



AKA Viking Board Instructions

Features

- Includes four fire modes: uncapped semi-auto, capped semi-auto, PSP ramping, and NXL full automatic
- Continuously monitors the trigger switch through the entire firing cycle
- Adjustable ABS programming prevents first shot drop off
- AMB algorithms help to eliminate mechanical bounce
- Power efficient software lengthens battery life
- Programming mode allows changes to debounce, dwell, loader delay, AMB, ABS dwell, fire mode, fire mode max rate of fire, eye mode, and bolt delay
- All settings are stored in non-volatile memory so they are not lost when battery is disconnected
- One-touch startup enables the marker to fire instantly
- Three eye modes: delayed, forced with force shot, and test
- Low battery indicator software

LED Indicator

The multi-color LED that shines out the data port shows which mode of operation the marker is currently in:

Rapid Blinking Red	At startup this indicates an exhausted battery
Rapid Blinking Yellow	At startup this indicates a low battery
Rapid Blinking Green	At startup this indicates a good battery
Solid Blue	Ball in breech, ready to fire
Slow Blinking Blue	No ball in breech
Slow Blinking Yellow	Eye malfunction; clean eyes or make sure the gun is being fired with paint and air
Slow Blinking Red	Eyes disabled, rate of fire limited to 20 balls per second in mode 1; otherwise capped at fire mode max rate of fire for fire modes 2 – 4

Power Operation

Sliding the power switch to the “on” position turns the marker on. The battery indicator will show the current power level of your battery with a flickering red, yellow, or green LED. It will then show a solid or blinking blue LED, depending on the presence of an object in the breech. Every time the marker is turned on, the eyes are enabled.

Eye Operation

The eyes are enabled when the marker is first turned on. The eyes can be toggled on and off by holding down the trigger for 3 seconds.

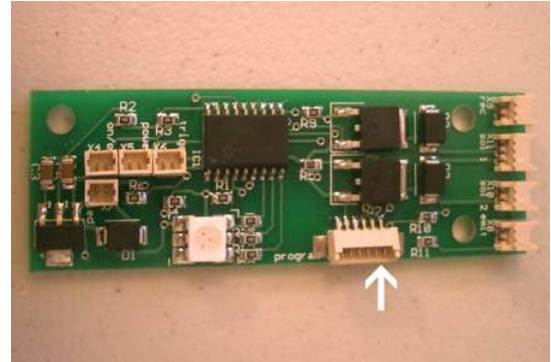
Note that the eye logic can tell the difference between paint being fired and an object constantly blocking the eyes. The eyes watch for the bolt to return every shot, so if this does not happen it will start flashing yellow to indicate an eye malfunction. Unblocking the eyes will cause it to revert back to a blinking blue LED to show that the eyes are working again and the breech is empty.

To determine if the eyes are working correctly, insert an object into the breech. Check to see if the LED changes from blinking blue to solid blue and then back to blinking blue once the object is removed.

Programming

The tournament lock must be disabled in order to change settings on the chip. By default the tournament lock is disabled. To toggle the tournament lock:

1. Turn the marker off.
2. Ground the right two pins of the programming connector together with a conductive object (see arrow in picture below).
3. Pull and hold the trigger.
4. Turn the marker on.
5. The LED will continuously flash red or green to indicate the status of the tournament lock (red is lock ON, green is lock OFF).



To change settings you must enter programming mode. While the marker and the tournament lock are off, pull and hold the trigger and turn the marker on. This will initiate the programming mode, showing a rainbow sequence, and then stop on solid green.

Pulling and releasing the trigger quickly will toggle between the different programming modes:

Green	Debounce
Purple	Dwell
Yellow	Loader Delay
Blue	AMB
Red	ABS Dwell
White	Fire Mode
Teal	Fire Mode Max Rate of Fire
Flickering Green	Eye Mode
Flickering Purple	Bolt Delay

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 button.

Programming Example

If you want to set the dwell to 20, 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 goes through a rainbow sequence then shows green. This is the debounce mode.
4. Quickly pull and release the trigger 1 time to switch to the dwell mode. The LED will show purple.
5. Pull and HOLD the trigger until the LED turns off.
6. Release the trigger. The LED will blink the current setting.
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

Debounce – The Musashi software features a hybrid debounce scheme that uses microcontroller cycles to debounce the pull of the trigger and ½ ms time increments to debounce the release. This results in a very effective debounce algorithm that does not hinder the user at any setting. At low debounce settings, however, it may cause the marker to read switch bounce as additional pulls, falsely generating shots or near full automatic fire. The setting ranges from 1 to 50 and is defaulted at 10.

Dwell – The amount of time the solenoid is energized each time the marker is fired. The default is 10 ms. The range is 1 to 30 ms. Too low of a dwell may lead to inconsistency or drop off, or may not even fire the marker. Too high of a dwell can cause bad air efficiency.

Loader Delay – Adds a slight delay after the eye has seen a ball and the bolt is cycled, causing the gun to fire. If not using force fed loaders, it may be necessary to increase this setting to prevent chopping. A setting of 1 means no loader delay, which is the fastest. The default is 2 and may be set from 1 to 50.

