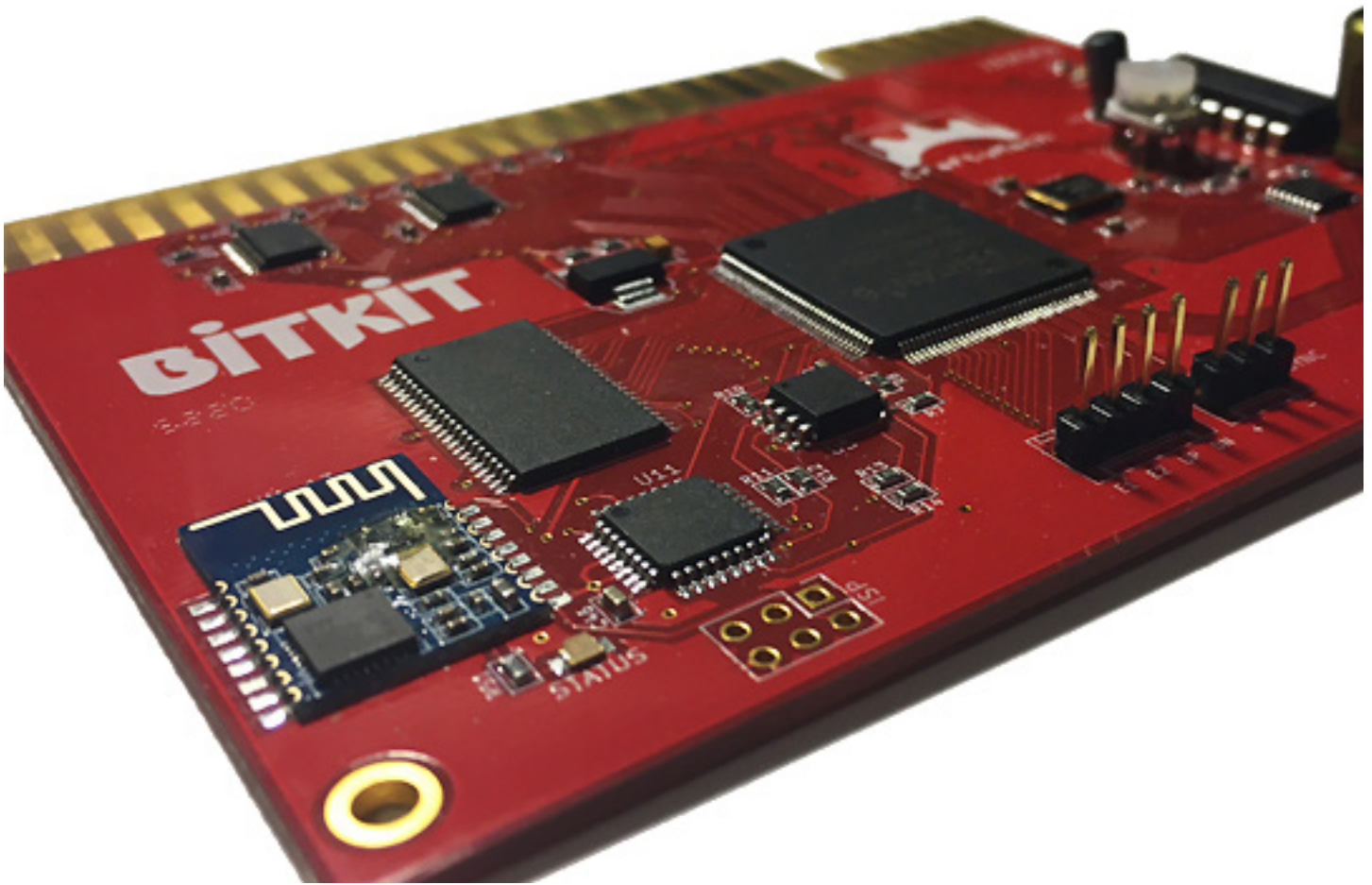




CraftyMech





# BITKIT

8Bit FPGA

Updated June 2021  
(C) 2017-21 CraftyMech LLC

<http://craftymech.com>

# About

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

## FEATURES

- Game Menu w/ screenshots
- High Score saving & online leaderboards
- Direct Boot option
- Pause gameplay
- Independent settings for each game/version
- Hide/Show games, and customize game names
- Add credits with button sequence
- Screen flip & Cocktail support
- Crosshatch, and color bar test patterns
- Easy wireless updating with Windows/Mac desktop app

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

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

*Cover art: Mike Kastrantas*

# 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 ?***

Use the **Player 1 Joystick** to move left/right and browse the Game Menu. Press **Player 1 Start** from the game menu to select a game.

