The
Cuttle Cart 2

The Atari 7800
Customizable Menu Cartridge

from

Chad Schell
of
Schell's Electronics

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High Score Cart Warning:

Do not use the Cuttle Cart 2 with the Atari 7800 High Score Cart. Always plug the Cuttle Cart 2 DIRECTLY into the 7800.

A High Score Cart is built into your Cuttle Cart 2, and plugging the Cuttle Cart 2 into another High Score Cart may damage the Cuttle Cart 2, the High Score Cart, or both.

Quick Start Guide:

In order to use your Cuttle Cart 2 (CC2), you will first have to set up the Multimedia Card (MMC) that will hold the games and other necessary files. To make this process relatively simple, a step-by-step guide is given below and programs are available that will get things up and running quickly. However, to take full advantage of the CC2 and all its features, you should read this manual.

Quick Start Steps:

1) Purchase a **32 MB** Multimedia Card. 32 MB MMCs are the most compatible right out of the retail package. If you choose to use another size, you will likely have to reformat it to FAT16. (See **Setting up the Multimedia Card**).
2) Unzip the "CC2 Base Files.zip" file onto the Multimedia Card. Make sure that you tell your unzip program to use folder or directory information. This should create four directories on your MMC: GAMES, BANKING, STARTUP, and MANUALS. It will also place appropriate files in the BANKING and STARTUP directories.
3) Create a new folder or directory on your computer and copy all your Atari 2600 and Atari 7800 ROMs into that directory. Make sure you copy the files, not move them as they are going to get moved and renamed in step 5.
4) Unzip the CC2MenuGenerator program into the same directory you just created.
5) Run CC2MenuGenerator. This will create a subdirectory called GAMES in the folder created above, and copy all the ROMs it recognizes into the directory while renaming them for CC2 use. It will also create two files in the directory in which you ran CC2MenuGenerator, MENU.TXT and MENU.CC2.
6) Copy MENU.TXT and MENU.CC2 to the root directory of the MMC.
7) Copy all the files in the GAMES folder created in step 5 into the GAMES folder on your MMC. (Make sure to copy just the files, not the directory itself; you do not want to create a GAMES folder inside the GAMES folder created in step 2.)
8) Read the Using the CC2 instructions and enjoy.

You will likely find that you still have ROMs in the directory in which you ran the CC2MenuGenerator. These are games not recognized by the menu generator's database. There are a lot of these available; many are bad ROMs, duplicates, or PAL games. You will have to read the full manual to get these installed and working on your CC2.

If these quick start steps do not work, you will have to follow the instructions in the **Setting up the Multimedia Card** section of this manual.

Using the Cuttle Cart 2

This section describes how to use the CC2 in its menu mode. For information on using the CC2 in development mode, see the section **CC2 Development Mode**. This section assumes that you already have a properly formatted MMC with all the appropriate files.

Figure 1: Cuttle Cart 2 with MMC Inserted

The Basic Steps

1) Setup your Atari 7800 just as you would to play standard 2600 or 7800 carts.
2) Insert the MMC into the Cuttle Cart 2. (Insert the MMC such that its label and the CC2 label are both in the same orientation, as shown in Figure 1.)
3) Insert the Cuttle Cart 2 into the Atari 7800.
4) Turn on the Atari 7800.

After a brief boot period the CC2 will be initialized and ready to run. It starts out in the **Main Menu Mode** (unless you select otherwise, see the section on User Settings in the **Utilities Mode**).

Cuttle Cart 2 Modes

The CC2 is operated from a series of modes, each of which lets you perform different actions. All of the modes on the CC2 can be operated using a joystick in either port, or using the buttons on the 7800 console. This allows you to operate the CC2 even if you are going to play a game that uses alternative controllers such as paddles or driving controllers (see note below concerning driving controllers).

The joystick FIRE buttons and the 7800 RESET button are used to perform actions or exit screens. The 7800 PAUSE and SELECT buttons and the joystick directions are used to scroll the screen or move a pointer. In scrolling situations if you hold the button down continuously, the CC2 will begin to automatically scroll until you release the button.

Specific details of what each button does in each mode are listed in that mode's description, but it is all really quite easy. If you forget the details of how the buttons work in each mode, a little experimentation should make it obvious how things work.

For brevity in the mode descriptions, LEFT, RIGHT, UP, and DOWN refer to pressing that direction on either joystick. FIRE refers to either joystick fire button, and RESET, PAUSE, and SELECT refer to the corresponding 7800 console buttons.

A note on driving controllers: Driving controllers interfere with the ability to operate the CC2, even from the console buttons. This is because a driving controller can provide input to the Atari 7800 that looks like you are pressing two different directions at once. If you have a driving controller plugged in when you start the CC2, it may begin to scroll automatically in one direction, or it may refuse to acknowledge any buttons. To overcome this, spin the driving controller a few times. The CC2 should detect that the driving controller is connected and lock out the joystick ports. You can then control the CC2 using the 7800 console buttons. To reactivate the joystick ports after disconnecting the driving controllers, turn the Atari 7800 off and back on.

Main Menu Mode

From the **Main Menu Mode** one can go to the **Game Select Mode** or the **Utilities Mode**, or one can load and start the currently selected game or view the currently selected game's manual.

Actions are selected by moving the pointer along the top of the menu to the desired choice and pressing either FIRE or RESET. The pointer appears as two hyphens "-" (see Figure 2), one on each side of the current selection. To move the pointer to the left, press PAUSE or LEFT. To move it right press SELECT or RIGHT.

