

## **Yakuza Series USB Upgrade For MacDev Cyborg RX Boards**

Tengu Graphical Pixel Editor by Tadao Technologies LLC, pat. pend.

### **FEATURES**

- Yakuza Series OLED graphical display system which shows eye status, battery life, current fire mode, max rate of fire, game timer, and menu system
- Microchip PIC18F2550 microcontroller runs at up to 48 Mhz and provides Full Speed USB 2.0 (12Mbit/s)
- Tengu USB interface for Windows XP and Vista provides free firmware updates, custom boot screens, settings adjustments, and more
- Zero power drain while turned off (less than 0.0001 mA)
- Industry first anti-breach bounce software reduces chopping when a loader is running out of paintballs
- Multiple modes of fire ensure compliance with all major tournament series: unlimited semi-automatic, adjustable semi-automatic, PSP ramping, PSP 3 round burst, NXL full-automatic, Millennium ramping, custom ramping, auto-response, 3 round burst, and full-automatic
- Tadao trigger logic asynchronously monitors the trigger switch, using an interrupt based scan at up to 12 million times per second for the quickest response time and fastest semi-automatic
- Tadao dynamic eye logic watches for the bolt to return every shot, cycling the marker as fast as possible
- Rate of fire adjustable from 5 to 30 bps in 0.1 bps increments, plus unlimited rate of fire
- Extremely easy to use OLED graphical and text based menu system for changing settings
- All settings are stored in non-volatile memory so they are not lost when the battery is disconnected
- Spring battery contacts so there's no wiring harnesses to break or wear out
- Five custom user profiles allow you to save settings for specific tournament series or performance tuning
- Additional features include adjustable debounce, anti-mechanical bounce, cycle percentage filter, anti-bolt stick, ball in place delay, bolt delay, eye modes, ramp start, ramp percentage, breakout modes, game timer, auto power down timer, shot counter, screen brightness, and more

### **BOARD OPERATION**

Turn on the board by pushing the power switch. The OLED display will show the boot screen, followed by the main screen with the current fire mode, rate of fire, battery, and eye status visible.

Turn off the board by pressing and holding the power switch for at least 1 second. The OLED display will turn off to indicate the board has shut down.

The eye system is toggled on and off by pressing the eye switch on the back of the frame. The OLED display will reflect the eye status.

If used, the eye system cycles the marker as fast as possible. During each shot the eyes watch for the bolt to return, ending the current firing cycle and starting another as quickly as the pneumatics allow. If the eye system is continually blocked (e.g. putting your finger in front of the eyes) and is unable to see the bolt return after every shot, the max rate of fire will be reduced to prevent further chopping, and the OLED display will show an eye malfunction. Firing the marker with paint and air will utilize the eye system correctly, maximizing the rate of fire.

The programming menu system is activated by holding down the trigger while turning the board on. The OLED display will show "Menu system initiated...." Further details regarding the menu system can be found below.

If selected in the menu system, the game timer will replace the current rate of fire indicator on the OLED display. The game timer will start after the first trigger pull.

### **USB**

Your Yakuza Series USB board has full USB 2.0 functionality, and works in tandem with the Tengu USB interface, which can be downloaded online at <http://www.tadaotechnologies.com/productcart/pc/viewContent.asp?idpage=15>. Tengu allows you to update the firmware on your board, create and save custom boot screens, modify all the settings, and more. To run the Tengu interface you need a mini-B USB cable and a PC running Windows XP or Vista. XP users will also need to download the Microsoft .NET Framework 2.0 or newer. Refer to the Tengu user guide for information regarding USB installation and using the Tengu USB interface.

## OLED DIAGRAMS

The OLED display built into the Yakuza series board shows the user a multitude of information via text and icons. The software is written with performance in mind, and will not update the screen until the user stops shooting for just a fraction of a second. This ensures that the screen does not interfere with the timings of the marker.

The battery indicator shows battery life by displaying a bar within the icon. The longer the bar, the higher the battery level. A low battery is reached at approximately 7.5 volts, but if quality alkaline batteries are used, the remaining power should be adequate for at least one more case of paint.

The eye indicator is displayed as a circular icon, which shows when the eyes are blocked or malfunctioning. If the eye system is off, the indicator displays “off.” If the eye system has a malfunction from not seeing the bolt return, it will show an X.

### Empty breech:



### Blocked breech:



### Bolt not seen returning:



### Eyes off:



## MENU SYSTEM

The Yakuza menu system allows the user to quickly and easily change a multitude of settings. The text based menu is much faster and easier to understand than LED based programming modes.

To boot into the menu system the user must hold down the trigger while pressing the power switch to turn the board on. After the menu boot message, the displayed setting will be the last one that was modified. If this is the first time the board has been booted into the menu system, it will show the fire mode.

Scrolling through the settings is done by pulling and releasing the trigger. The menu will wrap around to the beginning when the last setting is reached. You can scroll backwards through the settings by pushing the eye button. Once the first setting is reached it will wrap around to the last setting.