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

Press and hold **Player 1 Start** and **Player 2 Start** at the same time. The reset delay can be changed in the Options->Controls menu to be instant, 1 second, or 2 seconds. The control sequence can also be changed to *Player 1 UP + Player 1 Start*, or disabled entirely.

### ***If I enable the Credit Cheat option, 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 a game, how do I return to the Game Menu ?***

The Game Menu can be reached by exiting the booted game and holding **Player 1 Start**. If only 1 game is installed on the BitKit, exiting the game will always display the Options menu.

### ***I am direct booting a game, how do I access the Options Menu ?***

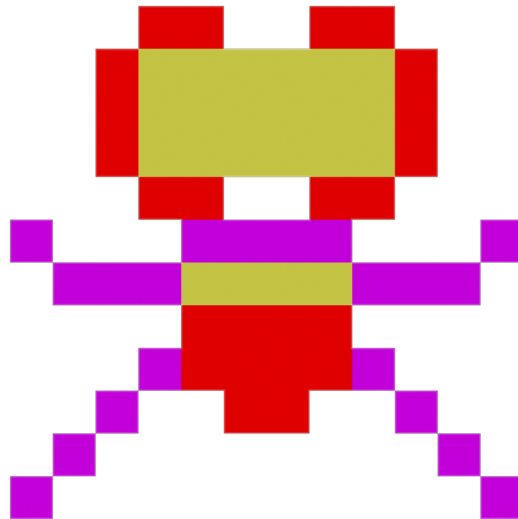
If the **Player 1 Start** button is held down during power-on, the boot sequence will exit and display the Options menu.

### ***My control panel only has a 2-way joystick, how do I navigate the Options menu without Up/Down?***

*Player 1 Button 1* can be used to move the cursor down, and all the Option menus wrap from bottom to top.