Figure 2: Main Menu Mode

Game Select Mode

Pressing FIRE or RESET while the pointer is on the -Select- entry in **Main Menu Mode** takes you to the **Game Select Mode**. In this mode, you can scroll through the menu of games to select the game you wish to play or the game whose manual you wish

Figure 3: Game Select Mode

to view. As a visual aid to determine when you are in the **Game Select Mode**, the menu entries will appear bright when you are in the **Game Select Mode** (actively scrolling the menu), and dim when you are in the **Main Menu Mode**. (Note that this behavior can be changed by selecting equal colors for both settings in the **Select Colors Mode**, described later.)

When in the **Game Select Mode**, move the bar that appears in the menu to select the game. The game whose name is highlighted by the bar is the selected game. Press UP or PAUSE to scroll the bar up one line. Press DOWN or SELECT to scroll the bar down one line. If the bar is already at the top or bottom of the menu, the menu itself will scroll one line in the appropriate direction. Press LEFT or RIGHT to scroll the menu one full page at a time backwards or forwards respectively. The selection bar itself will not move when you press LEFT or RIGHT.

To confirm your game selection, press FIRE or RESET once. This will return you to the **Main Menu Mode** with the -Play- option selected. To play the selected game press FIRE or RESET a second time.

Play Game Mode

Pressing a FIRE or RESET while the pointer is on the -Play- entry in the **Main Menu Mode** loads and starts the selected game. As a shortcut for quickly starting games from the menu, the pointer will always be set to -Play- after leaving the **Game Select Mode**. This means that pressing FIRE or RESET twice from the **Game Select Mode** will load and play the selected game.

View Manual Mode

Pressing FIRE or RESET while the pointer is on the -Manual- entry in the **Main Menu Mode** will load and display the currently selected game's manual. In this mode, pressing DOWN or SELECT will scroll the manual down one line. Pressing UP or PAUSE will scroll the manual up one line. Pressing LEFT or RIGHT will scroll the manual backwards or forwards one full page respectively.

To exit the **View Manual Mode** press FIRE or RESET. This will return you to the **Main Menu Mode**.

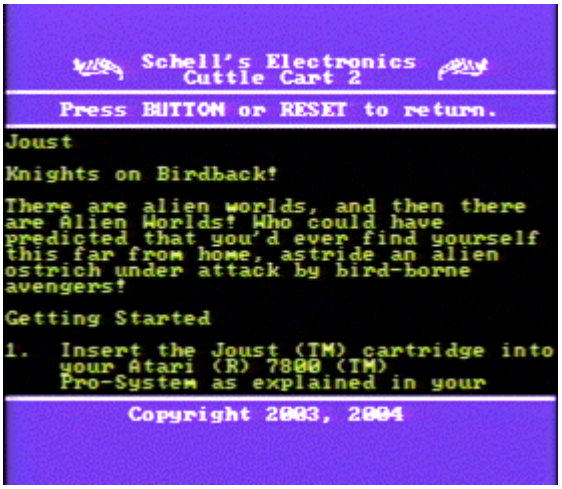

Figure 4: View Manual Mode

A Note About Manuals: For proper display on the CC2, manuals need to be formatted a specific way. They should be ASCII text files that are 40 columns wide and have every line, including the final line, terminated by either a line feed, or a carriage return/linefeed combination. If manuals are used that are not formatted this way, the CC2 will autowrap the text lines. However, this will create a poorly formatted display and will cause some artifacts in the scrolling of the screen where scrolling down and then back up the same number of lines may not return you to the same position in the file and the screen formatting will be slightly different. However the text will remain readable.

Utilities Mode

Figure 5: Utilities Mode

Pressing FIRE or RESET while the pointer is on the -Utilities- entry in the **Main Menu Mode** enters the **Utilities Mode**. From this mode you can update the CC2's operating system, modify user settings, and gain access to the **Select Colors Mode and CC2 Development Mode**.

In the **Utilities Mode** you select an item by moving the menu bar around the screen to highlight the desired item. Press UP or PAUSE to move the bar up one line. Press DOWN or SELECT to move the bar down one line. The bar will wrap from top to bottom or bottom to top if you scroll past either end. To toggle a user setting or perform an action, press FIRE or RESET while the setting or action is highlighted.

The configurable user settings are as follows.

Remember Last Menu Position - Set this to Yes to have the CC2 remember the menu page and bar location of the last game played or manual viewed the next time you start the CC2. The CC2 will restore the menu display to this location when you turn it on if the setting is Yes. If the setting is No, the CC2 will always display the menu starting from the first entry in the MENU.CC2 file.

Note that if you update the MENU.CC2 file, the menu will be displayed from the start of the new menu file the first time you start the CC2 after updating the MENU.CC2 file.

Start in Select Mode - Set this to Yes to have the CC2 boot directly into **Game Select Mode**. If set to No, the CC2 will boot into **Main Menu Mode**.

Screen Saver - If the screen saver is On the CC2 will blank the screen after about 5 minutes of inactivity (no button or joystick presses.) To restore the screen after it blanks press any button or move a joystick. Note that the CC2 screen saver only works while

the CC2 operating system is running. It has no effect once a game has been loaded. It also will not blank the screen if an error message is currently being displayed.

To disable this feature turn the Screen Saver setting to Off.

Boot to Dev Mode - If this is set to Yes, the next time the CC2 is started it will come up in **CC2 Development Mode** rather than **Main Menu Mode**.

The available Actions are as follows.

Select Colors - Selecting this action takes you to the **Select Colors Mode**, where you can adjust the colors of the CC2 display. See the **Select Colors Mode** section for more details.

Update Boot ROM - Select this action to update the operating system stored inside the CC2. Updates to add new features or fix problems may become available on the Schell's Electronics website at http://www.schells.com. These updates will come as files named BOOTROM.CC2. To update the OS, copy the latest version of BOOTROM.CC2 into the root directory of your MMC. Then select the Update Boot ROM Action.

