Vaporworks
Chaos Freestyle

The Chaos™ Freestyle board is a circuit board for the Indian Creek Designs™ Freestyle™ series paintball markers. The Chaos Freestyle board provides reliable and consistent paintball marker operation with the convenience of features such as 0-second boot time and button/trigger-adjustable fire control settings.

Contents

Installing the Board

Installing your board is a straightforward process, but we can not be responsible for damage caused by improper installation. For this reason, we ask that if you are not familiar with disassembling your paintball marker, that you please have your Chaos Freestyle board installed by a professional airsmith.

Remove Air From Marker

In the interest of safety, you must de-gas your marker before disassembling it. To de-gas your marker:

1. Turn off air supply.
2. Place marker into eye-bypass mode or hold bolt forward.
3. Pull trigger repeatedly until all gas is expelled from marker.

Remove Grip Cover and Clamshell

Unscrew the two grip screws to holding the grip cover to the grip. Detaching the grip cover exposes the clamshell. Unscrew the clamshell screws to remove the clamshell half.

Remove Circuit Board

Remove the circuit board from the retaining slot, being careful not to pull harshly on any of the wires, or damage the on/off toggle switch.

Disconnect Connectors From Old Board

Remove the wiring hardness connector from the circuit board using a firm, yet gentle grip. *Never grasp a connector by its wires*. To remove a stubborn connector, insert and twist a screwdriver between the thin gap between the connector and the socket.
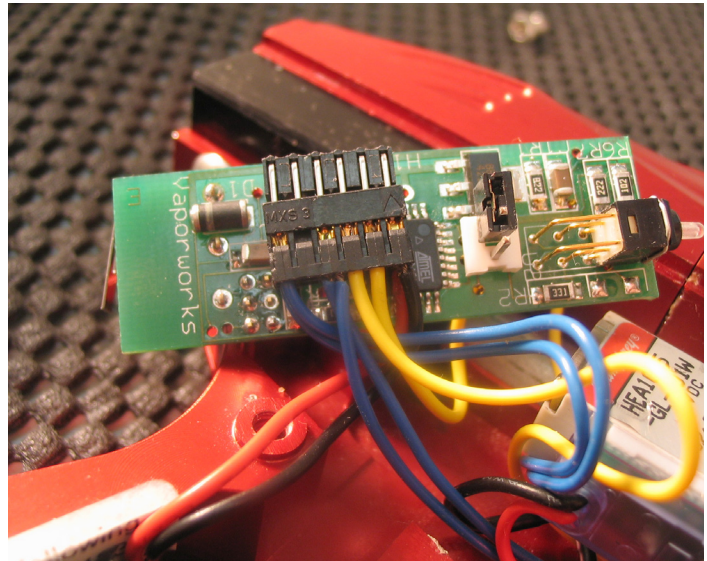
Reconnect Connectors to Chaos Freestyle Board

Attach the connector to the Chaos Freestyle board. For proper orientation, the leads in the harness connector from the battery should be the closest wires to the tournament jumper and on/off toggle switch. Refer to the picture to the right for more information.

Toggling Tourney Lock on the Chaos Freestyle Board

You can activate and deactivate the Tourney lock by installing or removing the jumper on the two taller tourney lock pins on the chip side of the circuit board. Installing the jumper enables Tourney lock. Removing the jumper disables Tourney lock.

If the tourney lock is engaged, you cannot change the dwell, debounce (mechanical and trigger), anti-bolt stick dwell, or firing mode from their current settings. If the tourney lock is engaged, the LED will be solid when idling. If the tourney lock is disengaged, the LED will blink every 0.5 seconds.