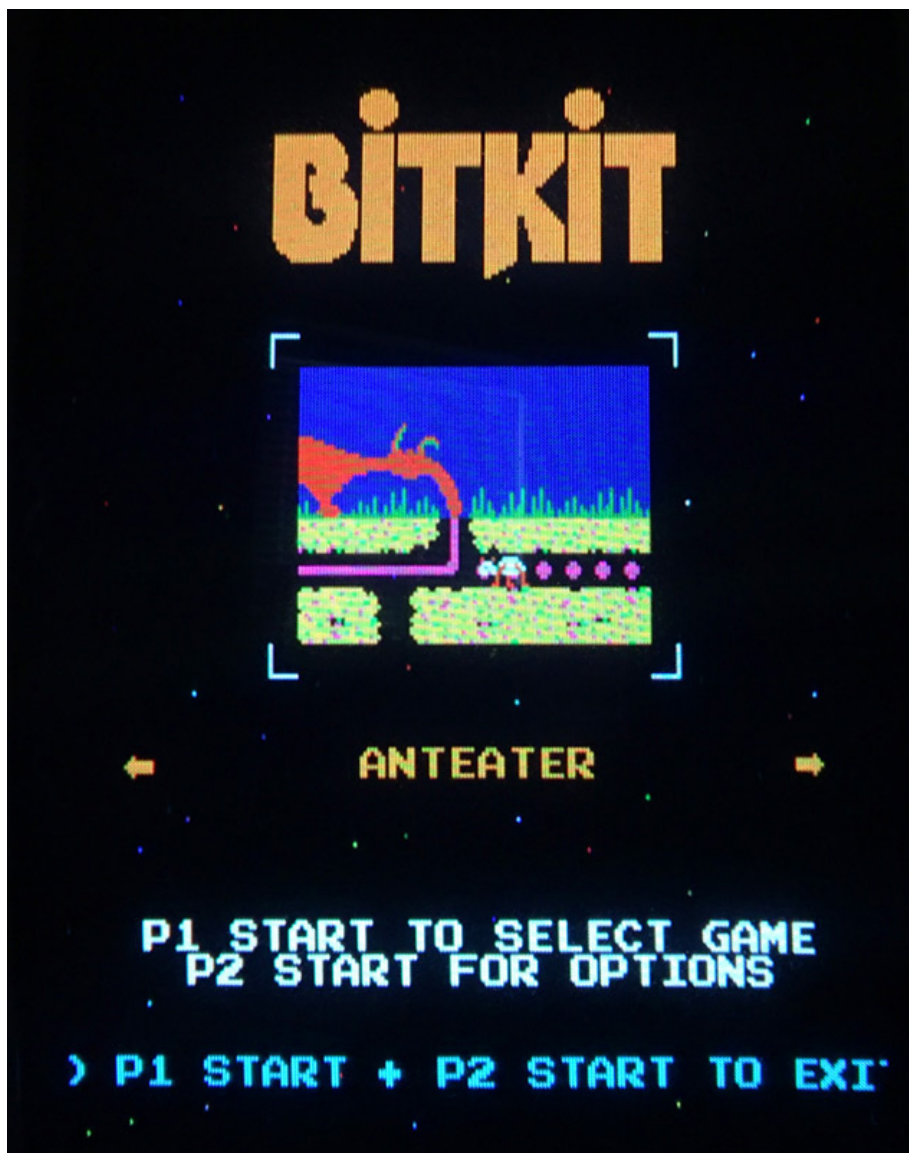
# CONTENTS

1. Game Menu	6
2. Options Menu	8
3. Special Features	19
4. Troubleshooting	22
5. JAMMA Adapters	25



# 1: Game Menu

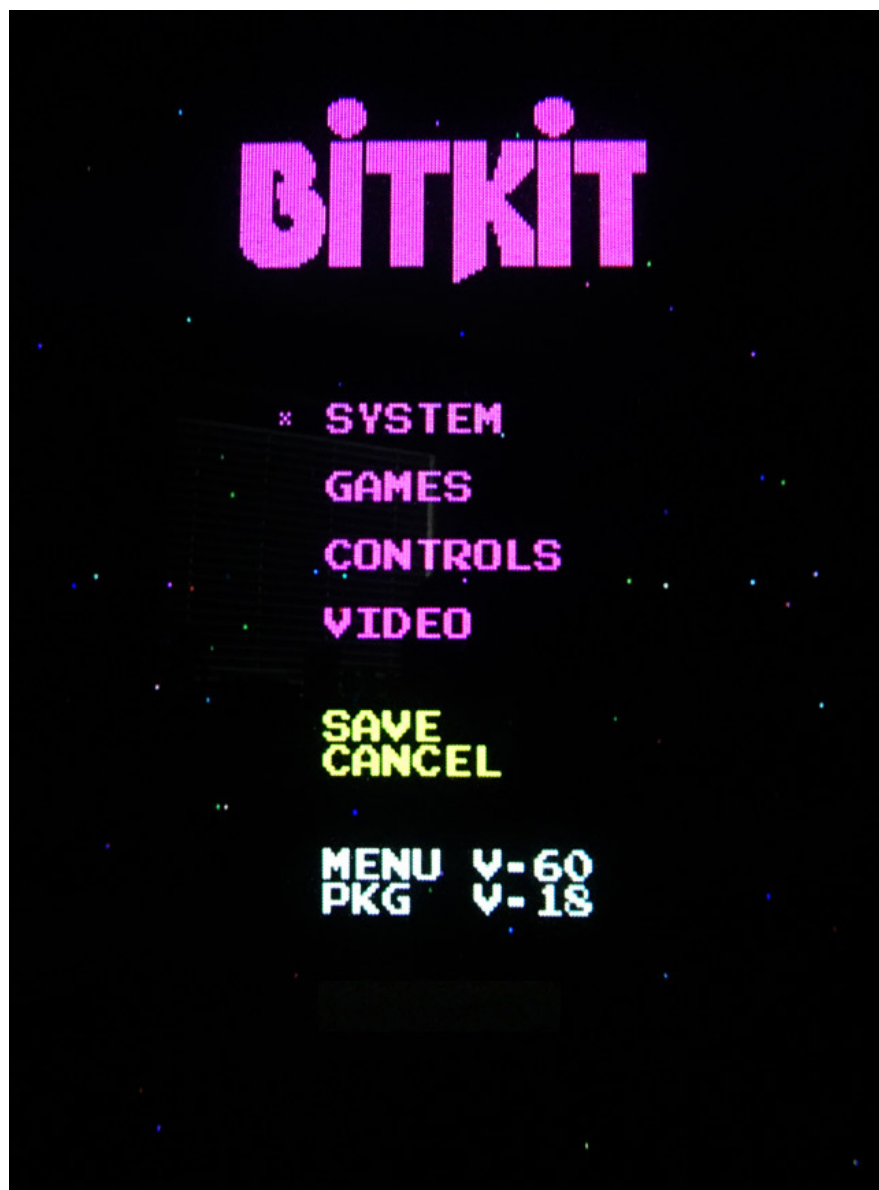
The BitKit boots to the game select screen by default, displaying the list of the available games. To **start a game**, use the *Player 1 Joystick* to browse the game list and find the desired game title. Then press *Player 1 Start* to launch the game.



