

LED CONVERSION BOARD - YAKUZA SERIES AUTOCOCKER

The LED conversion board replaces the OLED screen mini-board on your Yakuza Series board. Combined with new firmware, your board will function similarly to the Ebisu Series, using a multi-color LED to show the operating status. If your board has USB, you will be able to change settings using the Tengu USB interface. Both USB and non-USB boards can also change settings with the Ebisu/Musashi style LED programming mode.

INSTALLATION

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

1. Remove the grip panels to expose the circuit board and remove the battery.
2. Unplug the solenoid and eye harnesses and remove the board from the grip frame.
3. Gently pull the OLED screen mini-board off of the main board. A pair of friction based three pin connectors along the bottom edge are all that secure it. It is important that the pins on the main board do not get bent or damaged.
4. Line up the new LED conversion board with the three pin connectors on the main board. The LED conversion board orientation should have the three pin connectors at the bottom edge, with the cut out notch towards the three switches. Please refer to the pictures on the Tadao site product page for the conversion boards for additional clarification.
5. Gently press the LED conversion board into the three pin connectors on the main board.
6. Reinstall the board into the grip frame and plug in the solenoid and eye harnesses.
7. If you have a USB board and have not done so already, update your board with the new conversion firmware using the Tengu USB interface. (See USB section below)
8. Replace the battery.
9. Replace the grip panels.

BOARD OPERATION

Turn on the board by pressing the power switch (middle button).

The eye system is toggled on and off by pressing and holding the top button until the LED changes colors (approximately 1 second).

Turn off the board by pressing and holding the power switch until the LED turns off (approximately 1 second).

The multicolor LED will display different colors based on which mode of operation the marker is in:

Flickering Red – at boot time indicates an exhausted battery

Flickering Yellow – at boot time indicates a low battery

Flickering Green – at boot time indicates a good battery

Solid Blue – eyes on, ball in breech, ready to fire

Slow Blinking Blue – eyes on, empty breech

Slow Blinking Red – eyes off

Slow Blinking Yellow – eye malfunction caused by the eyes not seeing the bolt cycle

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 LED will show an eye malfunction by slowly blinking yellow. Firing the marker with paint and air will utilize the eye system correctly, maximizing the rate of fire.

If using a reflective eye with your autococker it is highly recommended that you run the eye calibration sequence built into the programming mode. Full details about this can be found in the **Eye Calibration** section near the end of this manual.

SELECT FIRE

Select fire allows you to pick two different fire modes which can be cycled through during game play. The modes are chosen in the programming menu using the fire mode 1 and 2 settings. You can choose to use just one (which disables select fire), or two modes at a time.

If select fire modes are enabled, you can cycle through them during play by pressing and quickly releasing the bottom button. The LED will flash purple once or twice to indicate which fire mode you are using 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 and 15 bps ramping.

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

If your board has a mini-B USB socket it will work with the Tengu USB interface, which can be downloaded online on the [Tengu webpage](#). Tengu allows you to update the firmware on your board and modify all the settings. To run the Tengu interface you need a mini-B USB cable and a PC running Windows 7/8, Vista, or XP. XP users will also need to download the Microsoft .NET Framework 3.5 or newer. Refer to the Tengu user guide for information regarding USB installation and using the Tengu USB interface.

MENU SYSTEM

The Ebisu series boards use a color coded menu system. Each setting has its own LED color and/or sequence assigned to it. To enter the menu system, hold down the trigger while turning the board on. The LED will show a rainbow sequence, followed by the last viewed setting.

The tournament lock must be disabled in order to change settings on the board. While the marker is turned on (but not in programming mode), push and hold the lock button located on the surface of the board. The LED will flash red or green to indicate the status of the lock. Red means the lock is on; green means the lock is off. When the lock and the marker are off, pull and hold the trigger, and turn the board on. The marker will boot into programming mode, showing a rainbow sequence before stopping at solid green. The board will remember the previously viewed setting after consecutive boots into programming mode.