Selecting the Update Boot ROM Action will bring up a warning screen about flashing your boot ROM. Hold down both PAUSE and SELECT to confirm that you wish to proceed with the update. You can release PAUSE and SELECT once the flashing process has started, which is indicated by the Erasing/Programming Flash messages and the Sectors Remaining countdown.

If a problem occurs while updating your Boot ROM, such as a power failure, you can still recover the use of your CC2 by use of the Emergency Boot ROM feature. For more details see the **Booting with the Emergency Boot ROM** section.

Update Emergency Boot ROM - Select this action to update the emergency boot recovery system stored inside the CC2. Updates to this system may become available on the Schell's Electronics website at http://www.schells.com. These updates will come as files named EMGBOOT.CC2. To update the system, copy the latest version of EMGBOOT.CC2 into the root directory of your MMC. Then select the Update Emergency Boot ROM Action.

Selecting the Update Emergency Boot ROM Action will bring up a warning screen about flashing your emergency boot ROM. Hold down both PAUSE and SELECT to confirm that you wish to proceed with the update. You can release PAUSE and SELECT once the flashing process has started, which is indicated by the Erasing/Programming Flash messages and the Sectors Remaining countdown.

If a problem occurs while updating your Emergency Boot ROM, such as a power failure, simply restart the CC2 and attempt the update again. If it fails for another reason, check

to make sure that you have the latest EMGBOOT.BIN file on the MMC and try the update again.

Select Colors Mode

Figure 6: Select Colors Mode

The **Select Colors Mode** allows you to adjust the color settings used by the CC2 to suit your personal tastes. Active colors are those colors used when in the **Game Select Mode**, the **View Manual Mode**, and the **Utilities Mode**, while deselected colors are those used in the **Main Menu Mode**. To change a color, move the highlight bar over the color you wish to change, and adjust the value up or down. The counter counts up or down in hexadecimal rotating through all the possible colors and intensities. When the highlight bar is on an active color setting, the active colors will be displayed, and when it is on a deselected color setting, the deselected colors will be displayed.

To move the highlight bar up one line press UP or PAUSE. To move it down one line press DOWN or SELECT. To increase the selected value by one press RESET, FIRE, or RIGHT. To decrease the value by one press LEFT. Because the color value can only be decremented using the joystick, it is suggested that you plug a joystick into the console when you wish to adjust the colors.

When you are satisfied with the colors you have selected, move the highlight bar to "Save Changes and Return" and press FIRE or RESET. This will return you to the **Utilities Mode** and store your color settings in the CC2's non-volatile RAM. If you do not like the changes you have made, you can choose "Discard Changes and Return" to restore the colors to their settings before you entered the **Select Colors Mode** and return to the **Utilities Mode**. Selecting "Load Defaults" will load the original CC2 colors, but will not save them. To save them you must select "Save Changes and Return" after you have loaded the default values.

Setting up the Multimedia Card

The Cuttle Cart 2 requires a properly formatted MMC in order to operate. The MMC must support operation at 3.3V, and it must be formatted with the FAT16 file system. Most MMCs on the market today meet these voltage specifications, but not all of them come formatted with the FAT16 file system.

Formatting to FAT16

32MB MMCs will almost certainly use the FAT16 file system, as will most 64MB cards. Cards smaller than 32MB will very likely use FAT12, while those larger may use FAT32. If you use one of these cards you will likely have to reformat the MMC to use FAT16.

This can be done under windows using the command line version of the format command. Using the format command available through the graphical interface will not work. Specifically the following commands will do the job:

Card Size:	Command:
8MB	format x: /fs:FAT /a:512
16MB	format x: /fs:FAT /a:1024
32MB or larger	format x: /fs:FAT

where x: is replaced with the drive letter of your MMC. Please be VERY careful that you enter the drive letter of your MMC correctly. Formatting a disk erases all data on the disk. If you supply the drive letter of a drive other than the MMC you will erase that disk. If you were to specify your main drive, you could delete everything on your computer, including the operating system itself! If you are not comfortable with the command line and disk formatting commands, it might be helpful to enlist the aid of a friend who is. **SCHELL'S ELECTRONICS IS NOT RESPONSIBLE FOR ANY DAMAGE, LOSS OF DATA, OR OTHER CONSEQUENCES RESULTING FROM YOUR ATTEMPTS TO REFORMAT YOUR MMC.**

MMC File and Directory Structure

The CC2 requires a certain file and directory structure on the MMC. Note that the CC2 does NOT support long filenames, so all files must follow the older FAT 8.3 naming convention. (For those not familiar with this naming convention, it requires that all filenames consist of a name that is between 1 and 8 characters long, followed by a period ("."), and then followed by an "extension", which is 1 to 3 characters long.

Example filenames:

FILENAME.TXT

GAME.BIN
MENU.CC2

It is also advised that files be named in all CAPITAL letters as this saves space on the MMC and decreases the load time of the CC2.

Four sub-directories (or folders) must be created under the root (top level) directory of the MMC. They are "GAMES", "BANKING", "MANUALS", and "STARTUP". Each of these directories will hold specific types of files with specific extensions, as follows:

BANKING: Holds bankswitching configuration files.
All files have the extension ".BNK"

GAMES: Holds game ROMs.
All files have the extension ".BIN"

MANUALS: Holds game manuals.
All files have the extension ".TXT"

STARTUP: Holds game start files and hardware ROMs.
All files have either the extension ".STR" or ".ROM"

In addition to these directories, the CC2 also requires a menu file in the root directory. This file is named "MENU.CC2", and follows a specific format described later. Two additional files that may exist in the root directory are BOOTROM.CC2, and EMGBOOT.CC2. These files are used to update the code that is stored inside the CC2 itself.

