

# BITKIT

8Bit FPGA

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<http://craftymech.com>

# About

The BitKit is an 8bit FPGA platform for accurately playing arcade classics in any JAMMA compatible cabinet. The BitKit includes a USB interface for updating firmware, and loading games (rom files are NOT included).

## FEATURES

- Menu system
- High Score saving & online leaderboards
- Hide/Show games, and customize names
- FREE play option
- Pause gameplay
- Direct Boot option
- Independent settings for each game/version
- Screen flip & Cocktail support
- Crosshatch, and color bar test patterns
- Vanguard can be played with 1, 2, or 4 buttons
- Easy USB updating with Windows/Mac desktop app

\* Game rom files are not included with the BitKit.

The BitKit is intended for **Home Use** only.

# Quick Guide

## ***Where can I download the BitKit Manager desktop application?***

<http://craftymech.com/downloads>

## ***How do I update firmware, upload game files, or download high scores?***

Download the BitKit Manager desktop application from the link above. Once installed, start the application and click the “Getting Started” link at the bottom of the left-hand navigation menu.

## ***How do I select a game from the game menu ?***

Press **Player 1 Start** from the game menu to select a game. Use the **Player 1 Joystick** to move the cursor up/down. Moving the joystick left/right will change the game menu page.

## ***How do I exit back to the menu from a game ?***

The default setting is to press **Player 1 Start** and **Player 2 Start** at the same time. The reset delay can be changed in the Options menu to be instant, 1 second, or 2 seconds.

***If I enable FREE play, how do I “coin-up” ?***

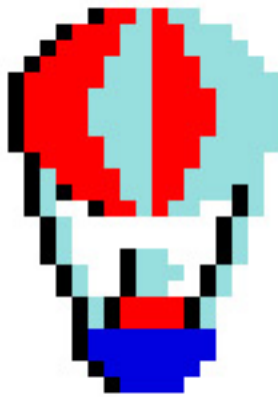
To add a credit, **tap Player 2 Start twice**. For a two-player game, add two credits by performing the sequence twice. Once the desired number of credits have been added, press *Player 1 Start* or *Player 2 start*.

***I am direct booting to a game, how do I get back to the menu ?***

Hold the **Player 1 Start** button down during power-on to escape to the Options menu.

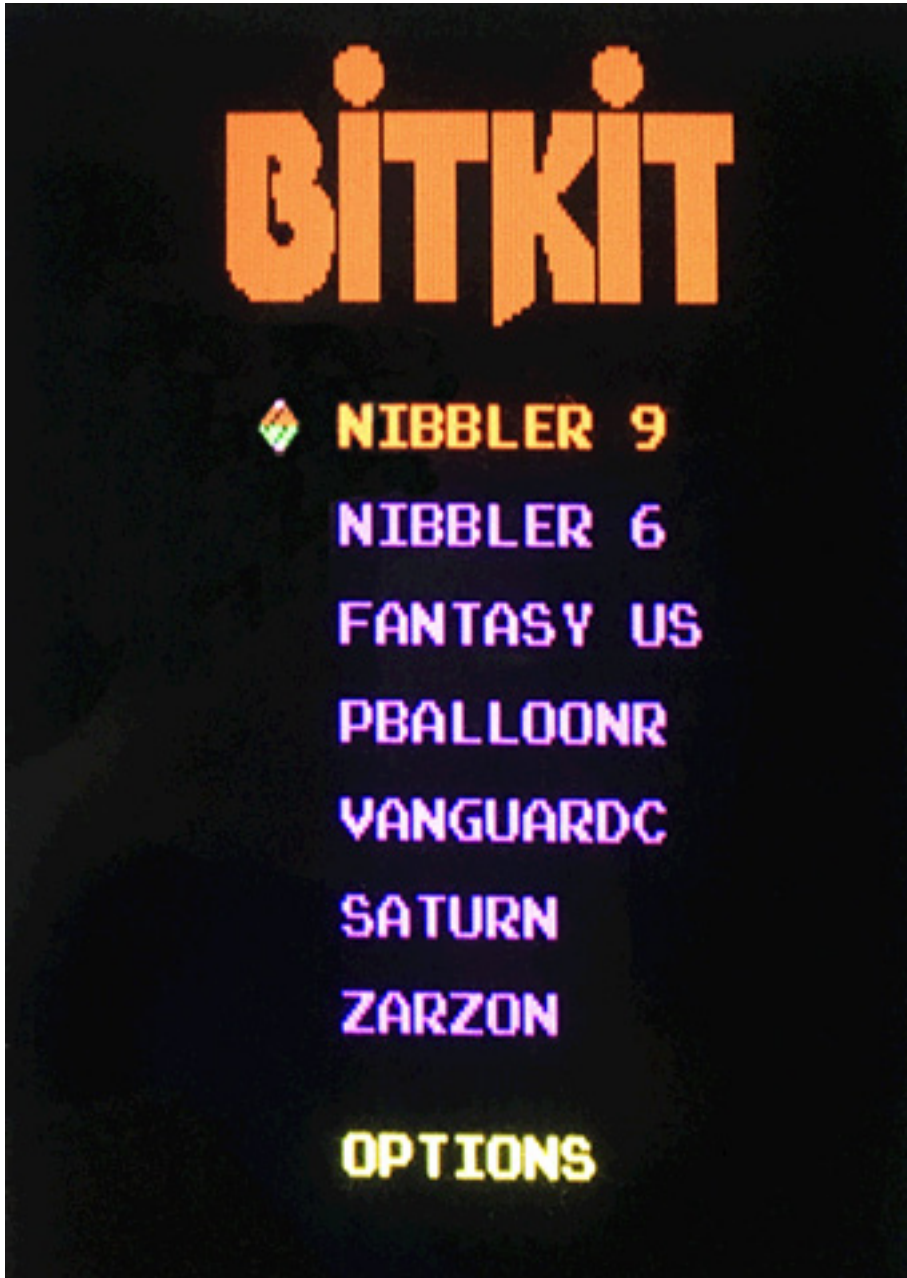
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# 1 : Game Menu