To change a setting the user must quickly press and release the power switch. The OLED screen will reflect this by displaying “set” in front of the current value. The setting can be modified at this point by pulling and releasing the trigger, which will advance the current value. Once you reach its maximum or last value, it will loop back to the lowest value. You can also decrement the value by pushing the eye button. After the desired value is displayed, you can save the setting by pressing the power switch. The “set” designation next to the value will disappear.

Example of changing the maximum rate of fire from 10 to 20:

1. Boot into programming mode by holding the trigger while pressing the power switch.
2. The first setting is fire mode. Pull the trigger one time to advance to max rate of fire.
3. Press and release the power button quickly. The “set” designation will display next to the current value.
4. Pull and release the trigger 10 times to increment the value from 10 to 20.
5. Press and release the power button quickly. The OLED screen will remove the “set” designation from view and save the setting.
6. Cycle through additional settings using the trigger, or exit programming mode by holding the power switch for 1 second, until the OLED screen turns off.

**Tournament lock:** The tournament lock prevents access to the menu system while enabled. It can be toggled on and off while the board is powered up in the main firing mode (not the menu system) by holding the lock switch on the surface of the board for 2 seconds. The OLED screen will display the status as it changes.

## SETTINGS

### Fire mode (default semi-automatic unlimited)

1. Semi-automatic unlimited
2. Semi-automatic adjustable
3. PSP ramping – 123 shots semi, on 4<sup>th</sup> shot ramps at 5 pulls per second, resets after 1 second
4. PSP burst – 123 shots semi, on 4<sup>th</sup> shot fires 3-round burst, resets after 1 second
5. NXL full-automatic – 123 shots semi, on 4<sup>th</sup> shot fires full-automatic, resets after 1 second
6. Millennium ramping – 123 shots semi, on 4<sup>th</sup> shot ramps at 6 pulls per second, ignores ramp start setting if less than 6 pulls per second
7. Custom ramping – user adjustable ramping, select custom ramp start and ramp percentage

8. Auto response – fires on each pull and release
9. Burst – 3-round burst
10. Full-automatic – 1 shot semi, on 2<sup>nd</sup> shot fires full-automatic, resets after 1 second

**Maximum rate of fire (default 10 bps, range 5-30 and infinity)**

The semi-automatic unlimited fire mode ignores this value, making it easy to switch back and forth between semi-automatic and PSP gun rules without modifying more than one setting. Adjustable from 5 to 30, with an unlimited option designated by the infinity symbol.

**Fine rate of fire timing (default 0.0, range 0.0 to 0.9 additional bps):**

Fine adjustment of the max rate of fire in 0.1 bps increments, from 0.0 to 0.9 additional bps.

**Game timer (default off, range 1-60 minutes):**

Enables and sets the game timer, which replaces the rate of fire indicator on the OLED display when turned on. The game timer is adjustable from 1 to 60 minutes.

**Debounce (default 5 ms, range 0.5-25.0 ms):**

The amount of time the trigger must be released for the microcontroller to allow the next trigger pull. Asynchronous interrupt based scan up to 12 million times per second that is run independently from code execution. Higher values reduce bounce.

**Anti-mechanical bounce (default 1, range 1-4):**

Helps eliminate mechanical bounce which can cause a loosely held paintball marker to go full-auto.

**Cycle percentage filter (default 2, range 1-10)**

Secondary debounce filter which adjusts how far through the firing cycle that additional buffered shots are allowed. A setting of 1 turns this filter off, while settings 2 through 10 set the percentage of the cycle that must pass before shots may be buffered. Higher settings will reduce bounce.

**Dwell (default 10 ms, range 0.5-25.0 ms):**

The amount of time the solenoid is energized during each firing cycle. Lower is less consistent, higher is less efficient.

**Anti-bolt stick (default off, range 1-10 ms)**

Bolt stick can occur when the o-rings in the bolt settle or stick, causing the next shot to have lower velocity. If the marker is left sitting for more than 20 seconds, ABS adds extra dwell to ensure the next shot has proper velocity. The default is off.

**BIP delay (default 1, range 1-10 ms):**

A slight delay that allows each paintball to settle in the breech before firing.

**Bolt delay (default 5, range 1-15 ms):**

A delay that gives the bolt enough time to block the eyes on the forward stroke. Too low will cause blank or skipped shots. Too high can slow the marker down.

**Eye mode (default forced)**

1. Forced with force shot – marker only fires when a paintball is present, unless a force shot is initiated by holding down the trigger for ½ second.
2. Delayed – the eyes will watch for a paintball for up to 500 ms after each pull, then fire. This is useful for sound activated loaders and was the stock setting on original Intimidators.

**Ramping start (default 6, range 4-14 pulls per second):**

How fast you pull for the ramping fire modes to start adding additional shots. Ramping modes only. Millennium mode will ignore settings below 6 pulls per second, automatically using 6 pulls per second.

**Ramping percent (default 500%, range 10%-500%)**

Adjusts how much the software helps the user. A 50% ramp will add 50% of the user's pulling rate to the current rate of fire. (i.e. if you pull 8 times per second, it will add an additional 50%, meaning the gun will fire 12 times per second)

**PSP/Millennium mode semi shots (default 3, range 1-5 shots):**

Sets the number of semi-automatic shots before ramping begins in any of the PSP or Millennium fire modes.