Although this may seem confusing at first, this complexity is part of what gives the CC2 its flexibility. Updates and new bankswitching schemes can be made available by distributing new files. The fact that each directory stores files with a different extension makes it easy to determine where any new file should be placed.

The MENU.CC2 File

The MENU.CC2 file is what tells the CC2 what games are stored on the MMC, and how to run each game. It also provides the On-Screen Menu that the CC2 will display, thus allowing you to place the games in any order and describe them however you wish (up to 40 characters).

It is ok for games to appear more than once in the menu file (for example, if you wanted to list all the games in alphabetical order and also list your favorite games at the start of menu.)

To create the MENU.CC2 file, you actually create a tab separated text file called MENU.TXT (or any other filename of your choosing), and then process that file with the CC2MenuConverter program to convert it to the MENU.CC2 file. The MENU.TXT file consists of a list of the game entries in the order you want them to appear in the menu. Each game entry consists of four columns, with a tab separating each column.

The first column contains the name of game as you wish it to appear in the menu. This entry can be up to 40 characters in length, and the characters can be any valid ASCII character. The CC2's On-Screen menu will display this text exactly as you enter it. To end this column entry and start the next column, enter a tab. (Press the [tab] key once.)

The remaining column entries are all limited to a maximum of 8 characters, and must contain only valid FAT filename characters. These are limited to the letters A-Z, numbers 0-9, and the underscore "_" character. Entries in these columns will be converted to all upper case. To end one column and start the next, enter a tab.

The second column contains the name of the game's ROM image. This name must match the filename of the ".BIN" file stored in the "GAMES" directory on the MMC. Note that only the part of the name before the ".BIN" is entered. Thus for a game whose ROM file is named "EXAMPLE.BIN", the entry would be "EXAMPLE".

This column is also used as the name of the game's instruction manual file. Thus the game's instruction manual text file must be named the same as the ROM file, but will end in the extension ".TXT". Thus the instruction file for the game "EXAMPLE.BIN" will be named "EXAMPLE.TXT". These ".TXT" files should be stored in the "MANUALS" directory on the MMC. If you do not have a manual file for the game, the game will still play correctly on the CC2, but if you attempt to view the manual on the CC2 you will receive an error message stating that the instruction manual file could not be found.

The third column contains the name of the bankswitching configuration file used by the game. This name must match the filename of a ".BNK" file stored in the "BANKING" directory on the MMC. Note that only the part of the name before the ".BNK" is entered. Thus for a game whose bankswitching configuration file is named "EXAMPLE.BNK", the entry would be "EXAMPLE". See the master list of games on www.schells.com to determine what bankswitching format each game uses. (There is no ready way to determine which bankswitching scheme a game requires without using the list, using trial and error, or knowing something about the game from some other source.)

The fourth column contains the name of the startup code file used by the game. This name must match the filename of the ".STR" file stored in the "STARTUP" directory on the MMC. Note that only the part of the name before the ".STR" is entered. Thus for a game whose startup code file is named "EXAMPLE.STR", the entry would be "EXAMPLE". See the master list of games on www.schells.com to determine what startup code file each game uses. (If you have to guess for a game not in the Master List, use “78BIOS”.)

After filling in all columns, press the [Enter] or [Return] key to start a new line and then enter the next entry.

An example of a few lines in the MENU.TXT file are shown below:

My First Game	MYGAME1	2K	78BIOS
Example Game 2	EXAMPLE2	F8	78BIOS
Really Long Menu Name	REALLONG	F6	F6BANK0

Note that the columns in the MENU.TXT file do NOT have to lie on the same tab stops, the only requirement is that there is at least one tab between columns. It is acceptable to have more tabs in order to make columns line up though, and that generally makes it easier to read and edit the file later.

Once you have created the "MENU.TXT" file, you convert it to the MENU.CC2 file using the supplied CC2MenuConvertor utility. Then copy the MENU.CC2 to the root directory of your MMC. (Under Windows drag the file to the MMC Disk Drive in the "My Computer" Window.)

The Menu Generator

If creating the MENU.TXT file and renaming all your ROMs to match the entries you type into MENU.TXT sounds painful to you, you are right, it is. That is why the CC2MenuGenerator program mentioned in the Quick Start section exists. What this program does is to scan all the files in a directory for ROMs it recognizes. When it finds one it recognizes, it moves it to a GAMES subdirectory and renames it into an appropriate 8.3 FAT Filename for use with the CC2. After scanning all the files, it generates a MENU.TXT and MENU.CC2 file to go with the ROMs it found. Instant ready-to-go MENU and GAMES directory ready to be copied onto your MMC.

But if you have games not in the Menu Generators database, sadly you have no option but to manually edit the MENU.TXT file and rename the file yourself. You will probably also have to do some trial and error to figure out what bankswitching configuration file the game requires. A lot of games are already in the database, and the intention is to update the database as new games come out, or as more people present verifiable unique and working ROMs not in the database.

But the Menu Generator is not that smart of a program. It always recreates MENU.TXT and MENU.CC2 from scratch. So if you want to add just one ROM, you have to copy all your ROMs to some directory and run it on all of them again, or just run it on the one ROM and then manually update the MENU.TXT file by cutting and pasting the line from the newly generated MENU.TXT file into your existing MENU.TXT file already on your MMC. Then simply rerun the CC2MenuConvertor to generate a new MENU.CC2 file.