The BitKit boots to the game select screen by default, displaying the list of the available games. To **start a game**, move the cursor with the *Player 1 Joystick* to the desired game title, and press *Player 1 Start*.

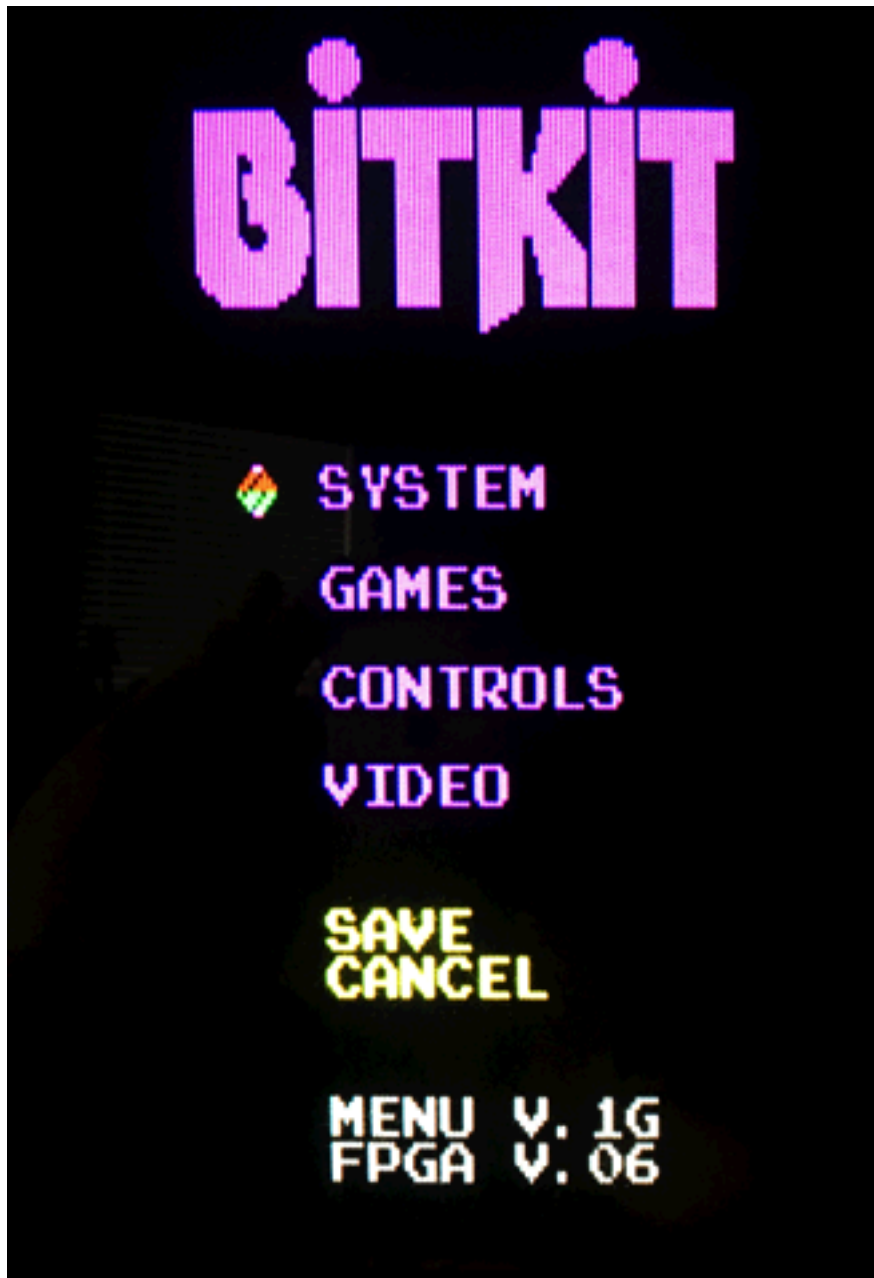


The *Player 1 Start* button is the action button for the Menu system.

If there are more than 8 games, the game list is split into multiple pages, and *Player 1 Left* & *Player 1 Right*, will switch pages.

