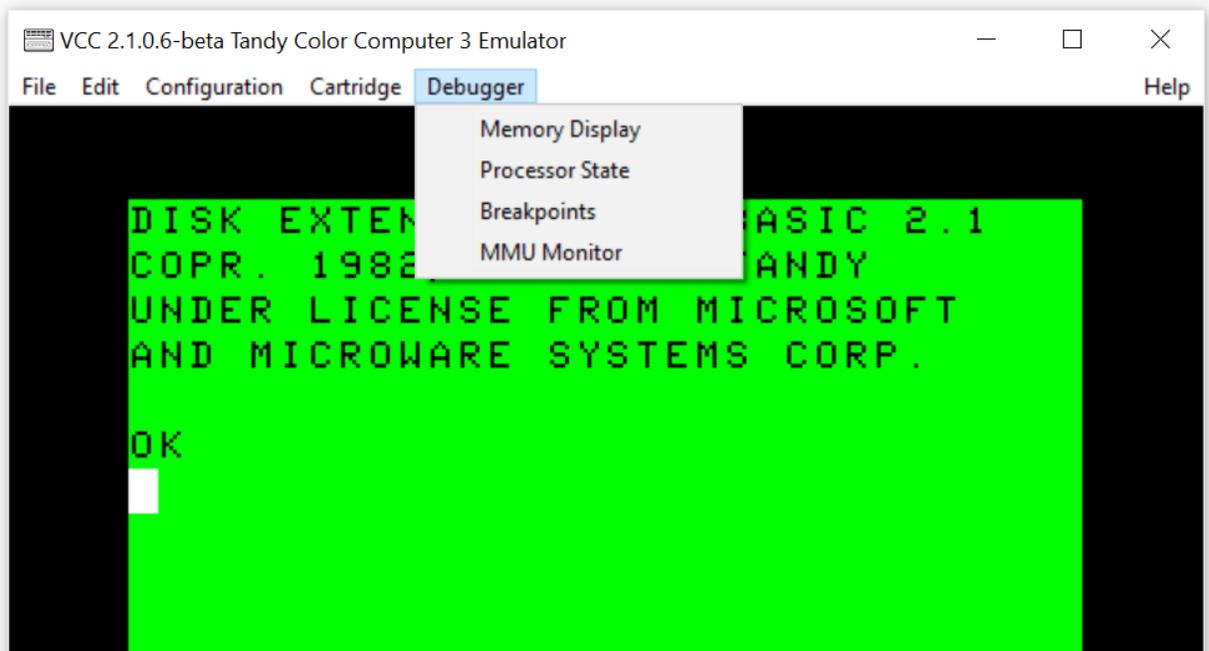
- DriveWire Server - Becker Port configuration for DW4



- **GMC.dll** – Emulates John Linville’s “Game Master Cart” (GMC) for custom game cart design with “Syd” type sound & music. **This Cart is still experimental, so please report any problems.**



- Select GMC ROM – Select and insert the GMC compatible game/sound ROM.
- **Debugger** - This menu selection opens the VCC "Debugger" which allows you to view the internal memory contents of your Coco 3. All Debugger windows are accessed through these menu options. Selecting one of these options will open the corresponding window.



**Note:** Interrogating the machine’s internals and displaying the results in real time *may* impact the frame rate of the emulator. On reasonably fast machines this will not be an issue. However, if you are playing a graphic intensive game and want to maintain 60 FPS, keep the debugger windows closed until you need them. When the windows are closed, the emulator’s framerate are not impacted.

- **Memory Display** - Selecting the memory display option will present the 64KB processor space. All values in the memory display are updated in real time.

Any address from 0000 to FFFF will be displayed

If the character can be displayed it will be shown here, otherwise it will be shown as a "."

Press this to close the window

You can enter a hexadecimal address here and the display will scroll to that address.

Address	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	ASCII
000000	00	22	22	00	00	00	FF	00	00	00	01	A9	01	A4	00		.
000010	00	00	00	00	00	00	00	00	00	26	01	26	03	26	03	26	.
000020	03	7F	37	7F	FF	00	00	7F	FF	00	00	00	00	00	00	00	.
000030	00	00	00	26	00	00	00	00	00	00	00	00	00	00	00	00	.
000040	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.
000050	00	00	01	A9	00	00	03	00	AB	EE	00	00	00	00	00	00	.
000060	00	00	AB	EE	AB	F1	00	00	00	10	10	00	20	00	00	00	.
000070	00	55	C0	E7	7F	FF	00	00	00	00	00	00	00	00	00	00	.
000080	00	00	00	00	00	00	00	00	04	C0	00	00	00	00	00	12	.
000090	18	0A	00	80	01	00	58	00	01	10	70	84	00	B4	4A	0C	.
0000A0	A7	26	02	0C	A6	86	26	00	7E	AA	1A	00	00	00	00	00	.
0000B0	09	5F	03	00	00	00	00	14	00	10	0E	00	0E	00	00	00	.
0000C0	00	00	00	00	00	00	00	00	80	00	60	00	00	00	00	00	.
0000D0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	02	BA	.
0000E0	42	04	02	00	00	00	00	00	00	00	00	00	00	00	00	00	.
0000F0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.
000100	38	38	38	38	38	38	00	00	00	7E	D8	A1	7E	D8	AF	7E	.
000110	A0	F6	1D	32	4A	80	4F	C7	52	59	FF	04	5E	7E	84	89	.
000120	35	AA	66	AB	67	14	AB	1A	AA	29	19	81	83	CF	0A	0E	.
000130	82	1E	CF	32	14	C1	92	C2	38	06	C2	19	C2	4E	00	4A	.
000140	B4	B2	77	00	B4	4A	B2	77	B4	4A	B4	4A	B4	4A	B4	4A	.
000150	B4	4A	FF	00	00	00	00	7E	C4	.							
000160	4B	7E	C8	88	7E	C8	93	7E	CC	1C	7E	C5	BC	7E	C8	48	.
000170	7E	C8	48	7E	CA	E9	7E	CA	F9	7E	8E	90	7E	CD	35	7E	.
000180	C8	A9	7E	C6	E4	7E	CA	E4	7E	C9	0C	7E	CE	D2	7E	C6	.
000190	E4	7E	C2	65	7E	CA	3E	7E	87	E5	7E	C8	80	39	39	39	.
0001A0	7E	C2	B2	7E	83	04	39	39	39	03	00	AB	EE	00	00	00	.
0001B0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.
0001C0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.
0001D0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.
0001E0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.
0001F0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.

- **Processor State** - Selecting the Processor State option will show the internals of the CPU. All values displayed are updated in real time.

Processor Registers are shown here

CPU Program Counter is displayed here.

Press this to close the window

Processor Condition Codes:

- E: All registers were stacked from last interrupt.
- F: Fast interrupt (FIRQ) disable flag.
- H: Half carry flag.
- I: Interrupt (IRQ) disable flag.
- N: Last operation was negative.
- Z: Last operation was zero.
- V: Last operation had an overflow.
- C: Full carry flag.

Processor Controls:

- Halt:** Stops the processor from running. All displays will freeze with the state of the machine at the time the button is pressed.
- Run:** Starts the processor running again. The machine will resume exactly where it left off when it was halted.
- Step:** Cycles the processor by one step. It will execute the next instruction and halt again.

D	W	X	Y	S	U	PC
00 0B	00 00	02 43	A0 0E	7F 2B	AB EE	A7 D3
A B	E F					

CC: - - 1 - 1 - - 1

E F H I N Z V C

DP: 00 MD: 00 V: 00 00

W, MD, V are 6309 CPU only

Buttons: Halt, Run, Step

- **Breakpoints** - Selecting the breakpoints option will allow you to load an LWASM source listing and set breakpoints.

Select the LWASM Source Listing

### Breakpoint Controls

**New Breakpoint:** To set a breakpoint, click on a source line below, and then click on New Breakpoint. You will only be able to set a breakpoint on a line with an address. All addresses will appear in the second column of the listing.

When a breakpoint is set, the first column will indicate which breakpoint has been set.

**Remove Breakpoint:** To remove a breakpoint, click on the breakpoint listed in the breakpoint control window. The source will scroll to the breakpoint. Click on the Remove Breakpoint button and the breakpoint will be removed.

**On/Off:** You can enable or disable a breakpoint by clicking on a breakpoint listed in the breakpoint control window. Clicking on the Off button will disable the breakpoint. A disabled breakpoint will remain listed in the source, but the CPU will not halt when it reaches the instruction. You can re-enable the breakpoint by clicking the On button.

**1st Column:** Indicates set breakpoints.

**2nd Column:** Memory Address— you can only set breakpoints on lines with an address.

**3rd Column:** Bytes in memory, this could be CPU instructions or data.

You can use this field to search the source for text. Pressing the find button repeatedly will move to the next location where the text is found.

- **Source Listing** - The Source Debugger can only deal with certain source listings. Currently the breakpoints window will only accept **LWASM Source Listings**. To create such as listing, you must specify this option on the LWASM command line. Here is an example command line:

```
lwasm --format=decb --list=sr3.lst --output=sr3.bin sr3.asm
```

This produces a listing file like this:

```
6000 1A50          (          sr3.asm):00047          START  ORCC  #$50  * Turn off
interrupts
6002 7FFF40      (          sr3.asm):00048
6005 7FFFDE      (          sr3.asm):00049          CLR   $FF40
6008 FC0112      (          sr3.asm):00050          LDD   $112
600B FD64CC      (          sr3.asm):00051          STD   RNUM
600E FD64CE      (          sr3.asm):00052          STD   RNUM+2
6011 8655        (          sr3.asm):00053          LDA   #$55
6013 9771        (          sr3.asm):00054          STA   <$71
6015 8E601D      (          sr3.asm):00055          LDX   #STRT
6018 9F72        (          sr3.asm):00056          STX   <$72
601A 171560      (          sr3.asm):00057          LBSR  HNAM
```

When the listing is loaded, it scans the file looking for the 4-byte address (6000 in the case of the first line). When it finds a line with an address it will make note of the listing line number. When a breakpoint address is sent to the CPU and the CPU's Program Counter (PC) matches the breakpoint address, the CPU will halt.

When the CPU halts, the breakpoint window will scan the source listing and locate the source line with the matching address. This allows you to see the source exactly as it appears in the listing including any comments.

**Note:** The source listing is used as the only means of source debugging. No disassembly of machine code is performed. This means if the program uses self-modifying code or data as instructions, the source listing window may not reflect exactly what the machine is executing. The memory window will contain the exact bytes seen by the processor, but the source listing may not. However, the breakpoint window will try its best to stay relevant to the area of the code being executed.

- **MMU Monitor** - Selecting the MMU Monitor option will allow you to see the current state of the Memory Management Unit (MMU). This device handles the mapping of the machine's real memory (128KB or 512KB in most CoCo3s) to the CPU's 64KB memory space.

On a CoCo3, the MMU has two sets of mappings of real memory to CPU memory: MAP 0 and MAP 1. Which mapping is used is determined by the **MMU Task Bit** (0 = MAP 0, 1 = MAP 1). The monitor will display which map is in effect by drawing lines from the MAP column to the CPU Memory ranges.

This shows that MAP 0 is currently being mapped into the CPU Memory space.

This shows that MAP 1 is currently not in use and invisible to the CPU.