AMB – Allows the user to adjust the anti-mechanical bounce feature. Mechanical bounce occurs due to the kick generated during each shot and can cause the marker to “run away,” firing even after the trigger has been released. AMB helps stop markers from going full auto when the trigger is pulled very slowly. The default is 2 and may be set from 1 to 5 (1 being off). AMB is only used in fire modes 1 and 2 (semi-automatic unlimited and capped). In PSP or NXL mode AMB is disabled.

ABS Dwell – Amount of dwell time added for an ABS shot. The range is from 1 to 10 additional milliseconds of dwell. The default is 1. For a more detailed explanation of ABS see the “Additional Features” section.

Fire Mode – Included are four different fire modes (default is 1):

1. Semi-automatic, unlimited rate of fire
2. Semi-automatic, capped rate of fire
3. PSP ramping
4. NXL full automatic

Setting 1 is normal semi-automatic with an unlimited rate of fire while the eyes are enabled. When the eyes are turned off, the max rate of fire is set to 20 balls per second.

Setting 2 is semi-automatic with a capped rate of fire. It limits the maximum balls per second that can be fired. The cap is set by the Max ROF setting.

Setting 3 is the PSP ramping fire mode that works as follows:

- The first 3 shots of a string are semi-automatic
- After the 4th shot the marker will add shots as long as the user continues to pull the trigger
- If the trigger is released, the marker will stop firing immediately
- If the trigger is not pulled again within 1 second of release, the 3-shot semi-automatic count starts over

In normal operation, continually pulling the trigger faster than 5 to 6 pulls per second will effectively give the user full automatic at the max rate of fire. If the user stops shooting then resumes within 1 second, the marker will return to the max rate of fire. If the user stops shooting for more than 1 second, the next 3 shots will be semi-automatic. On the 4th shot it will resume a faster fire rate.

Setting 4 is the NXL full automatic fire mode. It functions similarly to the PSP ramping mode except after the 3rd semi-automatic shot if the user pulls and holds the trigger the marker will fire in full automatic.

Fire Mode Max ROF – The maximum rate of fire setting only applies to the 2nd, 3rd and 4th fire modes. The max rate of fire is adjustable from 14 to 20 balls per second in ¼ balls per second increments, and has an unlimited setting. The default is 3, which is roughly 14.5 balls per second. Oscillator inconsistencies from chip to chip make it impossible to time perfectly, so the only true way to check rate of fire is to use a Pact Timer or ballistic chronograph. The red radar chronographs commonly found at fields are NOT reliable.

Setting	BPS	Setting	BPS	Setting	BPS
1	14.0	9	16.0	17	18.0
2	14.25	10	16.25	18	18.25
3	14.5	11	16.5	19	18.5
4	14.75	12	16.75	20	18.75
5	15.0	13	17.0	21	19.0
6	15.25	14	17.25	22	19.25
7	15.5	15	17.5	23	19.5
8	15.75	16	17.75	24	19.75
				25	20.0
				26	Unlimited eyes on 20 bps eyes off

Eye Mode – Three eye modes are available:

1. Delayed – The marker fires ½ second after every trigger pull regardless of a ball being in the breech. This is useful for sound activated loaders because it makes sure that a shot is fired, even without paint, so the loader will continue to feed.
2. Forced with force shot – The marker only fires if paint is seen in the breech or the user pulls and holds the trigger for ½ second, thus initiating a force shot. This is the default eye mode.
3. Test – This mode is specifically for seeing how fast the user can fire the marker. The eyes work in such a way as to prevent firing if they are blocked. This mode is only for dry firing. The LED is used to show the fastest achieved rate of fire:

Red	Less than 10 bps
Yellow	Between 10 and 15 bps
Green	Between 15 and 20 bps
Blue	Between 20 and 25 bps
Purple	Between 25 and 30 bps
Teal	Between 30 and 35 bps
White	35 bps or greater

As long as the user continues to fire, the fastest achieved rate of fire will continue to be displayed on the LED. If the user stops firing for 1 second, the LED will cycle back through the rate of fire colors. The rate of fire is determined by the user’s average of 3 shots in a row. For example, you must fire 3 times in a row at 20+ bps to attain the blue level.

Bolt Delay – This setting determines how long the eyes are ignored after the dwell time ends. Some delay is necessary to allow the bolt to move far enough forward so the eye system does not mistake a small gap between a paintball and the bolt face for a bolt return. The default is 10 ms and may be set from 1 to 25 ms. Higher settings will reduce the maximum capable rate of fire, while lower settings may lead to skipped or blank shots, because the bolt does not have enough time to block the eyes on its forward stroke.

Additional Features

ABS – ABS (anti-bolt stick) programming helps to eliminate first shot drop off. First shot drop off occurs when the lube and o-rings settle or “stick” inside the marker after it has been sitting. The next shot fired will be lower in velocity because the bolt has to break free. ABS will slightly increase the dwell to compensate if the marker is left sitting for 15 seconds.

A tip for setting the debounce and AMB – Although AMB is meant as a safety feature to stop run-away markers, it also has the unfortunate side effect of hiding bounce. To test your marker for bounce, shoot it as fast as possible with a single finger. If you have bounce, you’ll see and hear double shots for individual pulls. This means you need to turn up your debounce. The slow pull test in use by some judges is not realistic for finding guns that have the debounce set too low.

Additional Information
www.tadaotechnologies.com