Why does it work this way? Because chances are people will edit their MENU.TXT files to make the CC2 Menu appear the way they want it – the CC2 is a customizable menu cart after all. Alphabetical order not your preference? You want it listed by manufacturer instead? No problem, just arrange the MENU.TXT entries how you want it, retype the first column (the menu entry column) to display what you like and then generate a new MENU.CC2. Since you have a custom menu, you will probably want to add new games to match your style. Thus you copy them into your existing MENU.TXT file rather than creating a whole new one. (Of course, if you are not picky, you can always just create a new one.)

Another option to add a single new game is to consult the Master List of games for the information you need to run a game, rather than using the menu generator again for each new ROM. Sure the generator is great for that initial batch of games, but after that it is not really necessary.

Have you noticed that no mention has been made of editing the MENU.CC2 file directly? The reason for this is that it is not in a very friendly format for humans to edit, and if you make a mistake it will cause the CC2 to be unable to load your games. Always edit the MENU.TXT file and then convert it to a MENU.CC2 file when finished. You can keep the MENU.TXT file in the root directory of the MMC right with the MENU.CC2 file so it is always easy to find. (In fact, keep whatever files you want on the MMC. The CC2 does not care what files you store on the MMC as long as the ones it requires are present.)

CC2 Development Mode

Development mode is just a fancy name for the mode that allows games to be loaded into the CC2 by means of the RS232 serial cable rather than through the MMC interface. This makes it easy to try out new code while developing new games. No need to keep swapping the MMC in and out of the CC2 and the computer. To load games via the serial port, use the included 2.5 mm Stereo Jack to DB-9 converter cable to connect the CC2 to an RS-232 compatible serial port.

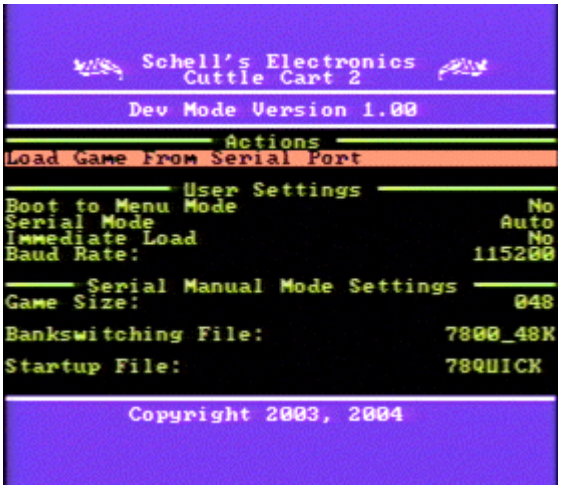

Figure 7: Dev Mode

Note that the MMC must still be inserted into the CC2 as the bankswitching and startup code must be loaded through the MMC interface. (This is a technical limitation of the CC2, relating to the fact that the serial link is implemented in the same device as the bankswitching schemes, and it cannot be active while the bankswitching configuration is being loaded.)

When booting into development mode, the user is typically presented with a menu of options, explained below. However, this is not the case if Immediate Load is set to on. See the description of the Immediate Load option below for more details.

Development mode works very similarly to the **Utilities Mode**, in that you move a menu bar to select the desired setting or action. Again the bar is scrolled up one line by pressing UP or PAUSE, and down one line by pressing DOWN or SELECT. Pressing FIRE or RESET will perform the selected action, or change the currently selected user setting. However, when you select one of the Serial Manual Mode Settings by pressing either FIRE or RESET, rather than directly changing that setting, you enter a submode that lets you edit that setting. The details of these submodes are described along with each setting below. To exit the submode and return to scrolling through the menu, press FIRE or RESET again.

The available Actions are as follows.

Load Game From Serial Port - This tells the CC2 to prepare to load a game over the serial port. This will take the CC2 to its serial loading screen. Once the screen appears, load the game over the serial port. Note that the screen saver will not work during the serial loading screen, and that once in the serial loading screen the menu can only be restored by occurrence of a serial error or by cycling power on the Atari. (Another limitation caused by the fact that the CC2 ROM chip requires a proper clock signal to output data, and the 7800 does not supply a proper clock signal when doing DMA graphics transfers. This coupled with the variable clock speed created by accessing the TIA chip to read the buttons caused lots of artifacts to appear on the screen. To eliminate these artifacts it was decided to just not sample the buttons in this state.)

The selectable User Settings are as follows.

Boot to Menu Mode - If this is set to Yes, the next time power is cycled on the Atari 7800 the CC2 will boot to the **Main Menu Mode**, where games can be loaded off the MMC interface.

Serial Mode - There are two available CC2 serial modes, Auto and Manual.

Manual Mode is a very simple mode to allow extremely easy interfacing to any computer. In this mode all the information about the game is controlled by the "Serial Manual Mode Settings" at the bottom of the dev mode screen. The settings are the size of the download in kilobytes, and the 8 character names of the bankswitching and startup files to use, both entered without their extensions (just like in the CC2 MENU.TXT files). How to alter these settings is explained further down in this manual.

Once the proper settings for the game have been entered, select "Load Game From Serial Port", and then have the computer send the game to the CC2 using a straight no parity, 8 data bit, 1 stop bit (N81) serial protocol. There is no handshaking, and no error detection or correction other than framing and timeout errors.

The advantage of this mode is that it is very easy to implement on most computers. Many operating systems can even accomplish this by means of a copy or cat type command. (Note that some operating systems, such as DOS, require CTS handshaking, which the CC2 does not provide. If this is the case, you must use a terminal program that does not require the handshaking.)

Auto Mode still uses the N81 serial protocol, but embeds information about the game being loaded into the download, and implements a 16-bit CRC error detection protocol. In Auto mode there is no need to set the "Serial Manual Mode Settings" at the bottom of the screen as they have no effect. Just select "Load Game From Serial Port" and load the game from the computer after the computer has properly formatted the game for the download. For details on the Auto Mode protocol, see

Appendix III - Serial Auto Mode Protocol.