Pull and release the trigger quickly to scroll forward through the settings. When the last setting is reached, it will wrap around to the beginning.

Green	Fire mode 1
Purple	Max rate of fire
Yellow	Fine rate of fire
Blue	Debounce

Red	Optical buffer
White	Anti-mechanical bounce
Aqua	Cycle percentage filter
Flickering Green	Eye mode
Flickering Purple	Eye calibration
Flickering Yellow	Dwell
Flickering Blue	Ramp start
Flickering Red	Ramp percentage
Flickering White	PSP/Millennium semi-shots
Flickering Aqua	PSP/Millennium reset time
Double Blink Green	G-mode breakout
Double Blink Purple	Bolt open delay
Double Blink Yellow	Bolt open time
Double Blink Blue	Watch time
Double Blink Red	Bolt close delay
Double Blink White	Auto-off timer
Double Blink Aqua	Fire mode 2 (for select fire)
Alternating Yellow/Blue	Save current settings to profile 1-5
Alternating Yellow/Green	Load profile 1-5 to current settings
Alternating Yellow/Red	Reset active settings to defaults (does not reset profiles)

When the LED is lit for the desired setting, press and hold the trigger until the LED goes out. When you release the trigger, the LED will blink to show the current setting. For example, if the current setting for debounce is 5, the LED will blink green 5 times. Once the LED stops blinking, you have 2 seconds to begin entering the new setting. To enter the new setting, pull the trigger the desired number of times. For example, to set the debounce to 2, you must pull the trigger 2 times. Every time you pull the trigger the LED will light. After all settings have been changed, turn the marker off using the power switch.

Since some settings may have a very high value, it is not necessary to watch the entire blinking sequence. You can bypass this by pulling the trigger one time during the blinking sequence. You can then begin entering a new value. The trigger pull that cancels the blinking sequence does not count towards the new value you enter.

Programming Example

If you want to set the max rate of fire to 20 bps, you should:

1. Make sure the marker is powered off and the tournament lock is disabled.
2. Pull the trigger and turn on the marker.
3. The LED shows a rainbow sequence then stops on solid green, which is the fire mode setting (unless previously changed to another setting before turning off the board).
4. Use the trigger to cycle through the settings until you reach the max rate of fire setting (solid purple).
5. Pull and HOLD the trigger until the LED turns off.
6. Release the trigger. The LED will blink out the current setting (10 blinks to indicate 10 bps).
7. When the LED stops blinking, enter the new setting by pulling the trigger 20 times.
8. Wait until the LED turns back on, indicating programming has been completed.
9. Turn the marker off.

SETTINGS

Fire mode 1 (default semi-automatic unlimited):

1. Semi-automatic unlimited
2. Semi-automatic adjustable

3. PSP ramping - 123-shots semi, on 4th shot ramps, 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-auto, resets after 1 second
6. Millennium ramping - 123-shots semi, on 4th shot ramps, resets after 250 ms
7. Custom ramping - user adjustable ramping, select 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

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 tournament gun rules without modifying more than 1 setting. Infinite setting only applies to eyes on; eyes off will still be limited to 30 bps.

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.

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. It uses an asynchronous interrupt based scan at up to 16 million times per second that is run independently from code execution. Higher values reduce bounce. Remember that each blink represents 0.5 milliseconds, so the default of 5.0 milliseconds will blink 10 times.

Optical buffer (default 5, range 1-15): Adjusts how much the trigger must move in front of the optical sensor to be recognized as a real pull or release. Low settings will bounce more.

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 10%, range 10-90% or off): Secondary debounce filter, adjusts when buffered shots are allowed. Higher values reduce bounce. 1 blink = off, 10 blinks = 90%.

Eye mode (default reflective): 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. The options are reflective (1), break-beam (2), or disabled (3).