## 2: Options Menu

<b>System</b>	General system settings
<b>Games</b>	Manage game list, and individual game settings
<b>Controls</b>	Test controls, and configure restart & pause combinations
<b>Video</b>	Flip screen, display test patterns for monitor adjustment



After making changes to BitKit settings, choose the **Save** action.

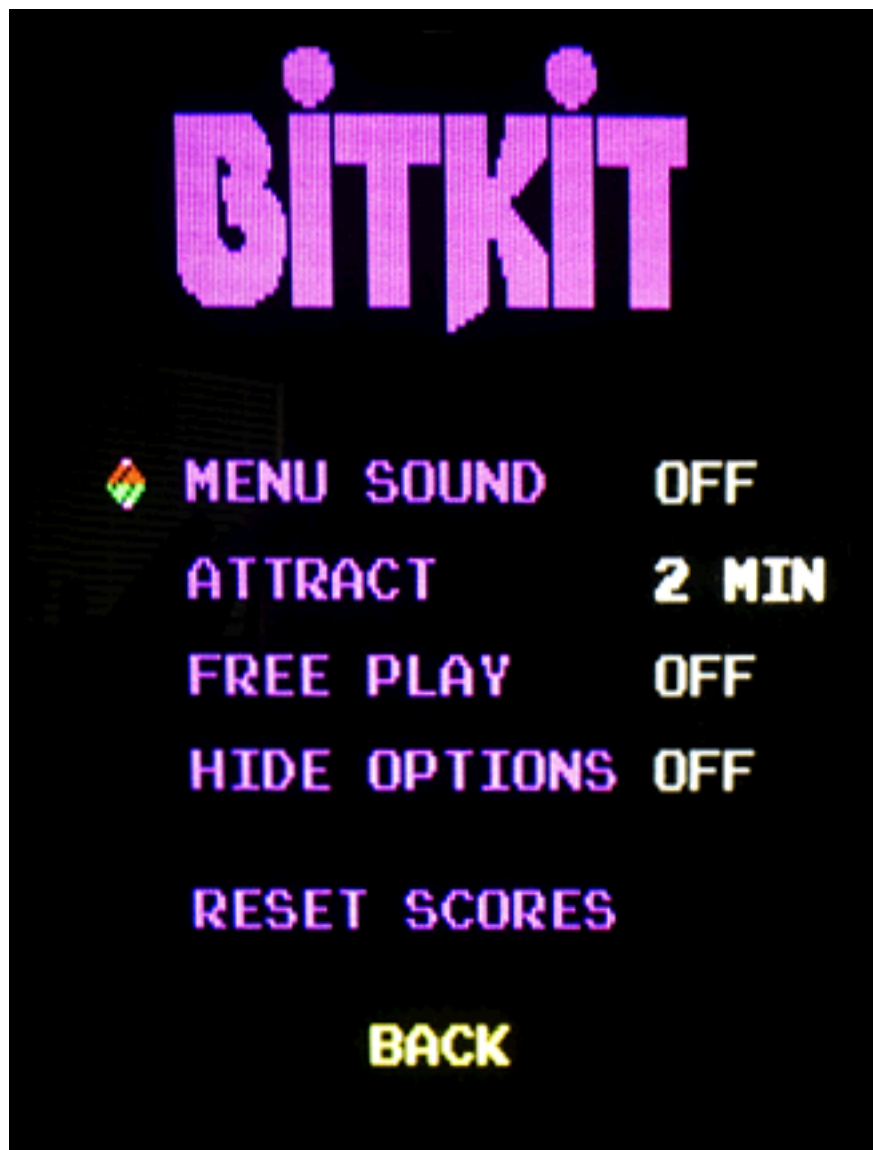
To back-out of the Options menu without saving changes, choose the **Cancel** action.