Immediate Load - This setting determines whether the CC2 boots into the Dev Mode menu, or immediately into the Serial Loading Screen. If set to No, it boots into the Dev Mode menu. If set to Yes, it boots directly to the Serial Loading Screen, ready to load a game in either Auto or Manual mode as previously set. Once Immediate Load mode is set to Yes, in order to return to the menu one must hold down PAUSE while cycling power on the Atari. PAUSE can be released once the CC2 menu screen is visible. Note that this only returns to the menu mode one time, to make the switch permanent Immediate Load must be set to No, or "Boot to Menu Mode" must be set to Yes. (If the latter is used, when Dev Mode is selected again, it will still boot directly to the Serial Loading Screen.)

This mode is to make it even easier to download frequently updated code. No buttons need be pressed to prepare the 7800 for loading, it is ready for loading immediately after booting.

Baud Rate – Press FIRE or RESET while this setting is selected to cycle through the range of available baud rates: 9600, 14400, 19200, 38400, 57600, and 115200 bits per second (BPS). The value will change once for each press of FIRE or RESET. Note that 115200 BPS will not function correctly when the CC2 is running on a PAL console - use a baud rate of 57600 BPS or lower.

Serial Manual Mode Settings – These describe the game ROM that will be loaded when operating in Serial Manual Mode. The settings and how to change them are as follows.

Game Size - The size of the game to be loaded in kilobytes. All downloads must be in kilobyte increments from 1-512 KB. To change this setting, highlight and then select it by pressing RESET or FIRE. Adjust the value down by pressing DOWN or PAUSE. Adjust the value up by pressing UP or SELECT. When the desired value is reached press RESET or FIRE to return to scrolling though the menu.

Bankswitching File - The name of the bankswitching file to load from the MMC after the serial download is complete. This is the 8 character FAT filename, minus the .BNK extension. To change the value highlight and select it pressing RESET or FIRE. Once selected, move the arrow to the character position you wish to change. Move the arrow to the left by pressing LEFT or PAUSE. Move the arrow to the right by pressing RIGHT or SELECT. The arrow will wrap from the 1st position to the 8th or vice versa if you scroll past either end. Once the arrow is at the location you wish to change, cycle through the acceptable characters using UP or DOWN or by pressing SELECT to increment the character by one. (Hold down a direction or button to autoscroll through entries.) When the name of the file is entered, press RESET or FIRE to return to scrolling through the menu. Using the joystick to enter filenames provides a much better experience than using the console buttons, so it is recommending that a joystick be plugged into the Atari to adjust the filename. Also, be careful that unused characters in

the filename be filled with ASCII space characters (like pressing the space bar.) It is easy to mistake these for underscore characters as they appear rather similar when highlighted.

Startup File - The name of the startup file to load from the MMC after the serial download is complete. This is the 8 character FAT filename, minus the .STR extension. This value is changed exactly like the Bankswitching File entry.

All of these settings are maintained in the CC2's battery backed RAM, so they do not need to be entered every time the CC2 is started, but only when one wishes to load a different ROM.

Opening the CC2 Case – How and Why

There are three reasons why one might have to open the CC2 case. The section describes those reasons and explains how to go about actually opening the case.

How to Open It

Before opening the case, be sure to ground yourself in order to discharge any carried static charge. You can do this by touching most large metal objects that are in contact with the ground.

Six tabs, three on each side of the case, secure the case. In order to open the case, squeeze the label half of the case near the end that is inserted into the Atari 7800, see Figure 8. Squeezing the case will reveal the tabs that hold the label half to the other half of the case. The top must be squeezed sufficiently that the tabs can pop out of the lower half of the case and thus allow the case to open. Be careful not to break the tabs! (The case will still close fine with a few tabs missing.)

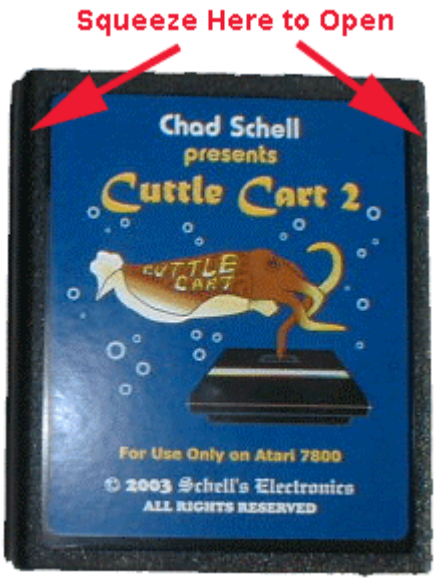

Figure 8: Opening Diagram

After removing the CC2 from its case, be careful not to expose it to static shock. Do not lay it on the carpet or other objects that tend to store static electricity.

Figure 9 provides a labeled diagram of the inside of Printed Circuit Board inside the CC2's case. Use it to locate the areas you will be working on.