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

## 2: Options Menu

<b>System</b>	Misc 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, Vert/Horz position, and test patterns for monitor adjustment



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

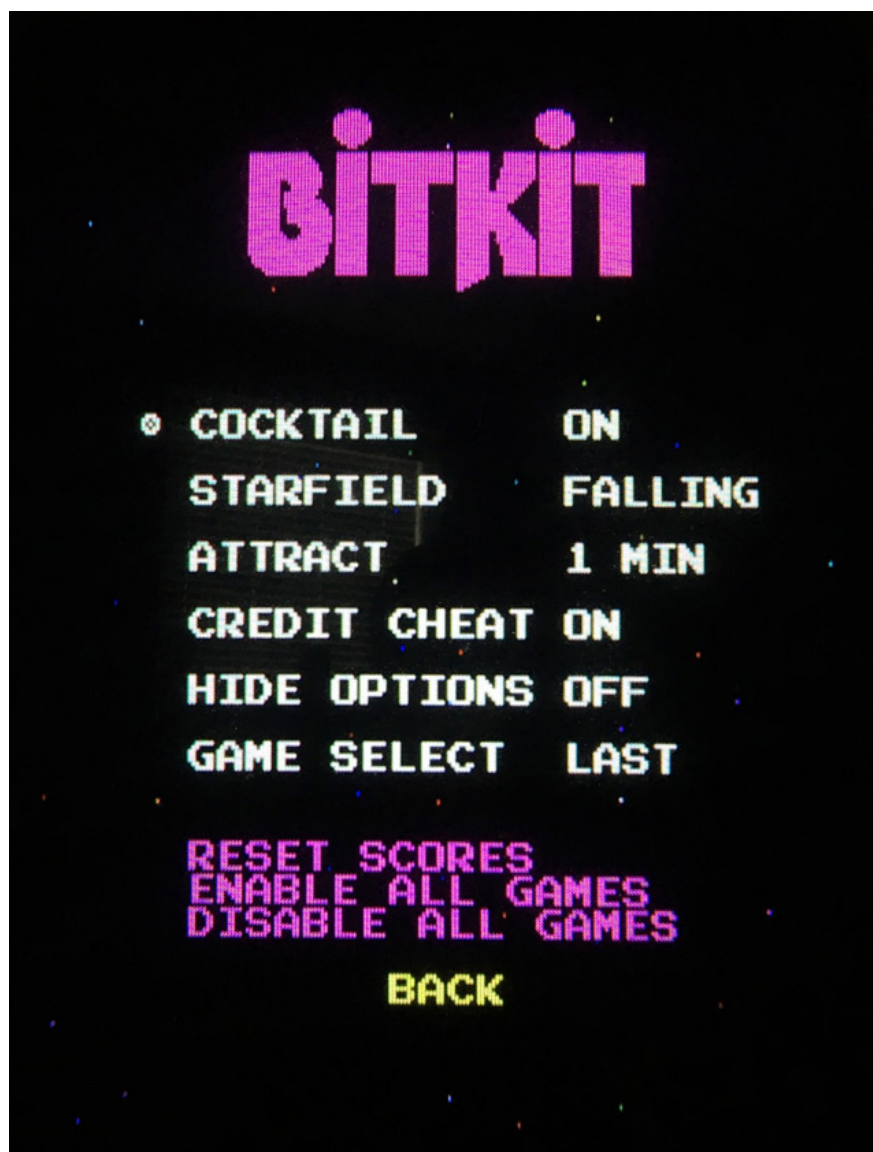
To back-out of the Options menu without saving changes, choose the **Cancel** action.



## SYSTEM

**Cocktail** - This setting will enable cocktail mode for all games that support the feature. Cocktail mode 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.

**Starfield** - Choice of falling stars, static blinking starfield, or none.



**Attract** - The Menu has a built-in screen saver, that will activate after the desired interval without any control input. The screen saver displays a slideshow of screenshots of all enabled games.

**Credit Cheat** - 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*.

**Game Select** - This setting determines what position in the Game Menu is displayed after exiting a game. **Last** will display the last game selected, while **Slot-1** will display the first enabled game from the list of game slots. On power-on, the Game Menu always defaults to the Slot-1 behavior.