MMU Monitor Window

Real Memory	MAP 0	CPU Memory	MAP 1	Real Memory
70000-71FFF	3B	0000-1FFF	3B	70000-71FFF
72000-73FFF	39	2000-3FFF	30	60000-61FFF
74000-75FFF	3A	4000-5FFF	31	62000-63FFF
76000-77FFF	3B	6000-7FFF	32	64000-65FFF
78000-79FFF	3C	8000-9FFF	33	66000-67FFF
7A000-7BFFF	3D	A000-BFFF	30	7A000-7BFFF
7C000-7DFFF	3E	C000-DFFF	35	6A000-6BFFF
7E000-7FFFF	3F	E000-FFFF	3F	7E000-7FFFF

MMU Enable Bit	<input checked="" type="checkbox"/> 1	\$FFD0 bit 6	Ram Vectors	<input checked="" type="checkbox"/> 1	\$FFD0 bit 3
MMU Task Bit	<input checked="" type="checkbox"/> 0	\$FFD1 bit 0	Rom Mapping	<input checked="" type="checkbox"/> 0	\$FFD0 bit 1 0

Address	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	ASCII
07A000	A1	CB	A2	B2	A7	7C	A7	0B	A7	F4	A9	DE	A7	D8	10	CE	.... .....
07A010	03	D7	86	37	B7	FF	23	96	71	81	55	26	57	9E	72	A6	...7..#.q.Uu.r.
07A020	84	81	12	26	4F	6C	84	31	8C	C4	8G	3A	E7	FF	A2	8C	...0n.1.....
07A030	FF	20	CC	FF	34	6F	01	6F	03	4A	A7	84	86	F8	A7	02	...4u.u.J.....
07A040	E7	01	E7	03	5F	02	86	02	A7	84	86	7F	8E	7F	00	6F	....0.....0
07A050	01	6F	03	6F	B4	A7	02	E7	01	E7	03	7E	A0	72	8D	8C	..0.0.....r..
07A060	2E	7E	C0	00	E5	02	27	0A	6F	1E	E5	02	27	02	33	5E	..^.....'.0...'.3^
07A070	A7	5D	6F	A4	8F	04	01	6F	83	30	01	76	FA	BD	A9	78	..]n....n.0...{
07A080	6F	80	9F	19	BE	7F	FF	20	0A	12	12	12	12	12	12	12	0.....
07A090	12	12	12	9F	74	9F	27	9F	23	30	89	FF	38	9F	21	1F	...t.'.#0..8..!
07A0A0	14	8E	A1	0D	CE	00	8F	C6	1C	BD	A5	9A	CE	01	0C	C6	.....
07A0B0	1E	BD	A5	9A	AE	14	AF	43	AF	48	8E	01	5E	CC	39	4B	.....C.H..^.9K
07A0C0	A7	80	5A	26	FB	B7	02	D9	BD	AD	19	7E	80	02	34	14	..Z.....^..4.
07A0D0	0D	E7	10	26	56	A8	ED	A1	99	BD	A1	CB	27	F8	7E	A1	...y.....'.^.
07A0E0	B9	72	86	55	97	71	20	0B	12	0F	6F	BD	AD	33	1C	AF	..r.U.q...o..3..
07A0F0	BD	A9	10	7E	AC	73	7D	FF	23	2B	01	3B	ED	8C	28	BD	...~s}.#+.j...{.

Close      Display Real Memory (8K Page)      7A000-7BFFF

The MMU is controlled by several registers:

**MMU Task Bit:** This selects which map set should be seen by the CPU.

**MMU Enable Bit:** This allows the CoCo3 to be CoCo1/2 compatible. Disabling the MMU will just provide a static 64KB to the CPU.

**Ram Vectors:** Enabling this register will cause CPU memory FE00-FEFF to remain constant regardless of the mapping.

**Rom Mapping:** A two-bit register that gives you several options on mapping RAM/ROM:

0 or 1    :16K Internal ROM, 16K External ROM  
 2        :32K Internal ROM  
 3        :32K External ROM

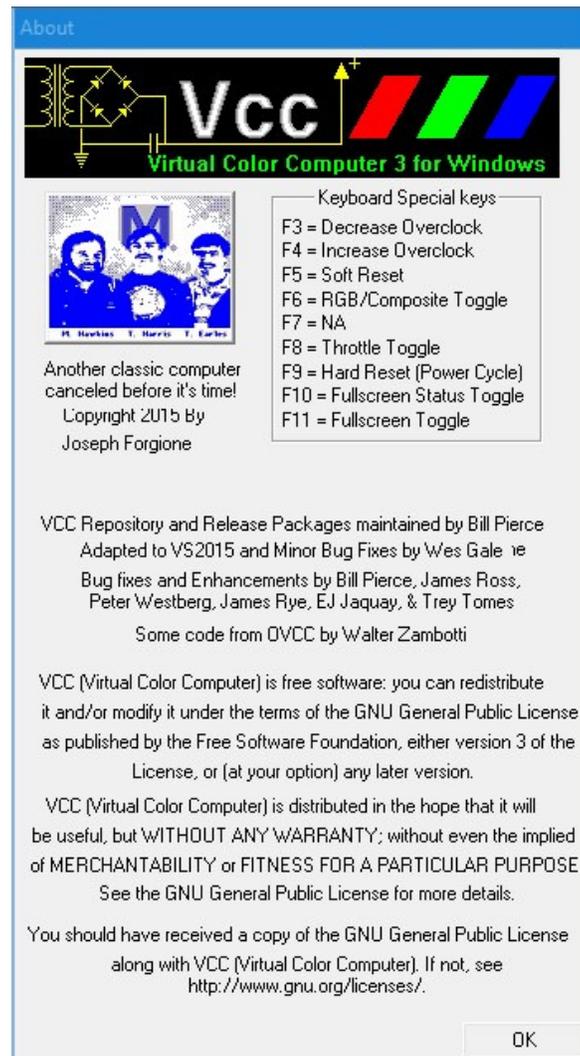
This is a display of the real memory in the machine.

Use this selection control to display a page of real memory.

The MMU will map real memory into CPU memory by 8KB pages – that is 8192 bytes per page. These pages are numbered from 0 to 3F (hex) and are placed in the MMU's 8 registers to make a mapping. The CoCo3's MMU has two sets of 8 registers, so that two maps can always be ready to be used.

Thanks to Mike Rojas for the wonderful Debugger utility!!

- **Help** - This menu selection has only one choice (I hope at some point to add an actual help file):
  - **About** - Displays the VCC “About Box” which contains the “Function Key” list and Copyright information.



This concludes the “MenuBar” selections and their uses. I hope my explanations are helpful to the new VCC user.

## Function Keys

- **F1 & F2** - By default these are mapped to the F1 and F2 keys on the standard coco keyboard. Alternatively they are the default Fire 1 and Fire 2 when using the keyboard to emulate joystick input in OS-9's "MouseKey" mode.
- **F3** - "CPU-1" for setting the CPU speed without having to use the menus. Key repeats until minimum speed is reached
- **F4** - "CPU+1" for setting the CPU speed without having to use the menus. Key repeats until maximum speed is reached
- **F5** - Soft Reset. Same as pressing the reset button on a real machine.
- **F6** - RGB/Composite toggle. Has the same effect as the Display Dialog setting except that unlike the configuration dialog option, changing this will not save its state to the ini file.
- **F7** - Unused
- **F8** - Throttle Toggle. Normally the emulator will try to run at the original 60 frames per second that the real hardware runs at regardless of the speed of the host CPU. This is known as "throttling". Alternatively the emulation can be allowed to run as fast as possible. This key is used to toggle between these two modes. It's useful during long loading or processing tasks to shorten the wait time. Note that unlike the configuration dialog option, changing this will not save its state to the ini file.
- **F9** - Hard reset. Same as pressing the Power button on a real machine. Press once for "Off" and again for "On"
- **F10** - Only used in Full screen mode. In windowed mode there is a status bar at the bottom of program window. In Full screen mode this information is displayed in a band at the top of the screen. This is used to toggle that band on and off.
- **F11** - Switches between Full screen and Windowed mode.
- **F12** - Unused (*may produce "odd" character onscreen when used with certain keymaps*).

We hope to be introducing a lot of new "Function keys in the future using the <SHIFT> <Fx> format, this open 12 more function keys. If more are needed, we can always resort to <CNTRL><Fx> & <ALT><Fx>.

**NOTE:** Holding "F1" and pressing "F9" twice will reverse the color artifacting in VCC. If you are getting the wrong colors in Composite mode, then this should help.

# Vcc Keyboard Configuration and Key Mapping

## Keyboard Layout

The default VCC keyboard layout tries to resemble the physical layout of the Color Computer 3 keyboard. This works well with Disk Extended Color Basic (DECB) but not so well with the more powerful OS-9 and NitrOS-9 operating systems. Also some PCs do not have number pads or have uncommon layouts. For these reasons VCC provides three built-in keyboard layouts (CoCo, Natural, Compact) and a user modifyable Custom layout.

The Coco (DECB) layout maps the PC's keyboard in a layout similar to an actual Coco 3 keyboard.

Natural (OS-9) maps the PC's keyboard to match the keycaps on a US QWERTY keyboard with the exception of a few special keys.

Compact (OS-9) is similar to Natural, but with some keys altered to compensate for missing the number pad keys on smaller laptops.

The Custom layout is stored in a separate file while the built-in layouts are hardcoded within the VCC executable.

The mapping is selected by a radio button on the VCC Config Keyboard tab.

Also on the Config Keyboard tab there are two buttons in the Custom Keyboard section, as follows:

The "Choose File" button changes the custom keymap file. If the chosen file exists the keymap is loaded. If the file does not exist a new file is created containing the selected keymapping. This allows user to create a file that contains a copy of any of the built-in keymaps.

The "EDIT" button modifies the Custom keymap. Changes made in the editor take immediate effect and are automatically saved to the keymap file unless Cancel is selected within the Editor. Using the keymap editor will cause the Custom keymap to be automatically selected.

It is possible to modify custom keymap files using a text editor. This should not be done while VCC is running. Otherwise VCC might overwrite the changes.

## Custom Keyboard Map File

The keyboard map file is used to map host PC key codes into Color Computer 3 keys. This file has the default name "custom.keymap" and normally resides in the user's Vcc appdata directory. The file contains lines of text, each contains four fields (two pairs) separated by one or more spaces or tabs. Blank lines, lines starting with "#", or anything on a line beyond four fields are comments. All other lines are key definitions. The first two fields of a key definition are the PC code and it's modifier. The next two fields are the CoCo key and it's modifier.

PC keynames start with "DIK\_" and CoCo key names start with "COCO\_"  
Key modifiers are specified with a single digit as follows:

0=not modified, 1=shift, 2=control, 3=alt.

A list of valid PC and CoCo key names can be found in keynames.h in Vcc sources.

Here are some example entry lines:

```
# PC key name      Mod  CoCo name      Mod
# -----
DIK_EQUALS        0    COCO_MINUS     1    # "=" Coco
DIK_MINUS         1    COCO_MINUS     2    # "_ " NitrOS-9
```

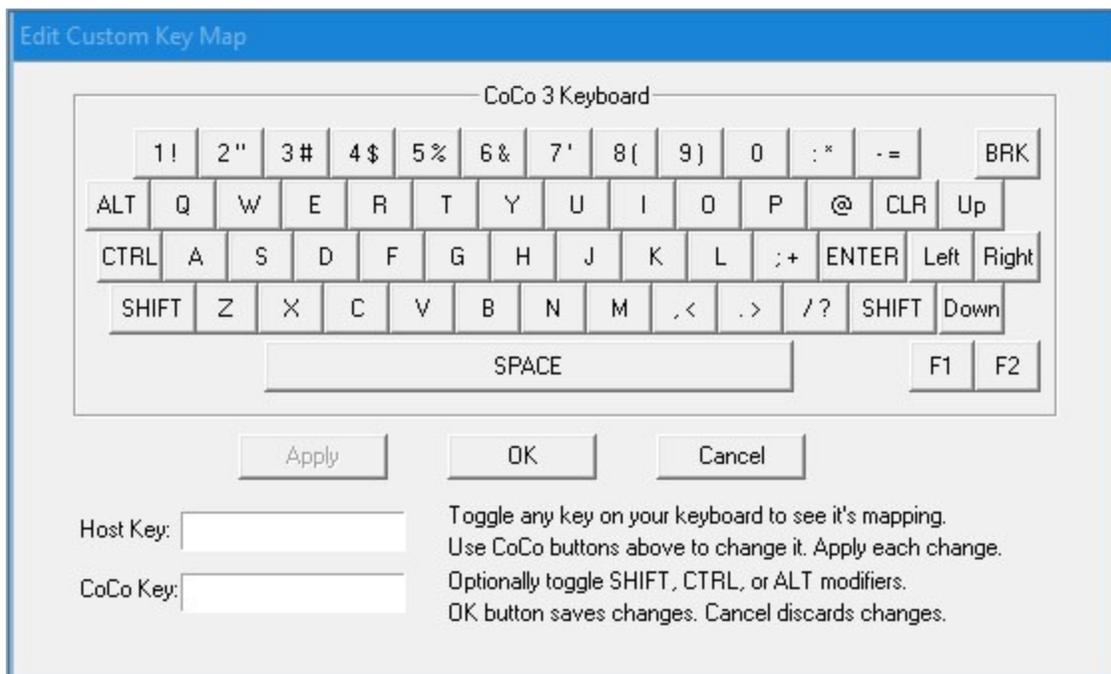
This above example maps PC '=' to 'Shift+' and PC 'Shift-' key to 'Control-' on the emulated CoCo.