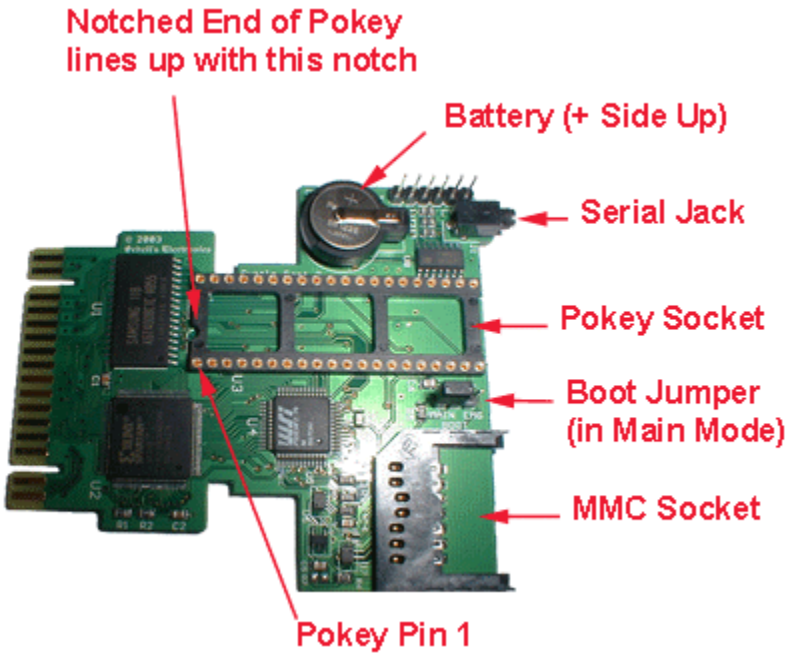

Figure 9: CC2 Printed Circuit Board Diagram

Booting with the Emergency Boot ROM

If something causes the "Update Boot ROM" procedure to fail, you must activate the CC2's Emergency Boot system to recover and reflash the main ROM. To activate the emergency boot mode, you have to open the case and set a jumper on the CC2 Printed Circuit Board.

Turn off the Atari, remove the CC2, and open the case. Locate the Jumper labeled "BOOT", directly to the left of the MMC socket. Move the jumper from the "MAIN" position to the "EMG" position. Insert the CC2 back into the 7800 such that the side with the battery is facing AWAY from the console buttons. (There is no need to put the CC2 back into its case.) Turn on the 7800 and follow the onscreen instructions. After reflashing the main ROM, turn off the 7800 and remove the CC2. Set the jumper back to the "MAIN" position. Try the CC2 to see if it now works correctly. If not make sure the BOOTROM.CC2 file on your MMC is the latest version available from www.schells.com. If it is and the CC2 still fails to operate, send an email to support@schells.com describing the problem.

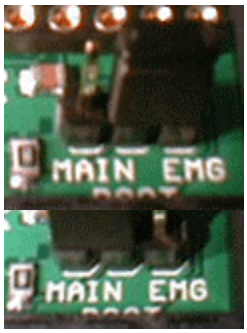

Figure 11: Jumper in Main Mode

If the CC2 works correctly, turn off the Atari 7800, remove the CC2, and put it back inside its case.

Replacing the Battery

The CC2 contains a watch battery to maintain the contents of its non-volatile RAM, which is used for storing things like your color preferences and other user settings, as well as the last menu position. In time, this battery will need to be replaced. Use only BR1225 or CR1220 lithium batteries. Remove the older battery and replace it with the new one. Be sure the "+" side of the battery is facing up. (You should be able to see the "+" sign when the battery is installed.) Note that all settings are lost when the battery runs too low or is removed.

Installing a Pokey

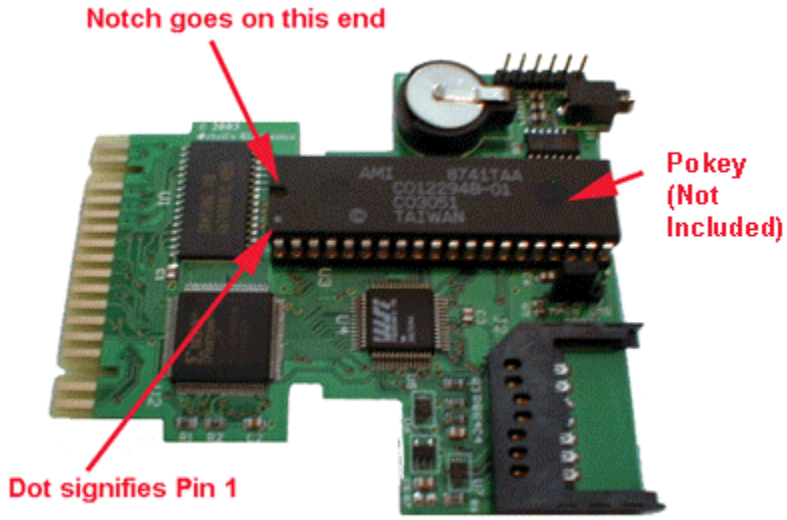

Figure 12: CC2 with Pokey Installed

The Pokey chip is a special chip that provides audio in two Atari 7800 games, Commando and Ball Blazer. The CC2 does not come with a Pokey chip, but instead includes an empty socket into which a Pokey can be installed. If you do not have a Pokey, these two games will be missing some or all of their sound, but will otherwise play normally. No other games are known to use the Pokey at the time of the writing of this manual.

To install the Pokey, insert it into the large rectangular socket labeled U3 on the printed circuit board. Pin 1 of the Pokey goes in the lower right hand corner of the socket, nearest to the label U3. Pin 1 on the Pokey is designated by a white dot on top of the chip near the pin. Another designating mark is a U shaped notch cut out of one end of the top

of the Pokey. This notch should be placed farthest away from the MMC socket, near the end of the CC2 that plugs into the Atari 7800. There is a similar notch in the socket; the two notched ends go together. See Figure 9 for a diagram of the location of the socket, the Pokey pin 1 insertion point, and the U shaped notch in the Pokey socket.

Align the Pokey such that each pin goes into one hole in the socket, and insert the Pokey by slowing applying force until it is firmly seated. Go slowly and watch for bent pins. If a pin starts to bend, remove the Pokey, straighten the pin with fine nosed pliers and try again. Figure 12 shows a picture of CC2 printed circuit board after the Pokey has been installed.