**PSP/Millennium mode reset time (default 900 ms, range 500-2000 ms):**

Adjusts the reset time for any of the PSP or Millennium fire modes for when the user stops shooting before it reverts back to the initial semi-automatic shots, as selected in the previous setting.

**G mode or “breakout mode” (default off)**

This breakout setting provides unlimited full-auto, which then falls back to the user selected fire mode, on the 1<sup>st</sup>, 2<sup>nd</sup>, or 3<sup>rd</sup> shot after turning the board on. Breakout modes are illegal for use in all tournament series and most recreational paintball fields. **Tadao Technologies LLC takes no responsibility for the user’s choice in using breakout modes.**

**Rate of fire display mode (default average)**

1. Maximum – displays the highest achieved rate of fire based on the shortest time between any 2 shots.
2. Average – displays the highest achieved average rate of fire based on 3 consecutive shots.
3. Off – compact display mode that reduces power consumption, and doesn’t show a rate of fire value.

**Brightness (default 5, range 1-5)**

Allows adjustment of the OLED display brightness. Lower settings are less bright, with a setting of 1 useful for night play and scenario games.

**Boot screen timer (default 1.5 seconds, range 0.0 to 3.0 seconds):**

Adjusts how long the boot screen is displayed when the board is turned on.

**Auto-off timer (default 30 minutes, range 5 to 60 minutes, or disabled):**

Adjusts how long the board must sit idle before automatically powering down to conserve batteries.

**Shot counter:**

Displays the number of shots. Can be reset by pressing/releasing the power switch.

**Save/Load profile:**

Allows the user to save or load settings in 5 separate profiles. Both saving and loading profiles follow the same operation. Enter the setting by pressing the power switch, then use the trigger to scroll to whichever profile you want to save or load. Press the power switch once the desired profile is selected. The board will prompt you for confirmation of the save or load, and then proceed to complete the action, or if aborted, return back to the main setting menu.

**Reset**

Allows the user to perform a settings reset, which returns all settings to their default values. Saved profiles and the boot screen image will not be reset.

**Version**

Displays the current software version running on the Yakuza series board.

## RECOMMENDATIONS

**Settings**

The Yakuza series ship with default settings which are tuned for a wide range of trigger adjustments and general usage. Obviously certain tournament series allow alternate fire modes with specific characteristics. The following is a list of settings which will give you a baseline. Ultimately, every marker is unique, and may require different settings for optimal performance.

**Semi-only tournaments:** Use the default settings, possibly only changing debounce, AMB, and CPF to suit your personal trigger adjustments.

**PSP:** Use the PSP ramping or PSP burst fire modes, with maximum rate of fire set to the required cap for the league (for 2009 this should be either 10.5 or 12.5 bps, depending on your division). Make sure debounce is near default values. The PSP/Millennium semi shots setting should be at 3, and the PSP/Millennium reset time should be 1000ms or less.

**Millennium:** Use the Millennium ramping fire mode, with maximum rate of fire set to the required cap for the league (for 2009, this should be similar to the PSP). The PSP/Millennium semi shots setting should be at 3, and the PSP/Millennium reset time should be 1000ms or less.

Many European tournaments besides the Millennium series utilize semi-automatic, but capped at 15 bps. Select the capped semi-automatic fire mode for these events.

### **Care and cleaning**

Your Yakuza series board includes a conformal coating to help protect against damage caused by moisture from things such as broken paint or rain. Under normal conditions, the board should continue to operate fine with small amounts of moisture present. However, paint is slightly corrosive and can destroy the conformal coating over time. In the event that you get broken paint or water on the electronics, unplug the battery, and then use rubbing alcohol and a blast of compressed air to clean the board off. The compressed air will ensure that everything is cleaned out from beneath the components and connectors.

### **Batteries**

Tadao Technologies recommends the use of quality alkaline batteries such as those made by Duracell and Energizer. Photo lithium 9 volt batteries are also adequate. Batteries labeled as “heavy duty” or “super heavy duty” are not true alkaline, and will cause inconsistent operation, or may not properly power the electronics. Rechargeable batteries are also not recommended because they typically do not provide enough current.

### **Trigger adjustment and switch life**

The trigger switch used on the Yakuza series boards is a high quality tactile lever switch made by Omron. It has a life expectancy of several million actuations. The life of a trigger switch on a paintball marker can be substantially shortened by using too short of a trigger pull. It is imperative that there is at least a tiny amount of travel before and after the actuation point. It is also extremely important that some kind of trigger return force is used, such as a spring or magnet. Excessive bounce may occur if a spring or magnet is not used, or the actuation point is too close to the beginning or end of the trigger pull.

#### TERMS OF USE

Use of this product constitutes agreement to the following:

The customer assumes all risk for the use of this product and is solely responsible for determining its suitability for use by any individual or installation in any specific marker. Under no circumstances shall Tadao Technologies LLC be held liable for damages resulting from the use or misuse of this product.

Further warranty information is available at [www.tadaotechnologies.com](http://www.tadaotechnologies.com).