Any CoCo key that is not mapped in the keymap file will be dead in Vcc. However shifted letter keys do not need to be mapped to make them uppercase because both DECB and OS-9 will handle this internally.

It is important to note that some PC keys can not be mapped. Specifically the F3-F11 keys can not be mapped, they are used for Vcc control. Keys selected for joystick input via the Joysticks config tab can not be mapped. Adding mappings for any of these keys in the keymap file will have no effect. Also the both Right Shift and Right Control keys are automatically mapped to match their left counterparts so they can not be independently mapped.

Whenever Vcc updates the keymap file all comments after the first valid map entry will be removed. This means user comments should be confined to the head of the file. Entry order may be changed by the Edit Custom Key Map dialog.

## Edit Custom Key Map screen



The Edit Custom Key Map screen is activated by clicking the "EDIT" button on the configuration menu Keyboard tab. The screen shows a virtual CoCo 3 keyboard, a Host Key text box, a CoCo Key text box, and three buttons:

- Apply - To apply an individual key modification.
- OK - To save the changes and exit the editor.
- Cancel - To undo changes and exit the editor.

Pressing a key on the PC keyboard causes it to be shown in the "Host Key" text box and if the key is mapped that will be shown in the "CoCo Key" text box and the key on the virtual keyboard to appear as pressed. Pressing a different PC key (other than a modifier) deselects the previous key and selects the new one. Modifier keys can be toggled either before or after non-modifier keys. This functionality allows easy toggling through various PC key combinations to see the CoCo mapping of each.

Mouse clicks (or touch on a touch screen) on the virtual keyboard are used to modify the PC key mapping. The Shift, Alt, and Control modifier keys can be combined with the PC or CoCo keys being pressed. Clicking a key button when no PC key is selected causes an warning popup to be issued.

Once a key mapping is changed the "Apply" button is enabled. Pressing either the "Apply" or the "OK" button sets the new mapping. "OK" exits the editor so "Apply" should be used if more than one key is to be mapped. All changes are automatically saved to the keymap file when "OK" is pressed and are discarded if "Cancel" is.

# VCC Default Keyboard Layouts

When the keyboard layout is set to “Coco (DECB)”, the PC keyboard is reconfigured to that of the Coco 3 as close as possible. The “Natural (OS-9)” mode is meant to be the full PC keyboard with a few slight modifications. The “Compact (OS-9)” mode is similar to the Natural mode, but configured for laptop computers with limited keys. The layout looks something like this:

## PC Keyboard:

```
[Esc] [F1][F2][F3][F4][F5][F6][F7][F8][F9][F10][F11][F12] [Prnt][Scr][Paus]

[~][!][2@][3#][4$][5%][6^][7&][8*][9(][0)][-_][=+][BkSp] [Inst][Hom][PgUp]
[Tab][Qq][Ww][Ee][Rr][Tt][Yy][Uu][Ii][Oo][Pp][[{}]][\N] [Dlet][End][PgDn]
[ Caps][Aa][Ss][Dd][Ff][Gg][Hh][Jj][Kk][Ll][;:]['"][Enter]
[ Shift ][Zz][Xx][Cc][Vv][Bb][Nn][Mm][,<][.>][/?][ Shift ] [UpA]
[Cntl][Win][LAlt][ Space ][ ][Win][Prp][Cntl] [LftA][DnA][RgtA]
```

## VCC Coco (DECB) Keyboard:

```
[ ][F1][F2][ ][ ][Rst][RGB][ ][Thr][Pwr][StB][FSc][ ][ ][ ][ ]

[~][!][2"]][3#][4$][5%][6&][7']][8(][9)]][0 ][:*][-=][BkSp] [ ][Clr][ ]
[ ][Qq][Ww][Ee][Rr][Tt][Yy][Uu][Ii][Oo][Pp][[{}]][\N] [ ][Brk][ ]
[ Caps][Aa][Ss][Dd][Ff][Gg][Hh][Jj][Kk][Ll][;:]['"][Enter]
[ Shift ][Zz][Xx][Cc][Vv][Bb][Nn][Mm][,<][.>][/?][ Shift ] [UpA]
[Cntl][ ][LAlt][ Space ][ ][ ][ ][ ][Cntl] [LftA][DnA][RgtA]
```

## VCC Natural (OS-9) Keyboard \*\*

```
[BRK][F1][F2][ ][ ][Rst][RGB][ ][Thr][Pwr][StB][FSc][ ][ ][ ][ ]

[~][!][2@][3#][4$][5%][6^][7&][8*][9(][0)][-_][=+][BkSp] [INST][Clr][PgUp]
[Tab][Qq][Ww][Ee][Rr][Tt][Yy][Uu][Ii][Oo][Pp][[{}]][\N] [DEL][EOL][PgDn]
[ Caps][Aa][Ss][Dd][Ff][Gg][Hh][Jj][Kk][Ll][;:]['"][Enter]
[ Shift ][Zz][Xx][Cc][Vv][Bb][Nn][Mm][,<][.>][/?][ Shift ] [UpA]
[Cntl][ ][LAlt][ Space ][ ][ ][ ][ ][Cntl] [LftA][DnA][RgtA]
```

## VCC Compact (OS-9) Keyboard

```
[ ][F1][F2][ ][ ][Rst][RGB][ ][Thr][Pwr][StB][FSc][ ][ ][ ][ ]

[BRK~][!][2@][3#][4$][5%][6^][7&][8*][9(][0)][-_][=+][BkSp][ ][ ][ ]
[ CLR][Qq][Ww][Ee][Rr][Tt][Yy][Uu][Ii][Oo][Pp][[{}]][\N] [ ][ ][ ]
[ Caps][Aa][Ss][Dd][Ff][Gg][Hh][Jj][Kk][Ll][;:]['"][Enter]
[ Shift ][Zz][Xx][Cc][Vv][Bb][Nn][Mm][,<][.>][/?][ Shift ] [UpA]
[Cntl][ ][LAlt][ Space ][ ][ ][ ][ ][Cntl] [LftA][DnA][RgtA]
```

\*\* Some changes have been made to the “Natural (OS-9)” keyboard layout to better facilitate it’s use in NitroS9 and some text editors. These changes are:

- <END> has been changed from <BRK> to <SHIFT><RIGHT ARROW> to facilitate the “End Of Line” sequence in NitroS9 and ShellPlus. Also, in the “Ed 3.1” text editor, this key will now produce a true <TAB>.
- <ESC> is now mapped as <BRK>
- <ESC> has also been mapped to <F12> for use with <CNTRL><BRK> used with some games/utilities.
- <INSERT> has been mapped to <CTRL><RIGHT ARROW>
- <DELETE> has been mapped to <CTRL><LEFT ARROW>
- <PAGE UP> has been mapped to <SHIFT><UP ARROW>
- <PAGE DOWN> has been mapped to <SHIFT><DOWN ARROW>

NOTE: The <LftAlt> key is mapped as the <Alt> key for the Coco 3 emulation. The <RghtAlt> key is mapped to Windows for use with opening the Menu Bar menus in VCC.

# Coco & PC key names used for KeyMaps

All CoCo key name and their default PC name mapping

<u>CoCo Key</u>	<u>(SHIFT/ALT)</u>	<u>PC Key</u>	<u>(SHIFT/ALT)</u>
COCO_A	0	DIK_A	0
COCO_B	0	DIK_B	0
COCO_C	0	DIK_C	0
COCO_D	0	DIK_D	0
COCO_E	0	DIK_E	0
COCO_F	0	DIK_F	0
COCO_G	0	DIK_G	0
COCO_H	0	DIK_H	0
COCO_I	0	DIK_I	0
COCO_J	0	DIK_J	0
COCO_K	0	DIK_K	0
COCO_L	0	DIK_L	0
COCO_M	0	DIK_M	0
COCO_N	0	DIK_N	0
COCO_O	0	DIK_O	0
COCO_P	0	DIK_P	0
COCO_Q	0	DIK_Q	0
COCO_R	0	DIK_R	0
COCO_S	0	DIK_S	0
COCO_T	0	DIK_T	0
COCO_U	0	DIK_U	0
COCO_V	0	DIK_V	0
COCO_W	0	DIK_W	0
COCO_X	0	DIK_X	0
COCO_Y	0	DIK_Y	0
COCO_Z	0	DIK_Z	0
COCO_0	0	DIK_0	0
COCO_1	0	DIK_1	0
COCO_2	0	DIK_2	0
COCO_3	0	DIK_3	0
COCO_4	0	DIK_4	0
COCO_5	0	DIK_5	0
COCO_6	0	DIK_6	0
COCO_7	0	DIK_7	0
COCO_8	0	DIK_8	0
COCO_9	0	DIK_9	0
COCO_1	1 !	DIK_1	1
COCO_AT	0 @	DIK_2	1
COCO_3	1 #	DIK_3	1
COCO_4	1 \$	DIK_4	1
COCO_5	1 %	DIK_5	1
COCO_7	2 ^	DIK_6	1
COCO_6	1 &	DIK_7	1
COCO_COLON	1 *	DIK_8	1
COCO_8	1 (	DIK_9	1
COCO_9	1 )	DIK_0	1
COCO_SEMICOLON	0 ;	DIK_SEMICOLON	0
COCO_COLON	0 :	DIK_SEMICOLON	1
COCO_7	1 '	DIK_APOSTROPHE	0
COCO_2	1 "	DIK_APOSTROPHE	1
COCO_COMMA	0 ,	DIK_COMMA	0
COCO_PERIOD	0 .	DIK_PERIOD	0
COCO_SLASH	1 ?	DIK_SLASH	1

COCO_SLASH	0 /	DIK_SLASH	0
COCO_SEMICOLON	1 +	DIK_EQUALS	1
COCO_MINUS	1 =	DIK_EQUALS	0
COCO_MINUS	0 -	DIK_MINUS	0
COCO_UP	0	DIK_UPARROW	0
COCO_DOWN	0	DIK_DOWNARROW	0
COCO_LEFT	0	DIK_LEFTARROW	0
COCO_RIGHT	0	DIK_RIGHTARROW	0
COCO_UP	0	DIK_NUMPAD8	0
COCO_DOWN	0	DIK_NUMPAD2	0
COCO_LEFT	0	DIK_NUMPAD4	0
COCO_RIGHT	0	DIK_NUMPAD6	0
COCO_SPACE	0	DIK_SPACE	0
COCO_ENTER	0	DIK_RETURN	0
COCO_CLEAR	0	DIK_NUMPAD0	0
COCO_BREAK	0	DIK_ESCAPE	0
COCO_BREAK	0	DIK_NUMPADPERIOD	0
COCO_F1	0	DIK_F1	0
COCO_F2	0	DIK_F2	0
COCO_LEFT	0	DIK_BACK	0
COCO_DOWN	1 [	DIK_LBRACKET	0
COCO_RIGHT	1 ]	DIK_RBRACKET	0
COCO_CLEAR	1 \	DIK_BACKSLASH	0
COCO_0	1 case	DIK_CAPSLOCK	0
COCO_SHIFT	0 SHIFT	DIK_LSHIFT	0
COCO_CTRL	0	DIK_LCONTROL	0
COCO_ALT	0	DIK_LMENU	0