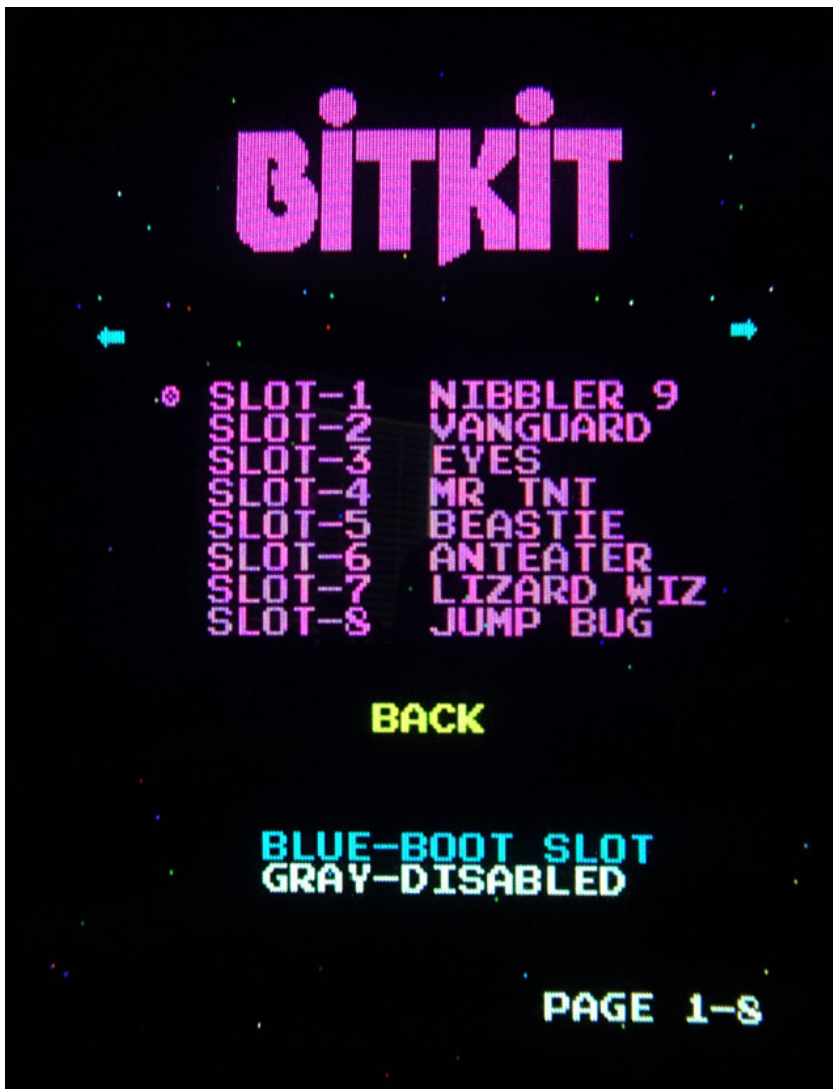
**Hide Options** - This setting toggles the display of the **Options** link on the Game Menu. When enabled, the only way to access the Options menu is to hold down *Player 1 Start* during the boot sequence. This setting is ideal for protecting BitKit settings during parties, tournaments, or other group 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 8 pages of 8 game slots each (64 total slots). Navigate between pages with *Player 1 Left* & *Player 1 Right*. Right and left arrows indicate available navigation choices.

The game name for each slot is independent from the display name used in the **Game Menu**. Empty slots are labeled as such, and the cursor will