## SYSTEM

These settings define Menu behaviors, and configure the *free play* setting for games that do not support free play by default.

**Menu Sound** - Enable/Disable sound effects in the Menu.

**Attract** - The Menu has a built-in screen saver, that will activate after the desired interval without any control input. The screen saver displays the top score from each game, along with credits for the BitKit system.

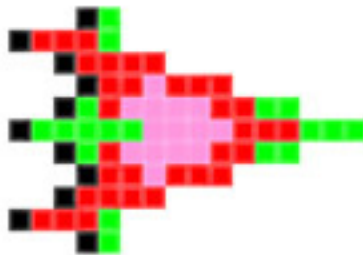




**Free Play** - This setting enables credits to be added using the controls. To add a credit, **tap Player 2 Start twice**. For a two-player game, add two credits by performing the sequence twice. Once the desired number of credits have been added, press *Player 1 Start* or *Player 2 start*.

**Hide Options** - This setting toggles the display of the **Options** link on the Game Menu. When enabled, the only way to access the Options menu is to hold down *Player 1 Start* during the boot sequence. This setting is ideal for protecting BitKit settings during parties, tournaments, or other group events.

**Reset Scores** - This option will globally reset high scores for all games. You will be prompted by a confirmation screen, before the high scores are reset. To reset high scores for a specific game, navigate to **Game Settings**, select a specific game, and select **Reset Scores**.



# GAMES

This sub-menu is where the game list, and settings for individual games, are managed. The game list is presented as 3 pages of 8 game slots each. Navigate between pages with *Player 1 Left* & *Player 1 Right*. Right and left arrows indicate available navigation choices.

The BitKit has 24 game slots, and all game slots are listed in this sub-menu. The game name for each slot is independent from the display



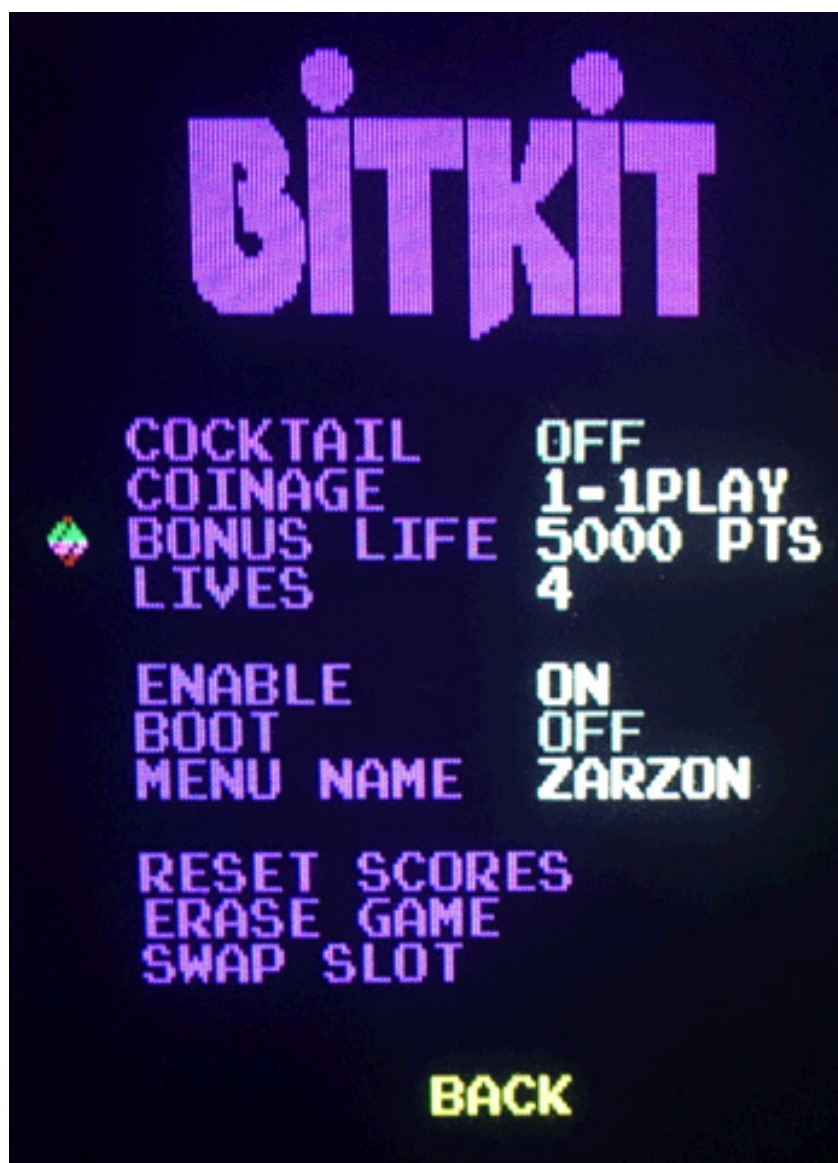
Game slots that are disabled are gray, while active games are purple. Empty slots are always gray.

