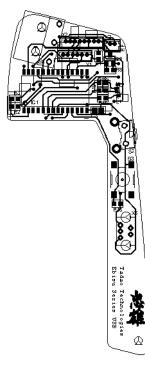# Ebisu Series USB Board
Bob Long Victory, Vice, Closer, Protégé, Marq, And G6R Intimidator
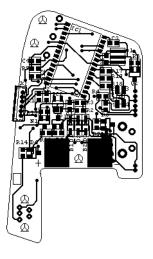
Full manual available at www.tadaotechnologies.com

FEATURES

- Licensed 4C^{TM} technology enables automatic detection and use of 4 Eye boards to dynamically maximize rate of fire and reduce chops
- Ebisu Series LED display system shows eye status, battery life, 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 from home, settings adjustments, and more
- Zero power drain while turned off
- Industry first anti-breech bounce software reduces chopping when a loader is running out of paintballs
- RF socket supports wiring harnesses for Magna, Pulse, and other RF transmitters (not on G6R board)
- 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 LED 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, and more
- High quality Omron 80 gram trigger microswitch

Victory/Vice/Protégé/Marq   **G6R Intimidator**

INSTALLATION

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

1. Remove the grip panel from both sides of the grip frame, exposing the battery and circuit board.
2. Remove the battery and unplug the 8 pin (Victory/Vice/Protégé/Marq) or 6 pin eye and 2 pin solenoid (G6R Intimidator) wiring harnesses.
3. Remove the 3 mounting screws.
4. Gently pull the board out of the frame. If you use a spring to return the trigger, make sure to keep track of it and the return spring bracket that sits over the trigger switch.
5. Place the return spring bracket on the Ebisu board's trigger switch.
6. Insert the Ebisu board into the grip frame.
7. Replace the 2 mounting screws for the trigger switch and the single screw down at the bottom of the board. Do not over-tighten.
8. 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.
9. Replace the grip panels.

BOARD OPERATION

Turn on the board by pressing power switch.

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

Turn off the board by continuing to hold the power switch after the eye system toggles (approximately 2 seconds).

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.

2C eye system installed:
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.

4C eye system installed
Solid Green – eyes on, both top and bottom eyes blocked, ready to fire.
Solid Red – eyes on, top eye blocked.
Solid Blue – eyes on, bottom eye blocked.
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.

The use of the 4C™ eye system allows for much faster rates of fire because it can anticipate the next paintball being loaded into the breech and start the firing cycle early, which negates the delay time found in the pneumatics of the paintball marker. The Ebisu software was written specifically to take advantage of this arrangement, and automatically uses the top eye set when the loader is feeding fast enough. It can also determine when the top eye set is blocked by paint or debris, and will default to using only the bottom eye until the top is clear again. Once the top eye is clear, it will resume use of both eye sets.

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.

SELECT FIRE

Software releases dated after **October 28, 2010**, contain the new select fire functionality. This allows you to pick up to 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 releasing the power switch quickly. The LED will flash purple once or twice to indicate which fire mode you're 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

Your Ebisu 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, 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 3.5. 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. Toggle the tournament lock by pushing the small switch located next to the mini-B USB socket. While the marker is turned on (but not in programming mode), push and hold the lock button. 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	Anti-mechanical bounce
White	Cycle percentage filter
Aqua	Dwell
Flickering Green	Anti-bolt stick
Flickering Purple	Ball in place delay
Flickering Yellow	Bolt delay
Flickering Blue	Eye mode
Flickering Red	Ramp start
Flickering White	Ramp percentage
Flickering Aqua	PSP/Millennium semi-shots
Double Blink Green	PSP/Millennium reset time
Double Blink Purple	G-mode breakout
Double Blink Yellow	Auto-off timer
Double Blink Blue	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 the blink sequence that shows the current value by pulling the trigger once and immediately to begin enter the new value. The trigger pull that cancels the blinking 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: 1-shot semi, on 2nd 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 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 12 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.

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.

Dwell (default 6 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 6.0 milliseconds will blink 12 times.

Anti-bolt stick (default off, range 1-10 ms): If the marker sits for more than 20 seconds, ABS adds extra dwell to the next shot to prevent first shot drop 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 14, range 1-25 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 down the marker.

Eye mode (default forced):
1. Forced with force shot – marker only fires when a paintball is present or 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.

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 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): 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.

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.

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.

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.

RECOMMENDATIONS

Settings
The Ebisu 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 2010 this should be either 10.5 or 12.5 bps, depending on your division). Make sure debounce is near default values.

Millennium: Use the Millennium ramping fire mode, with a ramp start value of 5 or higher, and the maximum rate of fire set to the required cap for the league (for 2010, this should be similar to the PSP).

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 Ebisu 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 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.