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

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

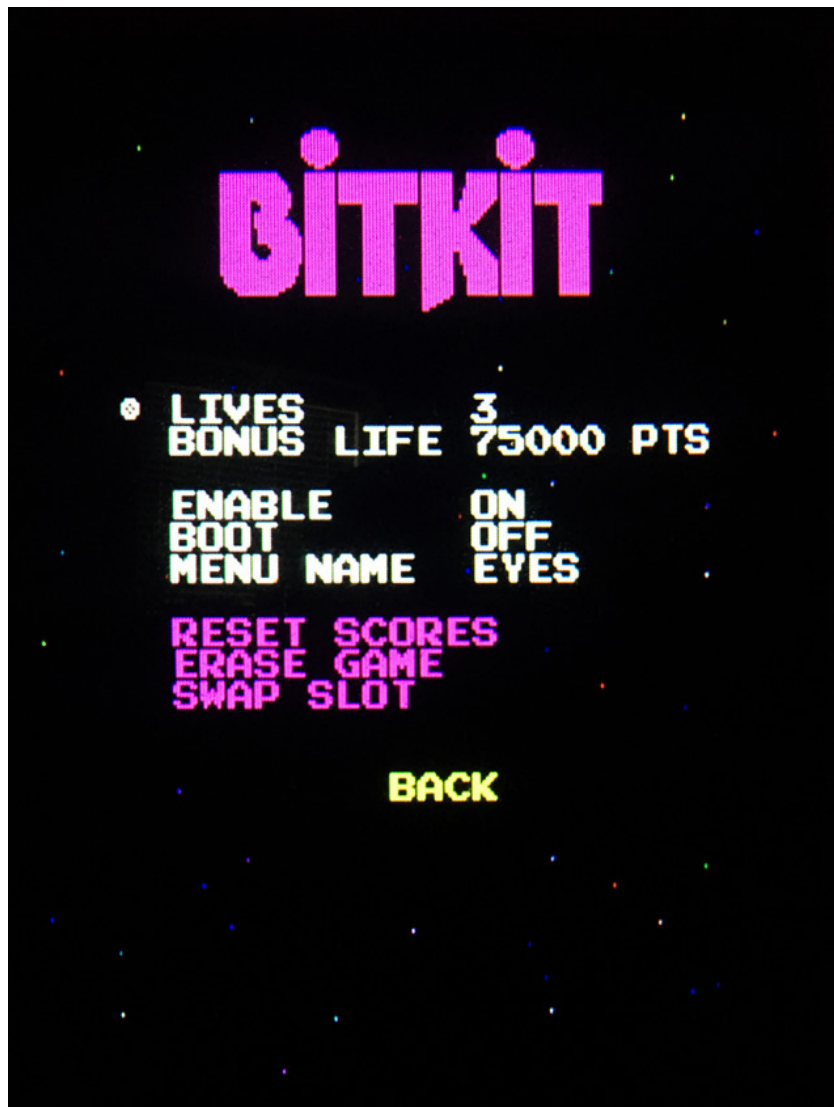


skip past these entries.

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 details on specific game settings, see **Chapter 3: Special Features**.

**Lives** - This setting selects the starting number of lives. Although it varies per game, the range is typically 3,4 or 5 lives.



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

Refer to **Swap Slots** on page 13 to learn how to change the slot order.

**Bonus Life** - Many games offer configurable bonus lives at specific score thresholds, such as 10000 pts, 75000 pts, etc.

**Difficulty** - Some games have a configurable difficulty level, usually with an *Easy* or *Hard* option (this setting may also be a number range).

**Enable** - When enabled, the game will be selectable from the Game Menu. When disabled, the game will be hidden from the Game Menu.

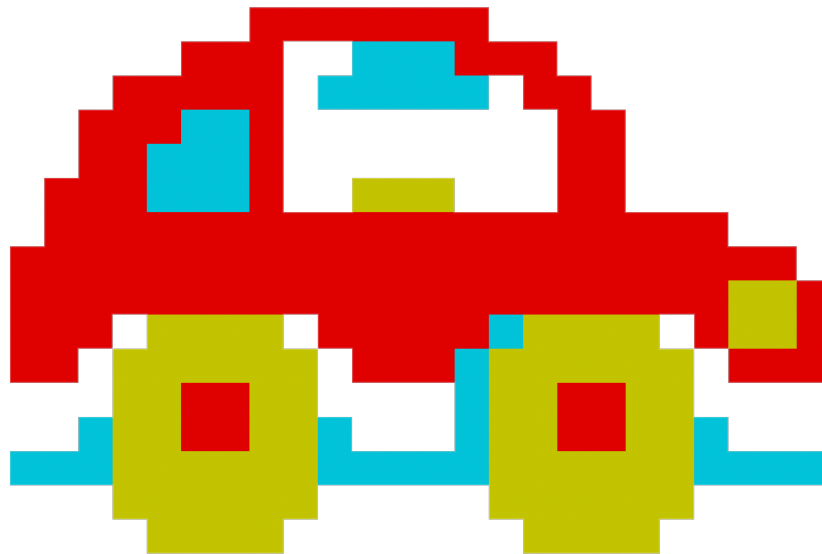
**Boot** - If this setting is enabled, the game will be configured to boot automatically, bypassing the Game Menu. If a game is marked for booting, but is not enabled, then this setting has no effect. If multiple enabled games are set to boot, the game with the lowest slot number will boot. To abort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

**Menu Name** - 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 Game** - 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 Reset (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.

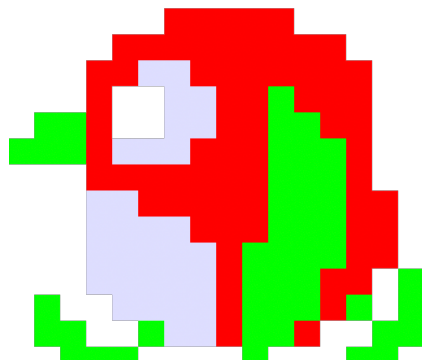
**Test P1** - Enter test mode by pressing *Player 1 Start*. The 4 cardinal directions will be displayed for each corresponding movement of the Player 1 joystick (Up, Down, Left, and Right). Pressing *Player 1 Button 1*, or *Player 1 Button 2*, will display "BUTTON1" or "BUTTON2" accordingly.

**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 Game Menu after launching a game. The default setting is *Player 1 Start* + *Player 2 Start* (press and hold 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 should only be used if you have no games enabled that make use of a second button.



## 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.

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



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.