A single game may be configured for direct boot, and will be displayed using red text.

name used in the **Game Menu**. Empty slots are labeled as such, and the cursor will skip past these entries.

To select a slot, press *Player 1 Start*. The screen below will be displayed, where individual settings for that game may be adjusted. To toggle a setting on/off, or rotate between choices, press *Player 1 Start*.

Settings common to all games are detailed in the following section. For title specific settings, see **Chapter 3: Game Settings**.



The order games appear in the game slot screen will determine the order of the game list menu.

See **Swap Slots** in the section below to learn how to change the slot order.

**Lives** - This setting selects the starting number of lives. Generally, the range is 3-5 lives, but will vary per game.

**Cocktail** - This setting will enable cocktail mode, which flips the screen between players, in a 2 player game. The Player 2 control inputs are used for the second player. This differs from 2 player non-cocktail mode, where both players use the Player 1 controls.

**Show** - When enabled, the game name will be displayed in the game menu. When disabled, the game will be hidden from the game menu.

**Boot** - If this setting is enabled, the game will be configured to boot automatically, bypassing the game menu. If a game is marked for booting, but is not enabled, then this setting has no effect. If multiple enabled games are set to boot, the game with the lowest slot number will boot. To abort the direct booting of a game, hold down *Player 1 Start* to display the **Options Menu**.

**Rename** - The name displayed in the **Game Menu** can be changed here. To move the cursor right or left, move the joystick right or left. To change the value of a letter, move the joystick up or down. Pressing *Player 1 Start* will end the input sequence.

**Reset Scores** - This action will reset the high scores for the game in the currently selected slot, and will trigger a confirmation screen. To reset all high scores, navigate to the **System** sub-menu, and select **Reset Scores**.

**Erase Slot** - This action will erase the game from the currently selected slot. High Scores associated with the game are still saved, and will not be lost. If the game is reinstalled at a later time, then the same high score table will be used regardless of what slot is used for the game.

**Swap Slot** - This action will flag this slot for swapping. In order to perform a swap, two slots need to be flagged. When two slots have been flagged, a new action will appear on the game slot screen, **Swap Slots**. Selecting that action will display a confirmation screen, and then the flagged slots will be swapped. **The process will take 2-3 minutes.**





# CONTROLS

From this sub-menu, player 1 & 2 controls may be tested. Control combinations for Restart (exit game) and Pause, are configurable here.



Most games only read input from the Player 2 controls in *Cocktail* mode (except for *Player 2 Start*). This is a limitation of the original game code.

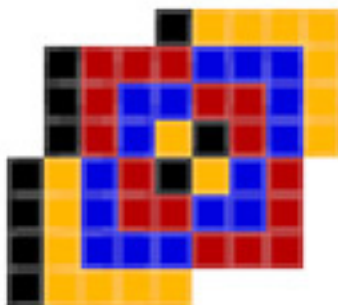
**Test P1** - Enter test mode by pressing *Player 1 Start*. The 4 cardinal directions will be displayed for each corresponding movement of the Player 1 joystick (Up, Down, Left, and Right). Pressing *Player 1 Button 1*, or *Player 1 Button 2*, will display "BUTTON1" or "BUTTON2" accordingly.

**Test P2** - Enter test mode by pressing *Player 1 Start*. The 4 cardinal directions will be displayed for each corresponding movement of the Player 2 joystick (Up, Down, Left, and Right). Pressing *Player 2 Button 1*, or *Player 2 Button 2*, will display “BUTTON1” or “BUTTON2” accordingly.

**Reset** - This setting defines the control combination for restarting the BitKit. Use this combination to return to the Menu system after launching a game. The default setting is *Player 1 Start + Player 2 Start* (pressing both buttons simultaneously). Selecting *OFF* will disable the restart feature, requiring a power cycle to return to the Menu system.

