

Yakuza Series USB Board
For the Eclipse E2 Autococker Frame
Tengu Graphical Pixel Editor by Tadao Technologies LLC, pat. pend.

FEATURES

- Fully functional in the Eclipse E2 Autococker frame with both coil based sears or MQ valves
- 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 7, Vista, and XP 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-breech bounce software reduces chopping when a loader is running out of paintballs
- RF socket and wiring harness included to support Magna, Pulse, and other RF transmitters
- 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
- Select fire functionality allows up to three separate fire modes to be accessed on the fly while playing
- 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
- Multiple custom user profiles allow you to save settings for specific leagues 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
- Uses the stock optical trigger sensor for drop-in functionality

INSTALLATION

Installation of the Yakuza board must be carefully done to avoid damaging the electronics or wiring harnesses.

1. Remove the grip panel from the right side of the grip frame, exposing the battery and circuit board.
2. Remove the battery and unplug the eye and solenoid harnesses.
3. Remove the 3 mounting screws.
4. Gently pull the stock board out of the frame.
5. Make sure to keep track of the 3 switch contacts.
6. Insert the Yakuza board into the grip frame.
7. Replace the 3 mounting screws, making sure the three switches sit snugly against the rear of the frame.
8. Plug the eye and solenoid harnesses back into the appropriate sockets.
9. Replace the battery. The positive terminal is towards the front of the frame, as shown by the + and – marks on the surface of the board.
10. Replace the grip panel.

BOARD OPERATION

Turn on the board by pushing the middle button. 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 middle button 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 and holding the top button for 1 second. 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 open, a paintball to load, and the bolt to close. The eye system times the autococker for you to some extent, and will fire as quickly as the pneumatics and your loader allow.

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 must first be primed by holding down the trigger for 4 seconds. A “timer ready” message will flash on the display. The game timer will then start on the next trigger pull.

SELECT FIRE

Software releases dated after **July 1, 2009**, contain the new select fire functionality. This allows you to pick up to three different fire modes which can be cycled through during game play. The modes are chosen in the programming menu using the fire mode 1, 2, and 3 settings. You can choose to use just one (which disables select fire), two, or three modes at a time.

If select fire modes are enabled, you can cycle through them during play by pressing the bottom switch for ½ second. The OLED display will show the current fire mode as it changes. All fire modes share the same rate of fire setting, unless unlimited semi-automatic is chosen. This allows you to have combinations such as unlimited semi-automatic, 15 bps ramping, and 15 bps full-automatic.

Unless specifically allowed, select fire functionality should not be used in tournaments. It is strongly advised to consult both tournament rules and local field regulations before use. Tadao Technologies LLC takes no responsibility for the user’s choice in using select fire functionality.

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 7, Vista, or XP. 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 breach:



Blocked breach:



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 turning 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 using the top and bottom buttons. The menu will wrap around to the beginning when the last setting is reached.

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 pressing the top or bottom buttons, which will increment or decrement the current value. Once you reach its maximum or last value, it will loop back to the lowest value. 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 turning the board on.
2. The first setting is fire mode. Press the top button one time to advance to max rate of fire.
3. Press and release the middle button quickly. The “set” designation will display next to the current value.
4. Press and release the top button 10 times to increment the value from 10 to 20.
5. Press and release the middle button quickly. The OLED screen will remove the “set” designation from view and save the setting.
6. Cycle through additional settings using the top and bottom buttons, or exit programming mode by holding the middle button 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 4th shot ramps at 5 pulls per second, resets after 1 second
4. PSP burst – 123 shots semi, on 4th shot fires 3-round burst, resets after 1 second
5. NXL full-automatic – 123 shots semi, on 4th shot fires full-automatic, resets after 1 second
6. Millennium ramping – 123 shots semi, on 4th shot ramps at 5 pulls per second, resets after 1 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 – fires full-automatic, resets after 1 second

Fire mode 2 (default none)

This setting allows the user to select a secondary fire mode which can be cycled through during play. Any fire mode can be chosen from the normal fire mode list, or it can be set to none to disable select fire functionality.

Fire mode 3 (default none)

This setting allows the user to select a tertiary fire mode which can be cycled through during play. Any fire mode can be chosen from the normal fire mode list, or it can be set to none to disable select fire functionality.

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.