## All Available DirectInput PC key names and scan codes:

DIK_ESCAPE	0x01	
DIK_1	0x02	
DIK_2	0x03	
DIK_3	0x04	
DIK_4	0x05	
DIK_5	0x06	
DIK_6	0x07	
DIK_7	0x08	
DIK_8	0x09	
DIK_9	0x0A	
DIK_0	0x0B	
DIK_MINUS	0x0C	/* - on main keyboard */
DIK_EQUALS	0x0D	
DIK_BACK	0x0E	/* backspace */
DIK_TAB	0x0F	
DIK_Q	0x10	
DIK_W	0x11	
DIK_E	0x12	
DIK_R	0x13	
DIK_T	0x14	
DIK_Y	0x15	
DIK_U	0x16	
DIK_I	0x17	
DIK_O	0x18	
DIK_P	0x19	
DIK_LBRACKET	0x1A	
DIK_RBRACKET	0x1B	
DIK_RETURN	0x1C	/* Enter on main keyboard */
DIK_LCONTROL	0x1D	
DIK_A	0x1E	
DIK_S	0x1F	
DIK_D	0x20	
DIK_F	0x21	
DIK_G	0x22	
DIK_H	0x23	
DIK_J	0x24	
DIK_K	0x25	
DIK_L	0x26	
DIK_SEMICOLON	0x27	
DIK_APOSTROPHE	0x28	
DIK_GRAVE	0x29	/* accent grave */
DIK_LSHIFT	0x2A	
DIK_BACKSLASH	0x2B	
DIK_Z	0x2C	
DIK_X	0x2D	
DIK_C	0x2E	
DIK_V	0x2F	
DIK_B	0x30	
DIK_N	0x31	
DIK_M	0x32	
DIK_COMMA	0x33	
DIK_PERIOD	0x34	/* . on main keyboard */
DIK_SLASH	0x35	/* / on main keyboard */
DIK_RSHIFT	0x36	
DIK_MULTIPLY	0x37	/* * on numeric keypad */
DIK_LMENU	0x38	/* left Alt */
DIK_SPACE	0x39	
DIK_CAPITAL	0x3A	

```

DIK_F1          0x3B
DIK_F2          0x3C
DIK_F3          0x3D
DIK_F4          0x3E
DIK_F5          0x3F
DIK_F6          0x40
DIK_F7          0x41
DIK_F8          0x42
DIK_F9          0x43
DIK_F10         0x44
DIK_NUMLOCK    0x45
DIK_SCROLL     0x46      /* Scroll Lock */
DIK_NUMPAD7    0x47
DIK_NUMPAD8    0x48
DIK_NUMPAD9    0x49
DIK_SUBTRACT   0x4A      /* - on numeric keypad */
DIK_NUMPAD4    0x4B
DIK_NUMPAD5    0x4C
DIK_NUMPAD6    0x4D
DIK_ADD        0x4E      /* + on numeric keypad */
DIK_NUMPAD1    0x4F
DIK_NUMPAD2    0x50
DIK_NUMPAD3    0x51
DIK_NUMPAD0    0x52
DIK_DECIMAL    0x53      /* . on numeric keypad */
DIK_OEM_102    0x56      /* <> or \| on 102-key (Non-U.S.) */
DIK_F11        0x57
DIK_F12        0x58
DIK_F13        0x64      /*                      (NEC PC98) */
DIK_F14        0x65      /*                      (NEC PC98) */
DIK_F15        0x66      /*                      (NEC PC98) */
DIK_KANA       0x70      /* (Japanese keyboard) */
DIK_ABNT_C1    0x73      /* /? on Brazilian keyboard */
DIK_CONVERT    0x79      /* (Japanese keyboard) */
DIK_NOCONVERT  0x7B      /* (Japanese keyboard) */
DIK_YEN        0x7D      /* (Japanese keyboard) */
DIK_ABNT_C2    0x7E      /* Numpad . on Brazilian keyboard */
DIK_NUMPADEQUALS 0x8D      /* = on numeric keypad (NEC PC98) */
DIK_PREVTRACK  0x90      /* Previous Track */
DIK_AT         0x91      /*                      (NEC PC98) */
DIK_COLON      0x92      /*                      (NEC PC98) */
DIK_UNDERLINE  0x93      /*                      (NEC PC98) */
DIK_KANJI      0x94      /* (Japanese keyboard) */
DIK_STOP       0x95      /*                      (NEC PC98) */
DIK_AX         0x96      /*                      (Japan AX) */
DIK_UNLABELED  0x97      /*                      (J3100) */
DIK_NEXTTRACK  0x99      /* Next Track */
DIK_NUMPADENTER 0x9C      /* Enter on numeric keypad */
DIK_RCONTROL   0x9D
DIK_MUTE       0xA0      /* Mute */
DIK_CALCULATOR 0xA1      /* Calculator */
DIK_PLAYPAUSE  0xA2      /* Play / Pause */
DIK_MEDIASTOP  0xA4      /* Media Stop */
DIK_VOLUMEDOWN 0xAE      /* Volume - */
DIK_VOLUMEUP   0xB0      /* Volume + */
DIK_WEBHOME    0xB2      /* Web home */
DIK_NUMPADCOMMA 0xB3      /* , on numeric keypad (NEC PC98) */
DIK_DIVIDE     0xB5      /* / on numeric keypad */
DIK_SYSRQ      0xB7
DIK_RMENU      0xB8      /* right Alt */

```

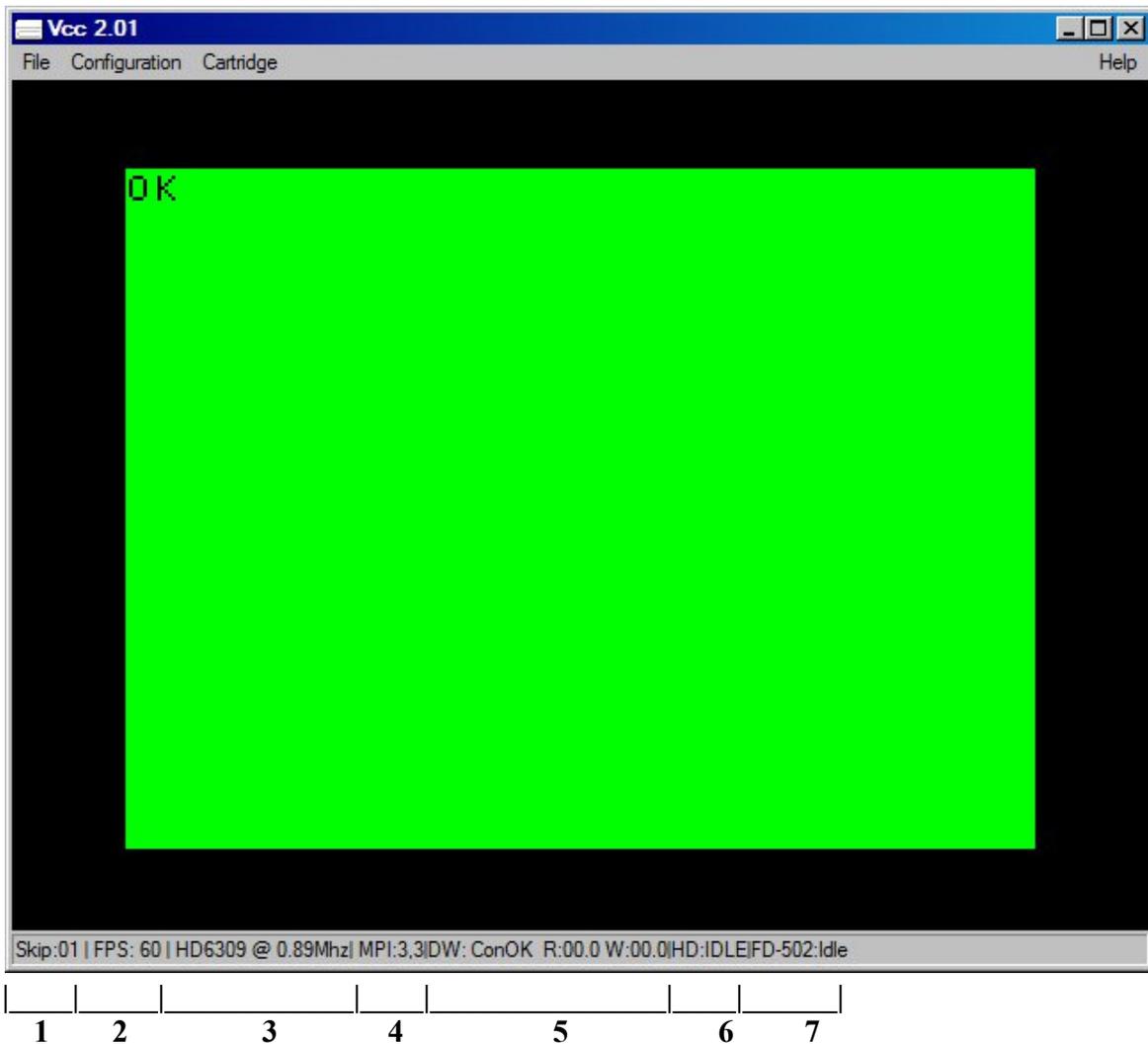
DIK_PAUSE	0xC5	/* Pause */
DIK_HOME	0xC7	/* Home on arrow keypad */
DIK_UP	0xC8	/* UpArrow on arrow keypad */
DIK_PRIOR	0xC9	/* PgUp on arrow keypad */
DIK_LEFT	0xCB	/* LeftArrow on arrow keypad */
DIK_RIGHT	0xCD	/* RightArrow on arrow keypad */
DIK_END	0xCF	/* End on arrow keypad */
DIK_DOWN	0xD0	/* DownArrow on arrow keypad */
DIK_NEXT	0xD1	/* PgDn on arrow keypad */
DIK_INSERT	0xD2	/* Insert on arrow keypad */
DIK_DELETE	0xD3	/* Delete on arrow keypad */
DIK_LWIN	0xDB	/* Left Windows key */
DIK_RWIN	0xDC	/* Right Windows key */
DIK_APPS	0xDD	/* AppMenu key */
DIK_POWER	0xDE	/* System Power */
DIK_SLEEP	0xDF	/* System Sleep */
DIK_WAKE	0xE3	/* System Wake */
DIK_WEBSEARCH	0xE5	/* Web Search */
DIK_WEBFAVORITES	0xE6	/* Web Favorites */
DIK_WEBREFRESH	0xE7	/* Web Refresh */
DIK_WEBSTOP	0xE8	/* Web Stop */
DIK_WEBFORWARD	0xE9	/* Web Forward */
DIK_WEBBACK	0xEA	/* Web Back */
DIK_MYCOMPUTER	0xEB	/* My Computer */
DIK_MAIL	0xEC	/* Mail */
DIK_MEDIASELECT	0xED	/* Media Select */

**Alternate names for keys, to facilitate transition from DOS.**

DIK_BACKSPACE	DIK_BACK	/* backspace */
DIK_NUMPADSTAR	DIK_MULTIPLY	/* * on numeric keypad */
DIK_LALT	DIK_LMENU	/* left Alt */
DIK_CAPSLOCK	DIK_CAPITAL	/* CapsLock */
DIK_NUMPADMINUS	DIK_SUBTRACT	/* - on numeric keypad */
DIK_NUMPADPLUS	DIK_ADD	/* + on numeric keypad */
DIK_NUMPADPERIOD	DIK_DECIMAL	/* . on numeric keypad */
DIK_NUMPADSLASH	DIK_DIVIDE	/* / on numeric keypad */
DIK_RALT	DIK_RMENU	/* right Alt */
DIK_UPARROW	DIK_UP	/* UpArrow on arrow keypad */
DIK_PGUP	DIK_PRIOR	/* PgUp on arrow keypad */
DIK_LEFTARROW	DIK_LEFT	/* LeftArrow on arrow keypad */
DIK_RIGHTARROW	DIK_RIGHT	/* RightArrow on arrow keypad */
DIK_DOWNARROW	DIK_DOWN	/* DownArrow on arrow keypad */
DIK_PGDN	DIK_NEXT	/* PgDn on arrow keypad */

# The Status Line

This is a view of the VCC screen showing the “status line”.