**Reset Delay** - This setting defines how long the reset control combination must be held, before a system restart is triggered. The options are instant, 1 second, and 2 seconds. If you have a cab without 2 actions buttons, you may have wired one or both of the start buttons to be buttons A & B. In this case, set the Reset Delay to be either 1 or 2 seconds, to avoid accidentally restarting the BitKit during gameplay.

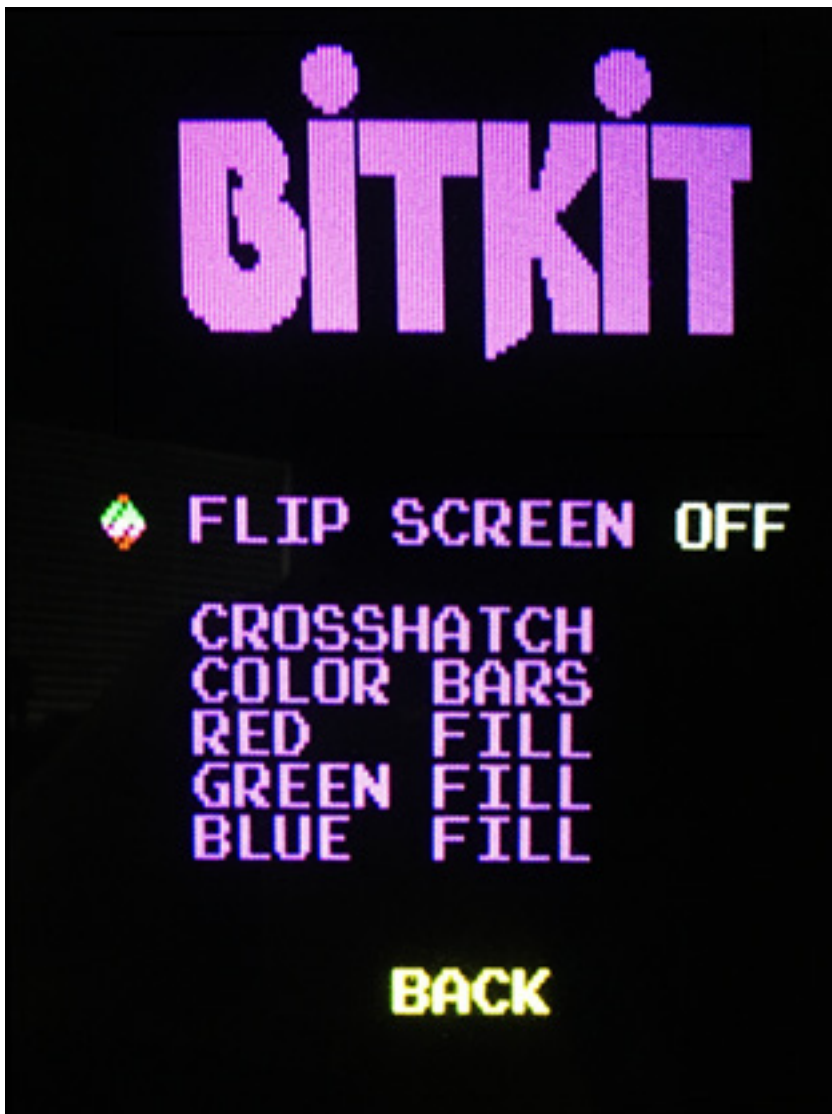
**Pause** - This setting configures the pause feature, which will freeze/resume gameplay. The default setting is OFF. The *Player 1 Button 2* option works well for all games except Vanguard. If Pause is configured to use *Player 1 button 2*, Vanguard must be set to 1-button fire mode.



## VIDEO

The Video sub-menu provides test patterns for configuring the CRT display, and to adjust the horizontal/vertical position of the BitKit's video output.

**Crosshatch** - Use the crosshatch pattern to adjust monitor convergence.



The Red, Green, and Blue patterns are useful for checking color purity.

If either screen has an area of discoloration, degaussing the monitor will usually resolve the issue.



**Color Bars** - For adjusting brightness, contrast, and RGB drive.

**Red/Green/Blue Fill** - Use these solid color screens to assist in degaussing, and to diagnose a problem with color purity.

**Flip Screen** - If the BitKit displays upside-down, use the **Flip Screen** option to change the screen orientation. This setting works in combination with each game's *Cocktail* setting, to ensure the proper screen orientation for both players.

**Vert Pos** - Use this option to move the video image up or down, if part of the display is cut off. The default setting is 3, with a range of 1-7.