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

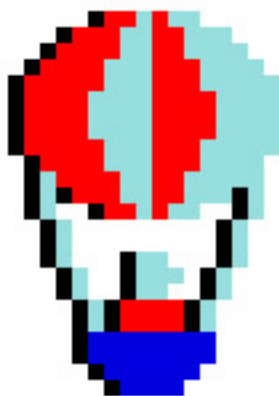
**Flip Screen** - If the BitKit displays upside-down, use this option to change the screen orientation. This setting works in combination with each game's *Cocktail* setting, to ensure the proper screen orientation for both players.

## **Vertical and Horizontal Position**

These two options can be used to center the display image so it is consistent between hardware platforms. First, set the BitKit on the Crosshatch test screen, and use the controls on your monitor to adjust screen size and position.

**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.

**Horz Pos**- Use this setting to move the image left or right. The default setting is 3, with a range of 1-7. Note this setting has no effect for Nibbler hardware games (Nibbler, Fantasy, Pioneer Balloon, Vanguard, and Zarzon).



## 3: Special Features

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

### NIBBLER

**Practice** - This setting can be used to set the game speed at a fixed level for all waves (only available for *Nibbler 9*). Normally, the game speed will increase as you complete waves, until maxing out before reaching wave 32. High score saving is disabled when this setting is enabled.

**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 speeds up the game by ~50%. This setting can be thought of as “*Dwayne’s Mode*” (from the documentary *Man Vs. Snake*). This setting also causes gameplay artifacts, such as abbreviated sound effects, a faster title screen sequence, and a faster death sequence for Nibbler.

### 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

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

## PAC GAMES

**Turbo** - Equivalent to the “*fast hack*” popular on Pac-man. This setting is available for all Pac games, bootlegs, and variants (Piranha & Titan).

## THE GLOB / BEASTIE FEASTIE

**Difficulty** - The range of values is 1-8 (default=1), 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.

*P1 Start & P2 Start buttons are mapped to the two action buttons by the Glob/Beastie Feastie code (the games were often sold as a conversion kit for Pac cabinets).*

## CRUSH ROLLER

**Teleport** - This setting enables a randomly placed teleport space that appears in the maze. Entering the teleport will move the player to another location, and can be usefull for escaping the enemies.



## SCRAMBLE / SUPER COBRA

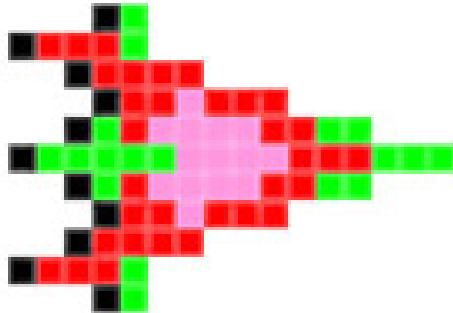
**Bomb P1 Btn** - This setting will map the *P1 Start* button to act as a second button (bombs) for a control panel with only a fire button.

## TURTLES

**Red PROM** - Enables red color palette instead of the default blue dominated color scheme. It is not known which color palette was used for the original release of Turtles. All examples in the wild that have been documented by photo or video seem to have the Red color scheme, but in MAME, Turtles has a blue palette.

## GALAGA

**Fast Shot** - Use this setting to enable the “fast shot” hack, which gives the player rapid fire and makes the game considerably easier.



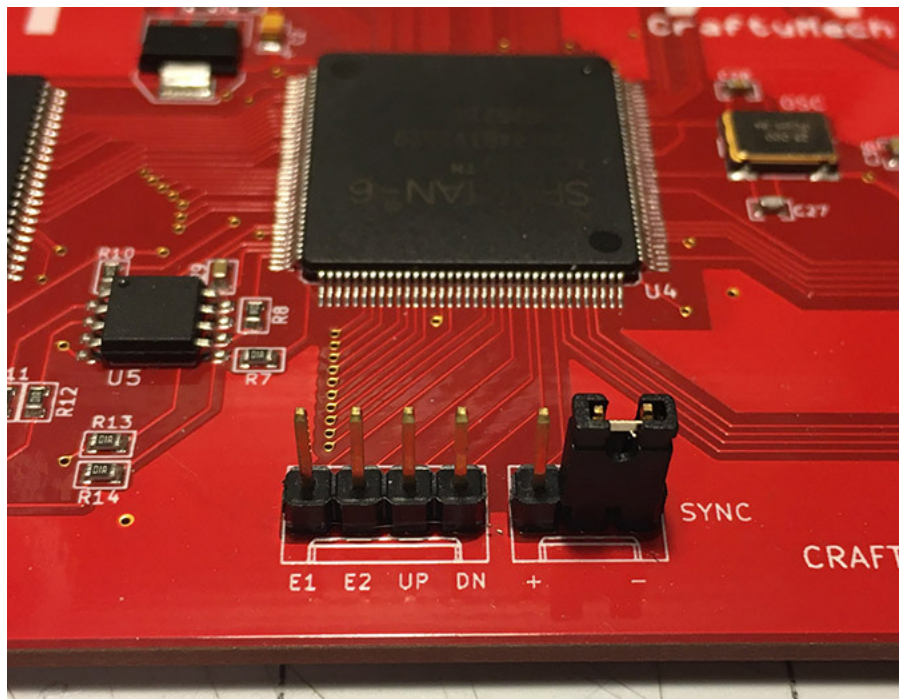
# 4: Troubleshooting

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).