The status line contains useful information about the status of the emulation.

1. Current frame skip setting. It means draw every nth frame. So 1 is every frame , 2 is every other frame etc.
2. Average frames per second. Should always read 60. if it consistently reads lower try selecting a higher frame skip or turning on scan lines. See the configuration dialogs section.
3. CPU Type currently being emulated. MC6809 or HD6309 and clock speed. .89 and 1.79 MHz are stock. Over-clocking up to 89 MHz is supported.
4. Cartridge data field. Some pluggable carts will also display information on the status line. More on this later.
5. DriveWire4 info field. Displays “ConOK” if there is a DW4 connection. The “R” & “W” fields display data as DW4 is accessed (only displays when the “becker.dll” cart is inserted)
6. Hard Drive info is only displayed if the “harddisk.dll” cart is loaded
7. FD-502 info is only displayed if the “fd502.dll” is loaded

## *Configuring VCC*

This section will try to explain the options to configure VCC for normal use.

Setting up VCC should be as easy as double clicking the VCC setup file icon and following the onscreen prompts. I have tried to make the *default* as close to a “stock” Tandy Color Computer 3, just as you would have bought it in 1986.

### **VCC Defaults:**

Here are the default settings for VCC.

#### *Configuration/Config*

- Audio – Primary Sound Driver. This should default to whatever your PC is using.
- CPU/CPU – Motorola MC6809
- CPU/Memory – 128k (up to 8 meg).
- CPU/Overclocking – 1.788 MHz (stock Coco 3 speed). VCC will actually start at .89MHz with 1.788MHz available through software POKEs.
- Display/Monitor Type – RGB
- Display/Frame Skip – 1
- Display/Scan Lines – Unchecked
- Display/Allow Resize – Checked
- Display/Throttle Speed – Checked
- Keyboard/Keyboard Mapping – Coco (DECB), emulates the Coco 3 keyboard
- Joysticks/Left Joystick - Mouse
- Joysticks/Right Joystick - Mouse
- Misc/AutoStart Emulation – Checked
- Misc/AutoStart Cart – Checked
- BitBanger/Add LF to CR – Checked
- BitBanger/Print Monitor Window – Unchecked

#### *Cartridge*

- Cartridge – Empty

This about covers the VCC default settings. You can change most of these settings to suite your needs. The CPU overclocking is particularly handy when running an assembler or compiling “C” code in OS-9. Overclocking also speeds up screen scrolling in text editors as well, but I would not advise using overclocking while running games. It may speed up the emulator enough to make the game unplayable.

## Setting Up A “Custom” VCC to Suit Your Needs

Here I will try to explain some of the setup possibilities with VCC. The emulator can be configured many ways and emulate some of the more unique Color Computer 3 setups.

VCC will remember any settings you make and these settings become the “default” for running VCC in the future.

### Using the MultiPak Interface

Included with VCC is an emulation of the Tandy MultiPak Interface (MPI). To use the MPI, Click the “Cartridge” menu selection at the top of the emulator window. Select “Cartridge” (actually, the only choice initially). Select “Load Cart”. If the navigation panel does not start in your VCC installation folder, you must navigate to this folder, usually “C:\Program Files (x86)\VCC x.xxx” (or wherever you installed it, "x.xxx" being the version number). Select the “mpi.dll” and click “Open”. On some more *modern* versions of Windows (Vista, 7, 8 & 10), the “.dll” extension may be hidden from view. If this is the case, just select “mpi”.

Once you have loaded the MPI, you will notice now that the “Cartridge” menu has expanded. You will see 4 “Cartridge Slots” and an “MPI Config” selection. These “slots” are where you insert the custom “ROM carts” included with the VCC installation or most any of the “ROM carts” you can find and download from any of the Color Computer archive websites. To use a ROM cart, you must *select* the proper slot in the “MPI Config”. Just move the “Slot Select” slider to the slot in which you have inserted the cart.

VCC comes with several *custom* ROM carts:

- FD-502 Disk Controller (fd502.dll) - Standard Tandy FD-502 Disk controller with an DECB ROM installed.
- Hard Drive Controller (harddisk.dll) - An emulation of the a typical MFM HD controller.
- SuperIDE Hard Drive Controller (SuperIDE.dll)\* - An emulation of Cloud9’s “SuperIDE” HD w/CF cards.
- Becker Port Cart - A custom designed cart of the “Becker Port” for use with DriveWire4.
- Orchestra90cc (orch90.dll) - An emulation of the Tandy Orchestra90cc cart.
- RamDisk (ramdisk.dll)\* – An emulation of a 512k RAM card similar to those made by Disto.
- Game Master Cart (GMC.dll) – An emulation of John Linville’s “Game Master Cart”

“\*”=Not currently working or questionable results, but being worked on.

Several of these carts require an external ROM image to run (included). The ROMs should *autoload* when the modules are inserted into the MPI slot. These carts & ROMS are:

- fd502.dll - disk11.rom, rgbdos.rom, or one of the hdbdos ROMs (explained in the “Loadable Modules” section of this manual).
- orch90.dll – orch90.rom
- GMC.dll – cyd\_gmc.rom (optional, other GMC compatible ROMs may be loaded manually as well)

The “becker.dll”, “harddisk.dll”, and “SuperIDE.dll” are dependent on whatever ROM image is loaded by the “fd502.dll”. This is handled in the “FD502 Config” menu under the “Cartridge” menu.

The “hdbdos” and “rgbdos” ROM uses are best explained in the “HDBDOS User’s Manual” available on the Cloud9 website and the “RGB-DOS User’s Guide” found in “The Color Computer Archives”.

The ROMs included in this installation are specifically written for use with emulators.

## Loadable Modules

As stated before, the VCC emulator does not know anything about the various peripherals that were available. It depends entirely on runtime loadable DLL files or Modules.

Modules (DLL) or program packs (ROM) images are loaded via the Cartridge menu option. After a module is loaded it will, if needed, add its own options to the Cartridge Menu and status line. There are currently 7 modules included. They are:

“mpi.dll”, “orch90.dll”, “harddisk.dll”, “Superide.dll”, “fd502.dll”, “becker.dll”, “GMC.dll”, and “ramdisk.dll”.

These are installed in VCC's home directory "C:\Program Files\VCC x.xxx" ("x.xxx" being the version number) by default.

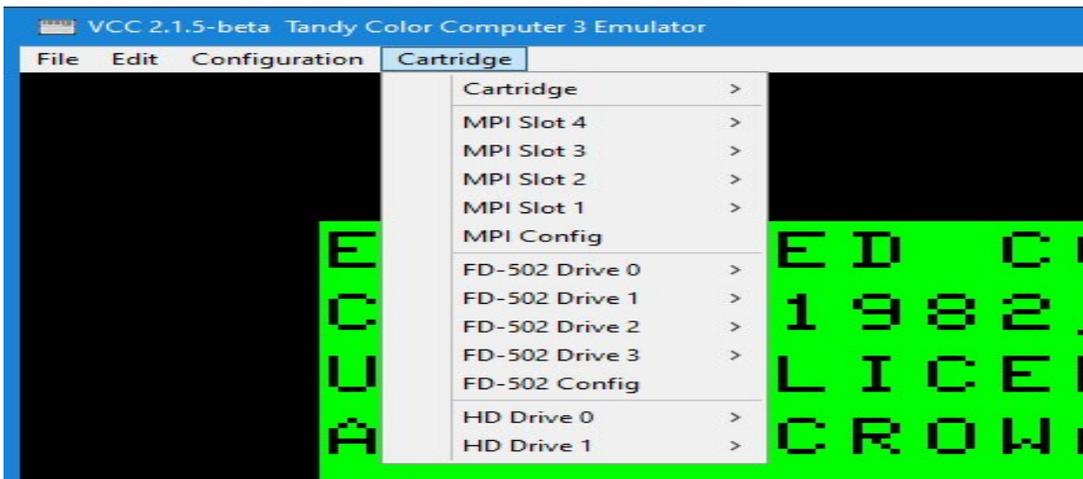
Any “ROMs” needed by these cart emulations are loaded externally and are included in the installation. The roms are stored in the same folder as the VCC executable and DLL files, usually “C:/Program Files/VCC x.xxx” (“x.xxx” being the version number)

### orch90.dll

This is the simplest module. It emulates the Orchestra-90 program pack. It has no menu options and returns no status. The sound from the Orchestra-90 pak will play in full stereo through your PC's speakers. To use the Orchestra-90 as the original, you must have the Orchestra-90 rom in the VCC installation folder along with the other roms. The “Autostart Cart” checkbox must be checked in the “Config/Misc” menu and if using the MPI, the MPI selector switch must be set to the same slot as the Orch90 pak. Hit “F5” to reset the emulator and start the cart.

### harddisk.dll

This is an implementation of the "emulator hard disk" that is supported in many Coco emulators. It adds a dual menu item used to Insert/Eject a virtual hard disk image (VHD) as HD 0 and HD 1. It uses an image of the RGB-DOS rom. This is a version of DOS that has been modified by Robert Gault for use with this type of emulation. It also contains an implementation of the Dallas DS1315 real time clock as used by Cloud-9. This can be used under OS9/Nitros9 with the appropriate driver. A 2<sup>nd</sup> hard drive has been added for more storage.



HD: [STATUS] will be added to the status bar and will change during the following events:

No Image!, Indicates that no VHD image has been selected.

Idle, VHD image is loaded but not being accessed.

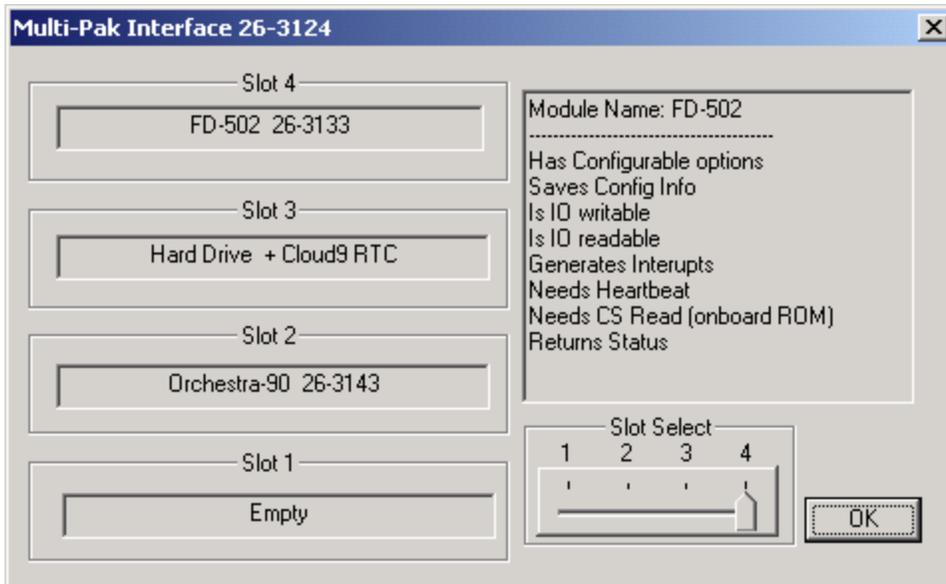
RD: ##### or WR: ##### a sector is being read or written.



## mpi.dll

The MPI module emulates the standard Tandy Multi-Pack interface. It adds 5 menu options. The first four allow Inserting/Ejecting carts from the Multi-pack. Any loaded modules will also add their own options to the menu. As with the main emulator, each slot will accept either a Module DLL or a Program ROM pack with the following exceptions. Don't try to insert the mpi.dll module into an MPI slot. Windows does not support recursive library loading. Also don't try to insert the same module into more than one slot. This is a limitation of the way the dynamic menu system currently works and will be fixed in a future version.