**Eyes Horz** - Use this setting for the Pac/Scramble hardware games (Eyes, Pengo, Anteater, etc.) to move the video image left/right, if part of the display is cut off. This setting is also useful when the screen is centered for the Menu/Nibbler, but offset for Pac/Scramble hardware games.

## 3: Game Settings

Unique settings for each game title are listed below. For an explanation of common settings (e.g. *Lives*, *Cocktail*) see the previous chapter.

### NIBBLER

**Difficulty** - The available options for this setting are *Normal* and *Hard*. The effect the *Hard* option has on gameplay depends on the rom version. For version 6, Nibbler will not pause at corners (normally a 13 frame delay). For all other versions, the *Hard* option causes the game code to use a more aggressive progression of speed & growth for Nibbler.

**Turbo** - This setting when enabled will run the game code at full speed (1.4 mhz). Normally, the CPU will skip every other clock cycle when accessing program code. Effectively, this reduces game speed by a little less than half. This setting can be thought of as “*Dwayne’s Mode*”. In the documentary *Man Vs. Snake*, Dwayne Richard achieved a billion point score on his personal Nibbler cabinet. However, it was later determined the CPU was faulty and the game was running too fast. Instead of slowing down when accessing program code, the CPU was running at full speed. This causes gameplay artifacts, such as abbreviated sound effects, a faster title screen sequence, and a faster death sequence for Nibbler.

### FANTASY

**No Extend** - The default value for this setting is *OFF*, which will grant the player the ability to continue their game during the first loop only. If enabled, the player is not able to continue the game after losing all of their lives. Fantasy was one of the first arcade games to offer a continue option.

## PIONEER BALLOON

**Japanese** - This setting toggles between English and Japanese for the message displayed after completing all seven stages of the game.

## VANGUARD

**Fire** - Configures the number of fire buttons to use. This setting defaults to *1 button*. In this mode, the player's ship always fires forward, and then also in the direction the joystick is held. *2 button* mode maps left/right fire to *Button 1*, and up/down fire to *Button 2*. *4 button* mode is intended for dedicated Vanguard control panels, where the 4 fire buttons are arranged in a diamond pattern.

## ZARZON

**Bonus Life** - The default value for this setting is 5000 points, with the alternate value of 10000 points. Given the difficulty of Zarzon, only sadists should opt for the harder setting.

**Shield** - For cabinets without a second button, the combination of *Player 1 Up + Button 1* can be configured to activate the player shield.

## PIRANHA / TITAN

**Difficulty** - The default value is *NORMAL*. On harder difficulty the enemies are more aggressive, and their speed increases faster as you progress levels.

**Turbo** - Equivalent to the “*fast hack*” popular on Pac-man.

## THE GLOB / BEASTIE FEASTIE

**Difficulty** - The default value for this setting is 1 (easiest). The range of values is 1-8, with 8 being the most difficult. Difficulty in The Glob ramps up very rapidly, so the default setting is recommended. Beastie is more forgiving, but the default setting still provides a good challenge. Sadistic operators would have placed The Glob on difficulty 8, and then watched the children cry.

## LIZARD WIZARD

**Difficulty** - The default value is *NORMAL*. On harder difficulty, the “lizards” move faster, and the lava rocks turn into fireballs faster.