Eye calibration (default 180, range 5-250, for reflective eye sensors ONLY): Runs the eye calibration routine which ensures that the reflective eye can properly detect the bolt and paintballs in the breech. On USB boards an exact value can be chosen with the Tengu USB interface, but it is recommended to run the automatic calibration built into the LED programming menu (See the below section entitled **Eye Calibration**).

Dwell (default 3.5 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. Remember that each blink represents 0.5 milliseconds, so the default of 3.5 milliseconds will blink 7 times.

Ramping start (default 5, range 4-14 pulls per second): How fast you pull for the ramping fire modes to start adding additional shots. Ramping modes only.

Ramping percentage (default 500%, range 10-500%): Adjusts how much the software helps the user while ramping. A 50% ramp adds 50% of the user's pulling rate to the current rate of fire. (i.e. pull 8 times per second and 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 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): Provides unlimited full-auto, reverting to the user-selected fire mode on the 1st, 2nd, or 3rd shot after turning on the board. Breakout modes are illegal for use in all tournament series. Tadao Technologies LLC takes no responsibility for the use of breakout modes.

Bolt open delay (default 1 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.

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. Each blink is 5 minutes, with a setting of 13 blinks disabling the auto-off timer.

Fire mode 2 (default disabled): 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.

1. Semi-automatic unlimited
2. Semi-automatic adjustable
3. PSP ramping - 123-shots semi, on 4th shot ramps, 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-auto, resets after 1 second
6. Millennium ramping - 123-shots semi, on 4th shot ramps, resets after 250 ms
7. Custom ramping - user adjustable ramping, select 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
11. Select fire disabled

Save current settings to profile 1-5: Allows the user to save the currently selected settings as 1 of 5 profiles, which can be loaded again later. These profiles can also be configured using the Tengu USB interface. To use: pull and hold the trigger until the LED turns off. Release the trigger. The LED will blink once. Enter in the profile number to which you would like to save the current settings by pulling the trigger the desired number of times.

Load profile 1-5 to current settings: Allows the user to load 1 of the saved profiles to the current settings. To use: pull and hold the trigger until the LED turns off. Release the trigger. The LED will blink once. Enter in the profile number you would like to load to the current settings by pulling the trigger the desired number of times.

Reset: Allows the user to restore the active settings to their default values. Profiles will not be changed. To use: pull and hold the trigger until the LED starts flickering to indicate that the reset has begun. Release the trigger. Once the LED returns to the alternating yellow/red sequence, the reset has completed.

EYE CALIBRATION

If using the reflective eye with your autococker, it is necessary to calibrate the sensitivity so it properly recognizes the bolt movement and paintballs when they fall in the breech. This should be done prior to using it or else the eye system will not function.

To start the calibration sequence:

1. Boot into programming mode.
2. Cycle to the eye calibration setting (flickering purple).
3. Pull and hold the trigger until the LED begins rapidly blinking green.
4. Ensure that the bolt is **forward**, blocking the reflective eye.
5. Press the top button on the rear of the grip frame. The LED should now start rapidly blinking blue.
6. Ensure that the bolt is pulled **to the rear** so the breech is empty and the reflective eye is not blocked.
7. Press the top button on the rear of the grip frame.
8. If the calibration was successful, the LED will show flickering purple in the programming menu. If the calibration was NOT successful, the LED will rapidly blink red before returning to flickering purple in the programming menu.

After calibration it is recommended to verify that the reflective eye is working by exiting programming mode, turning the board back on, and watching the LED show solid blue and slow blinking blue as you move the bolt forward and back.

If the LED rapidly blinked red after the last calibration step, this means that the reflective eye was unable to tell the difference between the bolt being forward and back. Typically this means that the eye may be dirty, broken, or installed incorrectly.

AUTOCOCKER TIMING AND 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 1, bolt open time 40, bolt close delay 30

$3.5 + 1 + 40 + 30 = 74.5$ milliseconds total cycle time, which is about 13.4 bps.

If you set the max rate of fire to 20 bps, the gun will still only fire 13.4 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.