The MPI Config option is mostly informational. The Slot Select Slider picks the slot the MPI will use on startup. Displayed on the left are the names of all loaded modules. On the right is a list of API interfaces the currently selected module needs.



This module will add an MPI item to the status line. Following this are two numbers. The first is the slot the Chip select signal is routed to, The second is the destination of the Spare Select line. Following this is any status info returned from loaded modules. In the example above the MPI is set for slot 4 (internally slots are numbered 0 to 3) and the harddisk and fd502 modules are also loaded.

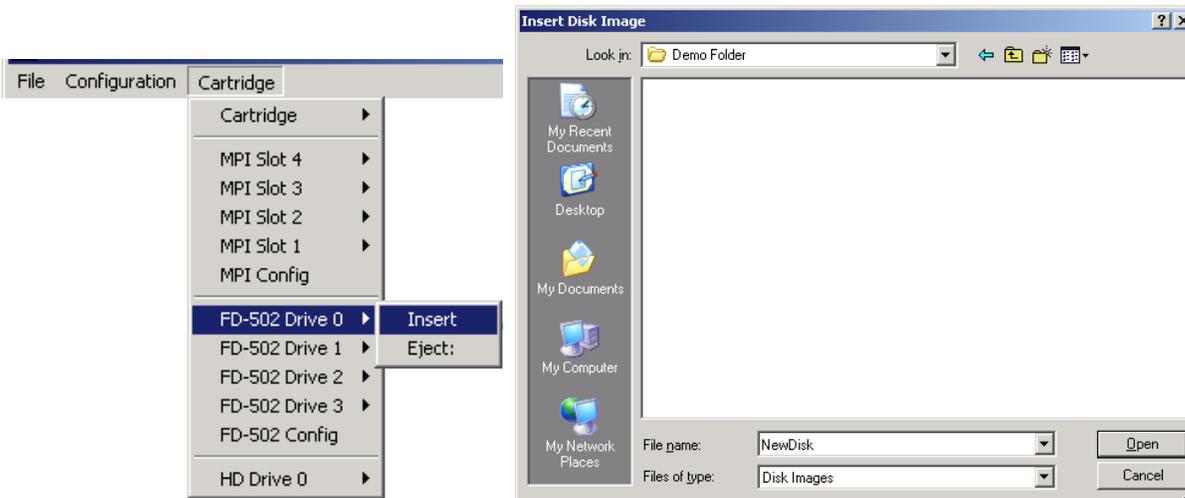
## fd502.dll

This module emulates the Tandy FD-502 Floppy disk controller with 4 Double Sided/ Double density disk drives attached. It adds 5 options to the Menu. The first 4 are simply to Insert / Eject Virtual disk images. Most image types are supported including DMK, OS9, JVC, DSK and VDK. To insert a virtual Disk simply select the drive you wish to put it in and select insert. Note: Only the first side of Drive 3 can be accessed.

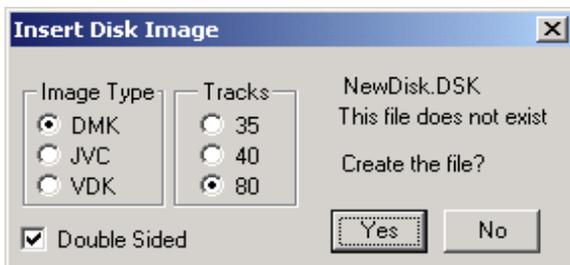
If you wish to have the disk "write protected" simply set the "read only" attribute from windows. This can be done by right-clicking the file, selecting Properties and checking the "read-only" box under Attributes. This will work for all image types. The DMK format uses a byte in the header to indicate "write protect". This will be respected if present but there is currently no way to change it from within this emulator.

### *Creating a New Blank Disk:*

Creating a new blank disk will be similar to inserting an existing image. Simple click Insert, and instead of picking an existing image type the name of the new disk image you wish to create (with the extension “.dsk”).



The following dialog will appear.



Just select the parameters for the new image and click yes. The image will be created, Zero filled and mounted in the drive you've selected. Note that unlike most other emulators the act of creating a new disk **will NOT format it**. Just as you would with a real disk you must either DSKINI (DOS) or format (OS9 et al) the image before it can be used.

For most disk use, you will want to use the JVC as it is the format most emulators use. The DMK and VDK formats are not fully implemented and in some cases, cause problems.

## Creating A New VHD Image

Creating a new VHD image is much like creating a new disk image above. In the "Insert" menu, type in a non-existent filename and the new dialog will appear.



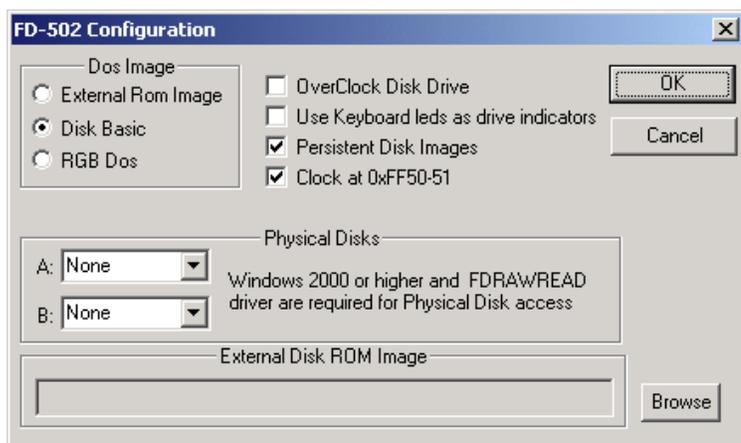
Input the size (in Kilobytes) that you want for your VHD.

The default size is 132,480k, which is the standard size for an HDBDOS/RGBDOS HD with 256 RSDOS disks and a (approximately) 92meg OS-9 HD, with HDBDOS/RGBDOS set at an offset of \$5A000 sectors. Refer to the HDBDOS manual for info in setting up this type of drive.

This size can be changed to any size you want, but remember to set your OS-9 HD driver to accommodate your VHD size.

You will have format this VHD before using it in RSDOS or NitrOS9

## The Configuration Dialog:



### Dos Image:

There are two built in DOS ROMS to choose from. Disk Basic is the standard DOS 1.1 that shipped with the FD-502 controller. RGB Dos is a version of DOS modified by Robert Gault to take advantage of the virtual hard disk emulation described elsewhere in the document. External Rom Image is just that. If you have a dump of a custom version of DOS (ADOS3 or HDB-DOS for example) simply click "Browse" and select it. then check the "External Rom Image" radio button. It is recommended that you keep this image in the same directory that VCC is installed to, but it's not required. To use the Becker Port cart and DW4, you will need to use this feature to mount the "hdbdw3bck.rom" image, and check "External Rom Image".

**OverClock Disk Drive** Sounds more sophisticated than it is. By default I attempt to emulate the time it would take a real disk to move the read/write head. Clicking this will reduce that time to almost nothing. If you are using the CPU over-clocking option and experience I/O errors try turning this on.

### **Persistent Disk Images:**

When checked any Disk images mounted when the emulator is shut down will be remounted when it's started back up. Unchecking this will cause the emulator to start with empty Floppy disk drives. This is also true with any hard drive controller modules and VHD files.

**Clock at 0xFF50-51:** Selected whether the Disto RTC will be enabled or not.

### **Physical Disks:**

**This is also experimental code. Please only use backup disks as I can't guarantee everything works 100% yet. Currently only "standard format" 18 sector per track disks are supported. I'm hoping get "protected" disk formats working In a later version.**

To use this option 3 requirements must be met. The drop downs will be grayed otherwise.

- 1) The host computer must be running Windows 2000,XP or Vista. Note I have only tested this on XP so far.
- 2) The host computer must have a supported Floppy disk controller chip, ( $\mu$ PD765a or equiv.). A USB floppy drive will NOT do.
- 3) The FDRAWCMD driver must be loaded. These drivers were written by Simon Owen and can be downloaded from his website here: <http://simonowen.com/fdrawcmd/> (I don't think the website exists anymore)

Download and run the fdinstall.exe file.

There are two drop downs. One for each Physical disk drive you may have. Simply select the Virtual disk drive from the dropdown next to the Physical disk Letter. For Example: To Map Virtual disk 1 to real Drive A:, Select "Drive 1" from the dropdown next to A:.

To un-map a disk either select None from the dropdown or select Eject \*Floppy ?? from the menu, where \*Floppy?? Is either A or B.

## **DISCLAIMER**

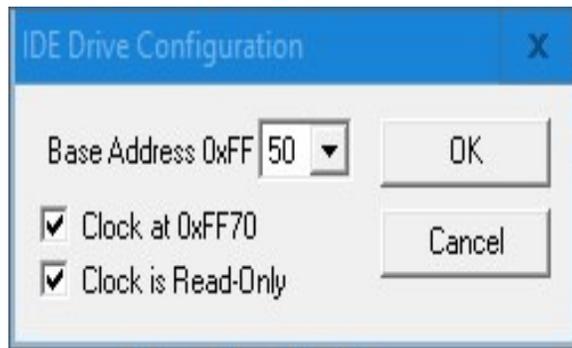
**\* We have no association with either the Glenside computer club or Cloud-9.**

**They do not endorse or support this program in any way. If you experience any issues with this software please DO NOT bother either of these entities. J.F.**

## SuperIDE.dll:

**NOTE: At the moment, this cart does not seem to function properly. The issue is being investigated. The SuperIDE worked before conversion to VS2015, so it's most likely a syntax problem in the VCC code and should be fixed soon.**

This is simulation of the Glenside IDE and Cloud9's SuperIDE controller with the Dallas DS1315 RTC. It provides no more functionality than RGB-DOS and the hard disk module that are included with VCC. Its primary purpose is to allow owners of the Glenside IDE or Cloud-9 Super-IDE Controller to mount and run a backup of their CF card under VCC without any driver modifications. As such it is compatible the both HDB-DOS and the Super-Driver currently in the Toolshed and NitROS9 repositories. It adds three menu items used to Insert/Eject backup images (.IMG files) created by my sideutil program and to set the base address of the virtual controller. Also note that currently the sideutil program only allows dumping of removable CF cards, Hard disks are not currently supported for safety reasons.



**Base Address:** This must be set to match the address of the real hardware the CF card image was taken from.  
FF40 Do not use this address with the FD-502 module loaded as it uses part of this range as does the becker.dll.  
FF50 Default base address. If selected verify the RTC in the FD-502 module is disabled as it uses part of this range.

FF60

FF70 Also used by the Modules RTC, Selecting this base will disable the internal RTC.

### **Clock at 0xFF70:**

Enables the DS1315 RTC at this address. It will be unavailable if the IDE base address is set to 0xFF70.

### **Clock is Read-Only:**

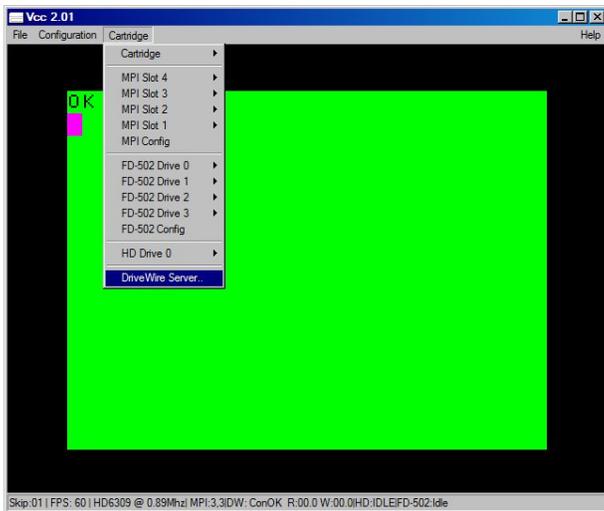
If this option is not selected changing the time in the emulator will affect the time of the host computer.

## becker.dll

The “Becker Port” cart emulation has been added to allow the user to utilize the features of the DriveWire4 file server on your PC. DriveWire4 can be used for multiple dsk/vhd access, TelNet, modem emulation (through telnet), internet FTP access, DriveWire MIDI through the PC host’s soundcard, virtual printing, and much, much more!