## SUPER COBRA

**No Extend** - If this setting is enabled, no continues are allowed.

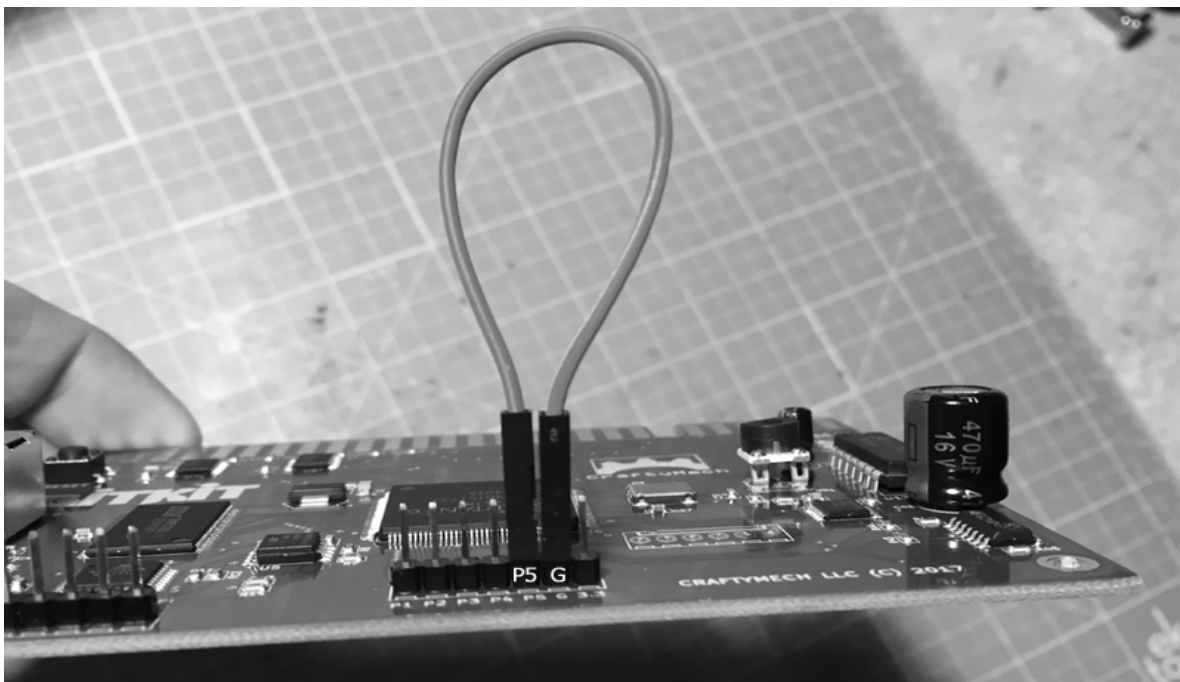
# 4: Troubleshooting

Use the following guide to help solve issues you encounter while using the BitKit.

## 1. The monitor will not sync (picture rolls, or is scrambled).

The JAMMA standard specifies negative composite sync. First ensure that the video cable to the monitor is properly connected to the -sync input. For most monitors, only a connection to the -H pin is required. Some monitors require both -H & -V pins to be connected, in which case you can install a short jumper between those pins on the video connector of your monitor cable.

If the monitor only accepts +sync, the sync polarity of the BitKit video signal can be changed to +sync. The BitKit has a 7pin “expansion” header to support future enhancements to the product. If you connect pins **P5** & **G** of the expansion header, the BitKit will output +sync. Note, do not connect these pins to your monitor, **connect P5 & G together** with a short length of wire.



## **2. The monitor loses sync when switching between games.**

The BitKit accurately implements the video output of each hardware platform, including the *hsync* and *vsync* signals. Some monitors are more tolerant of sync variations than others, and switching between games this may cause the monitor to lose sync.

Usually, this issue can be resolved by finding the “sweet” spot on the monitor’s sync pot(s).

Start with the Menu (which runs on Nibbler hardware), and adjust screen position and sync to optimize the picture. Then run one of the Pac/Scramble hardware based games (Eyes, Pengo, Anteater, etc.) and slowly adjust the sync pot(s) to stabilize the picture. Repeat this process until switching back and forth does not cause the monitor to lose sync.

If you still have trouble with stable sync between games, try adjusting the “*Eyes Horz*” setting described in the Troubleshooting section below. Then repeat the steps above.

## **3. The BitKit Menu is centered on the screen, but Pac hardware games are shifted to the left/right.**

Since the video outputs are different between hardware platforms, the screen may shift between games. You can adjust the left/right shift of Pac/Scramble hardware games using the **Options->Video->Eyes Horz** setting. Increasing/decreasing the value of this setting will move Pac/Scramble hardware games about an inch to either side.



## 5: JAMMA Adapters

In order to use the BitKit in an original cabinet (Nibbler, Vanguard, Eyes, etc.) a JAMMA adapter is required.

### **BitKit -> Nibbler, Fantasy, Pioneer Balloon, Vanguard**

This adapter maps *Player 1* and *Player 2* controls, including 2 action buttons, to the cabinet harness. For *Nibbler* & *Fantasy*, there are no action buttons on a dedicated control panel, so *Button 1* & *Button 2* are not used.

*Pioneer Balloon* has a single fire button, mapped to *Button 1*.

A dedicated *Vanguard* cabinet has four fire buttons (Up, Down, Left, Right). *Button 1* & *Button 2* on the JAMMA adapter are mapped to *Fire Left* & *Fire Right*. There is an additional 2 pin header on the adapter for connecting *Fire Up* & *Fire Down* to the BitKit. Connect *Fire Up* to pin 3 (**P3**) on the extension header, and *Fire Down* to pin 4 (**P4**).



## **BitKit -> Eyes**

This adapter maps *Player 1* and *Player 2* controls, including 2 action buttons, to the cabinet harness. *Eyes* only uses *Button 1*, so *Button 2* is not used with an original *Eyes* control panel.