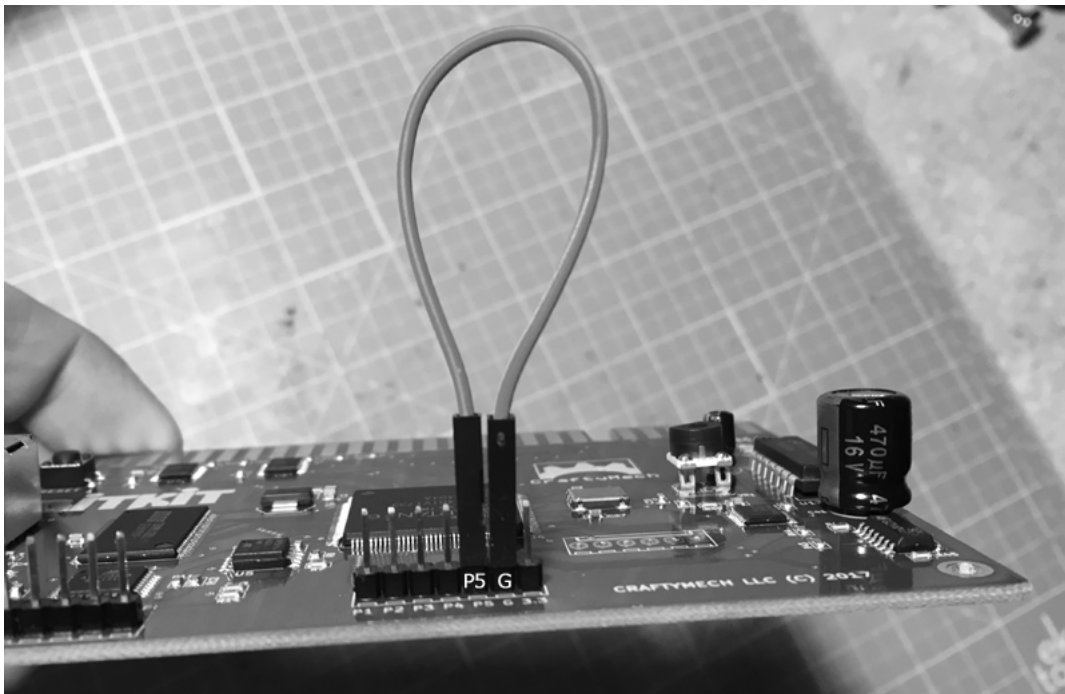
The JAMMA standard specifies negative composite sync. First ensure that the video cable to the monitor is properly connected to the -sync input. For most monitors, only a connection to the -H pin is required. Some monitors require both -H & -V pins to be connected, in which case you can install a short 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. BitKits made after 2018 have a Sync header on the bottom edge of the top side of the pcb. The default jumper position is for -sync, but by moving the jumper one position to the left, +sync is



selected. The sync change is immediate and does not require a restart of the BitKit.

Early model BitKits have a 7pin “expansion” header on the bottom edge of the top side of the pcb. 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 horizontal sync/hold pot.

Start with the BitKit Menu, and adjust screen position and sync to optimize the picture. Then launch one of the games that is out of sync (Nibbler and Vanguard are the usual suspects), and slowly adjust the sync/hold pot to stabilize the picture. Repeat this process until switching back and forth does not cause the monitor to lose sync.

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

The Nibbler hardware games have slightly different sync timing than the other platforms. These games are Nibbler, Fantasy, Pioneer Balloon, Vanguard, and Zarzon. If you find that the Nibbler hardware games are shifted right/left respective to the other games, you can use this approach to fix the problem:

1. Launch Nibbler, and use your monitor's Vertical position control to center the screen. Note because the monitor is vertical, this will actually adjust the side-to-side position of the picture.
2. Exit Nibbler, back to the BitKit Menu. Now the problem will be reversed, and the BitKit Menu will be shifted left/right of center. Adjust the **Options->Video->Horz Pos** setting so that the BitKit Menu is properly centered again. This setting has no effect for Nibbler hardware games, so now all BitKit games will be properly centered.



## 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.

Contact [sales@craftymech.com](mailto:sales@craftymech.com) for ordering information.