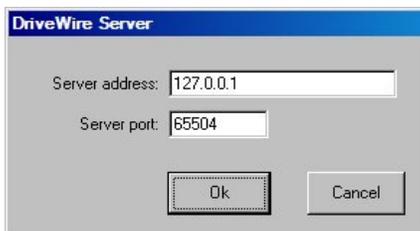
DriveWire4 (DW4) has opened the doors to the outside world to the Coco and now it’s available for VCC. To use DW4 with VCC, you must insert the “becker.dll” into one of the MPI slots, but DO NOT SELECT THE SLOT. You will need to use the “External ROM” feature of the FD-502 controller to load the becker version of HDBDOS.

The becker.dll cart will add another menu option to the “Cartridge” menu:



This menu option allows the setting for the Becker port to be changed to fit the user’s needs. In most cases, the default settings are what is needed and it should not have to be changed.

The default settings are:



These settings should be sufficient for most DriveWire4 uses. In the DriveWire4 server “Simple Config Wizard” utility, you will use the “Emulator or other TCP/IP” selection and use the default settings from there.

To use DW4 from BASIC, you must have the “Cartridge/FD502 Config/External Rom” selected and the browse to your HDBDOS rom in the “Browse” box. This rom is also used when “auto booting” NitrOS9 from an HDBDOS virtual floppy drive using Robert Gault’s RGBDOS menu system. If you are using “multi-partitioned” VHD images with NitrOS9 and HDBDOS images on one VHD, then you will have to use an “offset” in HDBDOS to reflect the size of the NitrOS9 partition to get to the HDBDOS partition. An explanation to this offset can be found on Robert Gault’s website @ <http://aaronwolfe.com/robert.gault/Coco/Downloads/Downloads.htm>.

Scroll to the bottom of the page for RGBDOS. Almost all that applies to RGBDOS will also apply to HDBDOS (in most cases).

## ramdisk.dll

**NOTE: At the moment, this cart does not seem to function properly. The issue is being investigated. The ramdisk worked before conversion to VS2015, so it's most likely a syntax problem in the VCC code and should be fixed soon.**

This cart image emulates a 512k. RAM cart. It's very simple to use and can give you 512k of extra data storage. To use the RamDisk cart, you use a 24 bit addressing mode (3 bytes) and read/write single bytes of data to/from the cart.

To set the address in the cart of the data byte you want to read or write, just poke your 24 bit address variable like this:

The address range of the cart is \$000000 - \$80000 or 0 – 524,288

To read/write to/from address \$6F4972 you would poke:

```
POKE &HFF40,&H72      = lswlsb of address
POKE &HFF41,&H49      = lswmsb of addresses
POKE &HFF42,&H6F      = mswlsb of address
```

To read the above address once set:

```
AA=PEEK(&HFF43)
```

To write &H55 to the above address: (overwrites any existing data at that address)

```
POKE &HFF43,&H55
```

A NitroS9 driver for this cart would be a very simple project.

## GMC.dll

**NOTE: The GMC.dll ROM cart is experimental and has not been fully tested. We welcome anyone with compatible ROMS or software that uses this ROM cart to test this feature and let us know if it is working correctly.**

**Any information for this ROM cart must be obtained from elsewhere as we could find very little pertaining to it's use.**

Please refer to John Linville (or others) for information on using this cart. There seems to be no documentation and/or very little information concerning it's use.

All we can say is "It seems to work with the supplied sample ROM image"

We have provided a sample ROM image, "cyd\_gmc.rom" in VCC's installation directory. Load the GMC.dll into the cartridge slot and in the cartridge menu, click "Select GMC ROM". Navigate to the VCC installation directory and select "cyd\_gmc.rom". Once selected, press F9 twice and the demo will play music.

All that is currently know about the GMC is that it is an emulation of the "TI SN76489 Digital Complex Sound Generator" chip using the Coco port \$FF41. The single port is "write only". No data can be read from this port. All programming for the GMC sound is done through this port.

I did try to gather a little info on the GMC and have included the sparse documentation from the "CoCopedia" WIKI site. You will find this document in your Start Menu under the VCC group as "Game Master Cart Info"

## System ROMs:

This installation of “VCC” comes with the following ROM images installed in the VCC installation folder along with the emulator and it’s supporting software:

“**coco3.rom**” - A combined copy of the original Tandy “Color BASIC”, “Extended Color BASIC”, and “Super Extended Color BASIC” ROMs installed in the Color Computer 3. This ROM was compiled from the “ToolShed” repository sources and not “ripped” from a real Color Computer 3.

“**disk11.rom**” - A copy of the “Disk Extended Color BASIC” ROM (v1.1) supplied with the Tandy “FD-502” disk controller. This ROM was compiled from the “ToolShed” repository sources and not “ripped” from a real FD-502 disk controller.

“**rgbdos.rom**” - A copy of the RGBDOS ROM by Robert Gault and downloaded from his website. This ROM has “offsets” for dual partitioned VHD images with NitrOS9 and RSDOS partitions. The offsets are set at “\$5A000” for *standard* VHD images that use a 90 megabyte OS-9 partition and and RSDOS partition with 256 virtual drives. To change this ROM for use with *single partition* VHD images, (in RSDOS) use:

POKE&HD938,0:POKE&HD939,0:POKE&HD93A,0

Or in a Windows hex editor, you can change the values permanently by changing the ROM image values directly at locations \$1938, \$1939, and \$193A, all to \$00.

“**hdbdw3bc3.rom**” - Standard “Becker Port” HDBDOS ROM. Compiled from the HDBDOS sources at the ToolShed repository. Not to be used with *dual partitioned* VHD images.

“**hdbdw3bc3 w-offset 5A000.rom**” - Standard “Becker Port” HDBDOS ROM. Compiled from the HDBDOS sources at the ToolShed repository, but modified for using dual partitioned VHD images for OS-9 and RSDOS. The offsets are set at “\$5A000” for *standard* VHD images that use a 90 megabyte OS-9 partition and and RSDOS partition with 256 virtual drives.

“**hdbdw3bck.rom**” - “Becker Port” HDBDOS ROM without the *speedup* (2 MHz) poke installed. This ROM allows time critical Games and Apps that do not run well (or run too fast) with the speedup poke. Compiled from the HDBDOS sources at the ToolShed repository. Not to be used with *dual partitioned* VHD images.

“**hdbdw3bck w-offset 5A000.rom**” - “Becker Port” HDBDOS ROM without the *speedup* (2 MHz) poke installed. This ROM allows time critical Games and Apps that do not run well (or run too fast) with the speedup poke. Compiled from the HDBDOS sources at the ToolShed repository, but modified for using dual partitioned VHD images for OS-9 and RSDOS. The offsets are set at “\$5A000” for *standard* VHD images that use a 90 megabyte OS-9 partition and and RSDOS partition with 256 virtual drives.

The RGBDOS and HDBDOS ROMs offsets can be changed to match any size VHD images with any size partitions using the methods used above for the RGBDOS ROM. The same ROM addresses apply to HDBDOS. To calculate the proper offset for your VHD partition, I suggest using Robert Gault’s “SPECS.BAS” program found on “RGBDOS Tools Disk image” found on his website (listed above). This program will calculate the size of your OS-9 partition (which must come first) and give you the proper offset to the RSDOS partition. The SPECS.BAS program can be found on the “Tools.dsk” in the RGBDOS zip available for download on his site.

### NOTE:

The ROM images are provided for your convenience and to assure the proper ROMs for VCC are present. The VCC Development Team is not responsible for the ROM contents as they are each developed by 3<sup>rd</sup> party developers, though verified to be accurate to the original ROMs of the same name. These ROM images are the same as used by most Color Computer 3 emulations.

## The VCC Command Line Options:

VCC *does* allow a couple of command line options. One has been available since at least VCC 1.42, and the other is a new addition in a recent release.

*NOTE: Command line options must be used in a Windows “Command Prompt”. You must CD to the location of the VCC installation directory or use the complete file path to “VCC.exe” before using any command line options.*

**File Load** – The “File Loading” function has been here all along but was never mentioned in previous manuals. In fact, I didn’t even know this function worked until someone pointed it out to me recently. First, the filenames must be in UTF(8) format and they must also reside in the VCC program folder (hopefully, this will change in the future). Only ROM, CCC, Pak, and BIN files may be loaded (also to be changed). To use the file load function you must use the command line as follows:

```
vcc.exe filename.bin  
vcc.exe filename.rom  
vcc.exe filename.bas  
vcc.exe filename
```

Alternatively, if you double click on any of these file types in Windows File Explorer (if already associated with another program, you may need to right click, select “Open With”, then associate this extension to VCC.exe), then associate these extensions with VCC, they will open VCC and run, from any directory.

**Custom VCC.ini Load** – You can now load a “custom” vcc.ini file from the command line in a Windows Command Prompt. You must first have created such a file from manually editing a vcc.ini file and saving it under a different name (w/the ini extension), or having “Saved” the custom ini file from the “File/Save Config” feature (below). Or load a custom ini from the cmd line:

```
VCC.exe -i IniFileName.ini
```

VCC now has a new feature to allow you to load a custom configuration from the cmd line by typing:

```
VCC.exe -i xxxxx.ini (xxxxx being the custom configuration name)
```

You can also set your Windows shortcut to VCC to load the custom config file on startup. To do so you just:

Right click on the VCC shortcut

In the “General” tab in the “Target” list, type (include quotes)

```
“C:\Program Files (x86)\VCCxxx\VCC.exe” -i “%appdata%\VCC\Custom.ini”
```

Now when you click your VCC shortcut, you will start with your custom config.

# Loading and Saving Custom VCC.ini Files

Alternately, you can Load/Save custom ini files now from the “File” menu while VCC is running. To save a custom ini file, just click “File/Save Config”, type in a new custom.ini name, and click Save.

To load a custom ini file (you must have created one first), Click “File/Load Config” , click the custom.ini file you want to load, then click Load. For your new configuration to boot, you’ll need to hit F9 twice.

NOTE: Before creating a “custom” version of VCC, I suggest you “Save” the current configuration under the new custom name first. This is because VCC writes many of the changes to an ini file as you go, so any changes you make will be saved under the current name. VCC starts under the “vcc.ini” file, so I suggest leaving that file “plain”, saving under a custom name, then make your changes. Most changes will be save to the “new” file, but don’t forget to “Save Config” when you’re done just to make sure. When you exit VCC, the current name is used to save the final state of your configuration.

## The VCC.ini File Format

The “vcc.ini” and any custom “ini” file you may save, will be stored in you “user/appdata/roaming/vcc” folder. The ini files are kept in a strict format and users must use caution if editing these files manually or you may ruin your VCC configuration and have to redo it from inside VCC.