Optical Buffer (default 25, range 5-75)

The use of an optical switch makes it possible to detect how far the trigger actually blocks the sensor during each pull. The optical buffer setting allows you to lengthen or shorten the approximate distance that the trigger must be moved to determine that the trigger has been released. Higher values will reduce bounce.

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 3.5 ms, range 1.0-25.0 ms):

The amount of time the solenoid is energized during each firing cycle. Lower is less consistent, higher is less efficient, and will consume more power.

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. This setting should only be used with MQ valves.

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

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

Eye mode (default reflective; other settings are break-beam and disabled)

The Yakuza E2 board supports the stock reflective eye, but can also use Ego break-beam eyes if your autococker is milled and equipped to use them. Owners without an eye system can also disable it so the board boots into eyes off mode and ignores the eye toggle switch.

Eye sensitivity (default 150, range 5-250, for reflective eye sensors ONLY)

Allows you to adjust the reflective eye's sensitivity. When the setting is adjusted, it will show the real-time digital sensor reading in parentheses on the lower right side of screen. This allows you to pick the correct setting so your paint and bolt are read properly.

In order to correctly set the sensitivity, select a value that is between the readings shown when the breech is empty and when the breech is blocked. For instance, if the reading is 120 when the bolt is forward, and 200 when the breech is empty, try a value of 160.

Bolt open delay (default 6 ms): A small delay between the end of the dwell time for the hammer and the beginning of the bolt moving backwards to load another paintball. Lower values increase the potential rate of fire, but can cause blowback up the feed tube.

Bolt open time (default 40 ms): The time the bolt spends in the rearward position waiting for a paintball to load. If the eye system is enabled the bolt open time will automatically be reduced if the eyes see a paintball fall into the breech. If the eye system is disabled it is very important that the bolt open time is long enough to allow paintballs to feed.

Watch time (default 500 ms): The additional amount of time that the eye system will wait for a ball to fall into the breech if one is not detected during the bolt open time.

Bolt close delay (default 30 ms): amount of time after the bolt begins to close before the next cycle is allowed to begin. If set too short your autococker will appear to double feed or may not fire at all while trying to shoot fast.

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 200-2000 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 1st, 2nd, or 3rd 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 does not 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.

Screen orientation (default vertical): The screen can be oriented in three ways: landscape left or right, or vertical.

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-dim timer (default off, range 1 to 15 seconds):

Automatically dims the OLED brightness to the minimum value after the specified time to help conserve battery life. The brightness will return to the user specified setting if the marker is fired or any input is provided via the various switches.

Screensaver timer (default off, range 1 to 15 seconds):

Displays the boot screen image after the specified amount of time passes. The main operating display will return if the marker is fired or any input is provided via the various switches.

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.

Autococker Timing/Rate of Fire Information

Total cycle time for the autococker is:

Eyes off: dwell + bolt open delay + bolt open time + bolt close delay

Eyes on: dwell + bolt open delay + bolt open time + ball in place delay + bolt close delay
(The watch time setting will be placed after the bolt open time if no paintball loads immediately)

With an autococker, the max rate of fire setting is used as a top end cap, but does not force the marker to fire at the exact rate of fire value.

For example, the default values are:

Dwell 3.5, bolt open delay 6, bolt open time 40, bolt close delay 30

$3.5 + 6 + 40 + 30 = 79.5$ milliseconds total cycle time, which is about 12.5 bps.

If you set the max rate of fire to 20 bps, the gun will still only fire 12.5 bps.

If you set the max rate of fire to 10 bps, the gun will fire 10 bps.

The max rate of fire setting is used to limit the rate of fire, but will not force it to fire faster than the timing settings permit.

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, CPF, and the optical buffer (if using the optical trigger switch) 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.

WARRANTY & TERMS OF USE

Use of this product constitutes agreement to the following:

Tadao Technologies LLC warrants to the original purchaser that this product is free from defects in material and workmanship during normal use and service. Warranty service extends only to the original purchaser who must provide valid proof of MAP purchase from an authorized Tadao dealer.

This warranty applies only to original factory components, and any modification to or tampering with original factory components by anyone other than Tadao Technologies LLC will void this warranty. This warranty does not cover defects or malfunctions which Tadao Technologies LLC determines were caused by water, paint, fire, physical damage, improper installation, customer misuse, modification, or abnormal wear and tear to parts. At its discretion Tadao will repair or replace the product within a reasonable period of time. Discontinued products are subject to warranty repairs only.

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 market. 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.