Reconnecting the wiring harness connecter

Chaos Freestyle board front side

On/Off LED Switch

Wiring harness connector

Tournament Jumper Block

Vlink programming port

Trigger switch
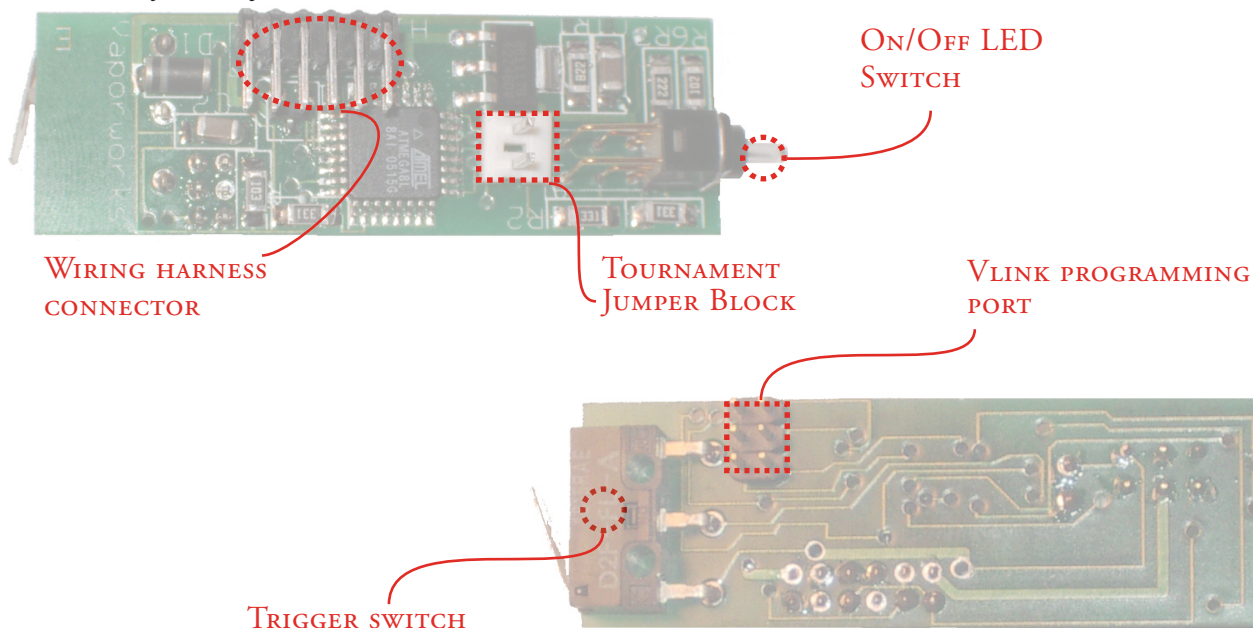
Chaos Freestyle board backside

Test the Board

Turn on the marker. The LED should light up green. If the LED does not light up, or if it blinks in the "Low battery warning" pattern, check your battery and your battery connector.

Place the marker into eye-bypass mode by either holding the trigger down for four seconds, or by holding the bolt forward. Pull the trigger a few times. You should hear a faint clicking from the solenoid after each trigger pull.

If you do not hear any clicking, you may have reversed the connector orientation. Verify that your harness are connected according to the diagrams on the preceding page and try the test again. Prolonged connection in the reverse orientation will damage the board!

Turn off your marker after the test.

Secure Chaos Freestyle Board to Grip Frame

Fold the harness wires up neatly, and place the circuit board into the grip frame, with the toggle switch sticking out the back of the grip frame. You may have to tug and fold some of the wires to seat the board flat.

Reassemble Grip

Attach the clamshell half back to the grip. Be careful not to pinch any wires between the frame and the body. Again, you may have to bend or fold some wires to seat the clamshell half flush with the marker body. Secure the clamshell in place with the four clamshell screws. Replace the grip cover and re-secure that with screws also.

Your marker is good to go!

LED Indicator

The Chaos Freestyle board contains an LED indicator in the on/off toggle switch that provides you with information about your marker's operation.

LED status	Description
Blinking	Tourney lock off
Solid	Tourney lock on
Brief flash	Shot fired
Solid after trigger pull	Eyes did not detect paint, no shot fired.
Rapid blink	Eye bypassed
"Heartbeat" blink	Low battery warning

Description of Board Settings

The Chaos Freestyle board controls the behavior of your marker based on settings that you can change. By changing the settings, you can tweak your marker to perform the way you want it to. The options and settings below correspond to Version 3.1 of the board firmware. If your board does not have Version 3.1, please use the appropriate manual for your firmware version.

Firing Mode

The firing mode setting lets you select between different firing modes:

Rate of Fire

The rate of fire determines the maximum number of balls per second (bps) that you can fire. You may set the rate of fire from 6 bps to unlimited bps. There is a secondary rate of fire control called AE Bypass ROF. This setting determines how fast you shoot if your maker automatically bypasses your eyes.

Solenoid Dwell

The *solenoid dwell* is the length of time that the solenoid is energized for each shot. A short dwell time may not release enough gas to propel your paintball at proper velocity. A long dwell time may waste gas, and reduce your marker's maximum rate of fire.

The ideal dwell time for a solenoid depends on its make and model. It also depends on the solenoid's age: a solenoid with a million cycles through it may need a longer dwell setting than a new solenoid. 8 ms is a good dwell time for new markers, and is the default setting of the Chaos Freestyle board.

The solenoid dwell timing can be adjusted from 2.5 ms to 18.5 ms.

Firing Mode	Description
Semi-automatic	Fires one ball for each trigger pull.
Turbo	Alternates between firing one and two balls for each trigger pull
Auto response	Fires one ball for each trigger pull, and another ball upon trigger release
Full-automatic	Fires balls continuously until the trigger is released
PSP Ramping	Fires balls in accordance with PSP 2005 equipment rules.
NXL Ramping	Fires balls in accordance with NXL 2005 equipment rules.
Snapshot Trainer	Fires a maximum of four balls before requiring a wait time of two seconds.
True Ramp	Fires in Semi-Automatic until the Ramp Start BPS has been achieved, then adds shots up to the set ROF.
Off The Break 1	Fires in Full Auto as long as trigger is held down when the board is first turned on. Once trigger is released, it fires in Semi-automatic for all pulls after that.
Off The Break 2	Adds shots as long as trigger is pulled greater than Ramp Start BPS on boot. Once the trigger isn't pulled for 1 second, it only shoots in Semi-automatic.