The format is as follows:

### [Version]

Release=VCC x.x (x=version #)

### [CPU]

DoubleSpeedClock=x (x=speed value 0-255)

FrameSkip=x (x=1-6)

Throttle=x (x=0-1, 0=off, 1=on)

CpuType=x (x=0-1, 0=MC6809, 1=HD6309)

MaxOverClock=x (1-256)

### [Audio]

SndCard=SndCardName

Rate=x (x=0-3, 0=none, 1=11,025khz, 2=22,050khz, 3=44,100khz)

### [Video]

MonitorType=x (x=0-1, 0=RGB, 1=CMP)

Scanlines=x (x=0-1, 0=off, 1=on)

AllowResize=x (x=0-1, 0=off, 1=on)

ForceAspect=x (x=0-1, 0=off, 1=on)

PaletteType=0

RememberSize=1

WindowSizeX=1280

WindowSizeY=990

### [Memory]

RamSize=x (0=128k, 1=512k, 2=2048k, 3=8192k)

ExternalBasicImage=FilePath\FileName (not normally used)

### [Misc]

AutoStart=1

CartAutoStart=1

KeyMapIndex=3  
CustomKeyMapFile=C:\Users\BPier\AppData\Roaming\VCC\OS9.keymap  
ShowMousePointer=0

### [Module]

OnBoot=FilePath\ROM\CCC\DLL\PAKFilename

### [LeftJoyStick]

UseMouse=x (x=0-1, 0=off, 1=on)  
Left=x (x=keycode)  
Right=x (x=keycode)  
Up=x (x=keycode)  
Down=x (x=keycode)  
Fire1=x (x=keycode)  
Fire2=x (x=keycode)  
DiDevice=x (x=DeviceName)  
HiRezDevis=x (0-2, 0=none, 1=RS HiRez, 2=CocoMax)

### [RightJoyStick]

UseMouse=x (x=0-1, 0=off, 1=on)  
Left=x (x=keycode)  
Right=x (x=keycode)  
Up=x (x=keycode)  
Down=x (x=keycode)  
Fire1=x (x=keycode)  
Fire2=x (x=keycode)  
DiDevice=x (x=DeviceName)  
HiRezDevis=x (0-2, 0=none, 1=RS HiRez, 2=CocoMax)

### [MPI]

SWPosition=x (x=0-3 slot number)  
SLOT1=PakFilePath\PakFileName  
SLOT2=PakFilePath\PakFileName  
SLOT3=PakFilePath\PakFileName  
SLOT4=PakFilePath\PakFileName

### [Hard Drive]

VHDImage=VHDFilePath\VHDFileName  
VHDImage1=VHDFilePath\VHDFileName

### [FD-502]

DiskRom=x (x=0-2, 0=ExternalRom, 1=RSDOSRom, 2=RGBDOSRom)  
RomPath=DiskRomPath  
Persist=x (x=0-1, 0=off, 1=on)  
Disk#0=DiskFileName1  
Disk#1=DiskFileName2  
Disk#2=DiskFileName3  
Disk#3=DiskFileName4  
ClkEnable=x (x=0-1, 0=off, 1=on)  
TurboDisk=x (x=0-1, 0=off, 1=on)

### [DefaultPaths]

FloppyPath=FloppyPathName  
HardDiskPath=HardDiskPathName  
MPIPath=MPIPathName  
CassPath=CassPathName  
PakPath=PakPathName  
SuperIDEPATH=HardDrive Pathname

[HDBDOS/DW/Becker]

DWServerAddr=x.x.x.x (x=Server IP addresss i.e. 127.0.0.1)  
DWServerPort=x (x=server port # i.e 65504)

[Glenside-IDE /w Clock]

Master=IDEMasterImageName  
Slave=IDESlaveImageName  
BaseAddr=x (x=0-3, 0=40, 1=50, 2=60, 3=70)  
ClkEnable=x (x=0-1, 0=off, 1=on)  
ClkRdOnly= (x=0-1, 0=off, 1=on)

[GMC-SN74689]

ROM=ROM Image Path/Name

## Known Bugs

VCC definitely has a few bugs, but some are a little more “evasive” than others.

1. Composite & RGB colors are *not* exactly correct. This is being worked on.
2. The CPU is not exactly “cycle accurate”. It’s just a hair slightly faster than a real CoCo 3 and there are a couple of things that this causes problems in. For example “Popstar Pilot” has a screen flicker and a couple of SockMaster’s demos will not work correctly. These programs count cycles in the render process and VCC is slightly off in timing. As soon as we find the timing issue, this will be fixed.
3. When VCC is not the window in focus, <ALT><TABBING> back to VCC seems to cause VCC’s keyboard to freeze. We have fixed other <ALT><KEY> issues, but this one is still being worked on.
4. When using VCC & DriveWire4, sometimes when doing a cold start (F9 twice), VCC & DW4 will lose sync, and VCC will have to be restarted. This is mostly DW4 related and I don’t think VCC is the culprit.
5. There’s a problem in the disk drive emulation in which IRQs are not being handled correctly. It doesn’t bother “normal” use, but if you play around with the drive commands directly via ML, it will show it’s nasty head.

I know there are more, but frankly my head is tired and I want to get this release out. If you know of any bugs, please report them to the “Issues” page on the VCC GitHub site where you downloaded this installation package.

## Bugs Fixed

- Fixed bug which cause certain RSDOS word processors (EliteWord, VIP Writer, etc.) to skip every other line of text. - James Rye
- Fixed the ALT key problem – EJ Jaquay
- Fixed the border color bug – James Rye
- Improved Composite Palettes (not fixed, WIP). - James Rye.
- Fixed “file paths” so that each type of file; vhd, dsk, cas, rom, dll, etc. has it’s own pathlist” - James Rye.
- Fixed VCC “ini” file to save in “user/home/appdata” to avoid permissions problem in Win7-10. - James Rye
- Fixed “Force Aspect” to actually work in all modes but full screen mode. - James Ross
- Improved PMODE artifact color scheme, - Peter Westburg
- Added “\*.ccc” to the program pak extensions. – Bill Pierce.
- Completed 6309 opcodes that were missing or incorrect – Walter Zambotti.
-

## Credits:

First and foremost, I would like to thank Joseph Forgeone, the original author of the VCC Color Computer 3 emulator. Without all his hard work, this wonderful emulator would have never come about.

I would like to thank Robert Gault for his contribution of the “RGBDOS” implementation and all the testing and suggestions during Joseph’s development of VCC. Robert has contributed more to the Coco Community than anyone could know.

I would like to thank Aaron Wolfe and David Ladd for the addition of the “Becker Port” for using VCC with DriveWire4. This has allowed VCC to communicate to the outside world and has opened many doors that were closed before.

I would like to thank Gary Colbourn for his work in converting Joseph’s Visual Studio 6 C++ code to compile in Visual Studio 2015 Community Edition.

I would like to thank Wes Gale for his bug hunting and squashing during the initial release of VCC to open source.

I would like to thank Walter Zambotti for his contribution in fixing the HD6309 CPU to function properly and adding in the missing instructions. Also for allowing us to use his “2nd Hard Drive” code.

I would like to thank David Johnson for an extensive proofreading of the VCC manual and pointing out MANY typos for me.

I would especially like to thank James Ross, James Rye, Peter Westburg (R.I.P.), EJ, Jaquay, and Trey Tomes for their endless work on the enhancements and bug fixes of the last couple of releases. Without them, I would not be making this release.

Last but not least, I would like to thank everyone in the Coco Community as the help and support of the Coco Community is what has kept the interest in the Color Computer going strong and made VCC possible in the first place!

Let’s make VCC the BEST Color Computer 3 emulator ever! (In my opinion, it already IS!)

Bill Pierce

# Addendum 1

## Using “wimgtool-os9.exe” & “wimgtool-rsdos.exe”

The “wimgtool-os9.exe” & “wimgtool-rsdos.exe” virtual disk utilities were derived from the old M.E.S.S. utility “wimgtool.exe”. Each of these utilities have been modified to serve a specific purpose to work with OS-9 formatted disks and RSDOS formatted disks respectively. I wish I could give credit to the individual who modified these utilities, but quite frankly, I cannot remember who it was.

Both utilities have the same usage with only minor differences, and those differences will be explained here. These utilities differ from their parent utility in that they do not work with virtual disks for non-coco systems, even though you can create and format a new disk for that system, the image functions are geared specifically for OS-9 and RSDOS. The utilities were created to fix a few bugs for these formats that existed in the original utility.

- **Wimgtool-os9.exe** – Move OS-9 files to and from your PC and an OS-9 formatted disk image
  - **File <ALT><F>**– File related functions
    - **New <CNTRL><N>** – Create a *new* formatted OS-9 disk image. Navigate to the desired directory in which you want your disk created.
      - **Filename** - Type in the disk name without the extension.
      - **Save as type** – Select the desired system type from the pull down menu. To create an OS-9 formatted disk for Mame, select “CoCo OS-9 disk image (OS-9 format)(\*os9)” with the extension “os9” (required by Mame) or “CoCo JVC disk image (OS-9 format) (\*.dsk)” used by most other emulators (including VCC).
      - **More** – Expands the disk type menu to allow you to select more advanced options for your new disk image. Clicking “Less” collapses this advanced menu.
        - **Heads** – Number of disk sides (Usually 1 or 2 for OS-9)
        - **Tracks** – Number of tracks on the disk image (Usually 35, 40, or 80 for OS-9)
        - **Sectors** – Number of sectors per track (Usually 18 for OS-9)
        - **Sector Bytes** – Number of bytes per sector (Usually 256 for OS-9)
        - **Interleave** – Not used for these disk types
        - **First Sector** – Select “0” or “1” for the starting sector # (usually 1)
      - **Save** – Saves the new disk image to your PC
      - **Cancel** – Cancels the new disk creation
    - **Open <CNTRL><O>** - Open an existing OS-9 formatted disk image. Navigate to the desired directory containing the disk image you want to load, select the image and click “Open”.
    - **Close <CNTRL><W>** - Close the current open disk image, saving the new image over the original disk image. Clicking the “X” to close the program will produce the same results and the modified disk image will be saved.
  - **Image <ALT><I>** - File to disk and disk to file functions
    - **Insert File <CNTRL><I>** - Inserts an OS-9 file (or any ASCII text file) onto the OS-9 formatted disk image. Use the “Open” dialog to navigate to the desired file and click “Open” to insert the file or “Cancel” to cancel the operation.
    - **Extract <CNTRL><E>** - Extracts a selected file or files to the PC hard drive. Use the “Save As” dialog to navigate to the desired location you want to save the file, then select the desired format from the “Save as type” (OS-9 file will have only one option available) pull down menu and click “Save” to save the file or “Cancel” to cancel the operation.
    - **New Directory <CNTRL><Y>** - Creates a new OS-9 directory on the current disk image. Each new directory can be clicked and opened to create multiple sub-directory levels.
    - **Delete <DEL>** - Deletes the selected file(s) from the OS-9 formatted disk image. CAUTION: This operation cannot be undone.



- **Basic** – Use for CB, ECB, DECB, and SECB standard Basic files.
  - **Data** – Used by certain text editors and database programs
  - **Binary** – For raw binary data formatted files
  - **Assembler Source** – Used by EDTASM and various other RSDOS assemblers.
- **ASCII Flag** – Flags the file as ASCII or binary
  - **ASCII** – Flags the file as ASCII text
  - **Binary** – Flags the file as raw binary database
- **OK** – Completes the file transfer and returns to the disk image display. Click “**Cancel**” to cancel the file transfer and return to the disk image display
- **Extract <CTRL><E>** - Extracts a selected file or files to the PC hard drive. Use the “Save As” dialog to navigate to the desired location you want to save the file, then select the desired format from the “Save as type” (RSDOS will have only one option available) pull down menu and click “**Save**” to save the file or “**Cancel**” to cancel the operation.
  - **Mode** – Select the mode in which the file is transferred
    - **ASCII** – Save the file in ASCII text mode.
    - **Raw** – Saves the file in raw binary mode.
- **New Directory <CTRL><Y>** - Not available for RSDOS disk images.
- **Delete <DEL>** - Deletes the selected file(s) from the- RSDOS formatted disk image. CAUTION: This operation cannot be undone.
- **View Sector Data <CTRL><V>** - Opens the “Sector Viewer” utility. From this utility, you can view the raw data contained on your disk image, sector by sector.
  - **Track** – Sets the track number from which you are viewing.
  - **Side** – Selects the disk “side” in which you are viewing.
  - **Sector** – Selects the actual sector shown in the viewer.
  - **OK** – Exits the viewer
- **View <ALT><V>** - Sets the interface viewing style and file associations.
  - **Icons** – Sets the viewing style to “Icons”, for a more “Windows” file list view.
  - **List** – Sets the viewing style to a simple filename list with less information.
  - **Details** – (Default) Sets the viewing style to a more detailed list showing the “Filename”, “Size”, “Attributes”, and “Notes”.
  - **File Associations** – Select the disk file extensions you want associated with the utility, then when this type of file is double clicked in Windows, it will open with this utility.
- **Status Bar** – The Status Bar at the bottom of the window shows the file(s) selected, the name of the current disk image and the remaining free bytes on the disk image.