Appendix I - Bankswitching Configuration Files

Filename: (w/o .BNK extension)	Bankswitching Type:
2K	2600 2K Non-Bankswitched Cart
4K	2600 4K Non-Bankswitched Cart
3F	2600 Tigervision 3F Bankswitching
7800_4K	7800 4K Non-Bankswitched Cart
7800_8K	7800 8K Non-Bankswitched Cart
7800_16K	7800 16K Non-Bankswitched Cart
7800_32K	7800 32K Non-Bankswitched Cart
7800_48K	7800 48K Non-Bankswitched Cart
78POKEY	7800 32K Non-Bankswitched Cart w/POKEY
78SC_BIG	7800 Supercart w/144K ROM
78SC_LOW	7800 Supercart w/128K ROM and bank 6 mapped to $4000
78SC_POK	7800 Supercart w/POKEY
78SC_R16	7800 Supercart w/128K ROM and 16K RAM
78SC_R8K	7800 Supercart w/128K ROM and 8K RAM
78SC_SM	7800 Supercart w/64K ROM
78SCR8SM	7800 Supercart w/64K ROM and 8K RAM
ABS78	7800 Absolute Bankswitching
ACT78	7800 Activision Bankswitching
CV	2600 Commavid Bankswitching
E0	2600 Parkervision E0 Bankswitching
E7	2600 M-Network E7 Bankswitching w/RAM
F4	2600 F4 Bankswitching
F4SC	2600 F4 Bankswitching w/Superchip
F6	2600 F6 Bankswitching w/Superchip
F6SC	2600 F6 Bankswitching w/Superchip
F8	2600 F8 Bankswitching
F8R	2600 F8 Bankswitching w/Banks reversed
F8SC	2600 F8 Bankswitching w/Superchip
FA	2600 CBS Electronics FA Bankswitching w/RAM
FANR	2600 CBS Electronics FA Bankswitching w/o RAM
FE	2600 Activision FE Bankswitching

HSC_16K	7800 16K Game w/High Score Cart Support
HSC_32K	7800 32K Game w/High Score Cart Support
HSC_48K	7800 48K Game w/High Score Cart Support
MEGABOY	2600 Dynacom Megaboy Bankswitching
SC	2600 Self-Loading Supercharger Bankswitching
UA	2600 UA Bankswitching

Special Notes:
HSC Bankswitching requires the file HSC.ROM to be in the STARTUP directory.
SC Bankswitching requires the files SC.ROM to be in the STARTUP directory.
Also, SC games must follow a specific naming convention. The first load must have a name which is 6 characters in length, followed by the ASCII characters "00" (that is zero zero). Example: MNDMST00.BIN
All subsequent loads of a multiload game must have the same first six characters, and the last two characters must be the number of the load. For example, Escape From the Mind Master uses the numbers 01-03 for loads 2-4, so they would be named MNDMST01.BIN, MNDMST02.BIN and MNDMST03.BIN. Note that ONLY the first load of a multiload game should be given a menu entry. The other loads are simply placed in the GAMES directory and will be loaded automatically as needed.

Appendix II - Startup Code Files

Filename: (w/o .STR extension)	Description:
78BIOS	Call the 7800 BIOS - Use this as the default
HSC	Used for 7800 games that use the High Score Cart
SC	Used for Starpath Supercharger games
F6BANK0	F6 games that must start in Bank 0
F8BANK1	F8 games that must start in Bank 1
78QUICK	Start 7800 Games without going through the 7800 BIOS a second time. Not 100% reliable.
26QUICK	Start 2600 Games without going through the 7800 BIOS a second time. Only useful if you have a DevOS modified Atari 7800.
HSCQUICK	Start 7800 High Score Cart Games without going through the 7800 BIOS a second time. Not 100% reliable.

Appendix III - Serial Auto Mode Protocol

To send a file to the CC2 in Serial Auto Mode requires embedding information about the ROM in the download stream, as well as calculating and sending regular CRC error codes.

The format is as follows:

Initial Header: 20 bytes

Information:	Character Position:
File size in Kilobytes - Sent as an unsigned 16 bit integer, little endian (that is least significant byte followed by most significant byte).	00-01
8 Character Bankswitching filename (w/o the .BNK extension). All letters in the filename must be sent in ALL CAPITALS. If filename is less than 8 characters, the remainder must be filled with ASCII space " " (0x20) characters.	02-09
8 Character Startup filename (w/o the .STR extension). All letters in the filename must be sent in ALL CAPITALS. If filename is less than 8 characters, the remainder must be filled with ASCII space " " (0x20) characters.	10-17
16-Bit CRC of the previous 18 characters, sent as a 16-bit unsigned integer, BIG endian (that is most significant byte followed by least significant byte).	18-19

ROM divided into 1kB segments, each followed by a 16-bit CRC. The ROM segments are sent in order from start of file to end of file. The file size must be an integer multiple of 1kB between 1 and 512 KB.

Information:	Character Position:
Nth 1kB segment of the ROM, starting from the beginning.	(20+(N-1)*1026) - (17+N*1026)
16-Bit CRC of the previous 1kB segment, sent as a 16-bit unsigned integer, BIG endian (that is most significant byte followed by least significant byte).	(18+N*1026) - (19+N*1026)

Continue sending ROM segments and their CRCs until the end of the file, at which time the CC2 will load the bankswitching and startup files and launch the game, assuming no errors were encountered.

If an error is encountered, the CC2 will abort the download and post an error message. Simply stop the computer download, return the CC2 to the Serial Loading Screen, and send again.

The 16-CRC used for error detection is computed in typical 16-CRC fashion with the following key values:

Initial Value: 0
Polynomial: 0x1021
Not reversed, not reflected.