Anti-Bolt Stick Added Dwell

If the O-rings of a bolt are contaminated, the bolt may have difficulty moving if it has not been recently fired. The first shot will be at a lower velocity and may have trouble clearing your barrel. To counter this effect, the Anti-bolt Stick Added (ABS) Dwell setting lets you add a few additional milliseconds to the dwell timing of your first shot, but only if you have not fired your marker within the past 30 seconds.

The ABS dwell setting can be adjusted from 0 ms to 10 ms.

Dwell settings are a measurement of time. If you lower them, you shave off milliseconds, which in turn means it is entirely possible to achieve a few more balls per second.

-Countermeasure

Trigger Debounce

The trigger debounce value represents the strength of the electronic filtering applied to your trigger pull. Filtering the trigger signal is necessary, because the mechanical contacts in a trigger switch bounce several times before coming to rest. If we did not debounce the signal, your marker might register several phantom events for each actual trigger pull.

The ideal debounce setting varies with the different makes and models of trigger switches. You must experiment to find the best setting for your particular switch. A marker with a debounce value that is too low has a tendency to double-fire, while a marker with a debounce value set too high experiences a reduction in its maximum rate of fire.

The trigger debounce filter strength multiplier is adjustable from 3 to 30 via button programming, and from 1 to 30 via the V-link data cable.

Mechanical Debounce

The mechanical debounce filter counters mechanical trigger debounce. Increasing the strength of this filter reduces the likelihood of the recoil forces of your marker pulling the trigger for you. The mechanical debounce filter strength multiplier is adjustable from 0 to 15.

Ramp Start BPS

The ramp start bps is the setting at which shots will automatically be added into the firing stream to achieve the maximum ROF set on the board as long as the trigger is continously activated faster than this speed. The ramp start BPS is adjustable from 6bps to 20bps.

Anti-Chop Eye Adjustments

Anti-chop eyes prevent the marker from firing if a paintball has not completely fallen into the chamber. This is good, because if you fire your marker while a portion of the paintball is still in the feed tube, the motion of the bolt will chop the paintball in half, sending paint into your hopper, your barrel, and the inner workings of your marker. Most paintball players would classify that as a "bad thing".

The Chaos Freestyle board lets you customize several eye-related settings:

You cannot manually bypass the eyes in automatic fire mode by holding down the trigger.

Holding down the trigger in auto-fire mode does only one thing: spray lots and lots of paintballs!

Disabling the Eyes

You can disable the anti-chop eyes. Your marker then acts as if eyes were never installed. With the eyes disabled, your maximum rate of fire is limited to 20 balls per second.

Instructions on how to disable the eyes are presented in the next chapter.

Bypassing the Eyes

You can temporarily bypass the anti-chop eyes by holding down the trigger for two seconds. To re-enable the eyes, hold down the trigger for another two seconds. Manually bypassing the eyes will not lower your firing rate.

Automatic Eye Bypass

If the marker believes that your eyes are malfunctioning or are blocked by paint from a chopped paintball, the marker will automatically bypass the eyes and reduce your rate of fire to 12 balls per second.[‡] Once you have cleared the eyes of paint and returned them to functioning status, the marker automatically resumes normal operation.

After Eye Delay

The after eye delay is the time, after the anti-chop eyes detect a paintball, that the marker waits before firing. This delay decreases your chances of chopping a paintball; a paintball may bounce a little when it falls into the chamber, or the eyes may have been drilled a little high and might detect paintballs before they have completely fallen into the chamber. The after eye delay is adjustable from 0 ms to 13 ms.

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‡ If you have a V-link data cable, you can change this value (known as the AE Bypass ROF) using the V-link Application software.

Eye Mode

The eye mode determines how the marker retests the eye condition after a paintball has loaded. There are three components to Eye Mode: bolt detection mode, SCOPE mode, eye timer mode.

Bolt Detection Mode

In the *eye-monitored* mode, the eye monitors the bolt position during the firing cycle to know when the bolt moves forward, back, and a ball is loaded. However, this mode only works for markers with eye systems that can see the bolt (break beam systems, or reflective eyes with a shiny, reflective bolt).

Bolt Detection Mode	Description
Eye-monitored	Bolt position can be monitored by eyes
Bolt Timer	Bolt position cannot be monitored by eyes, so a bolt timing value must be specified.

In the **bolt-timer** mode, the system assumes that the bolt has completed its travel after a certain number of milliseconds. Use this mode if your eye system cannot see the bolt, or if you believe you can get better performance through manual timings. The default bolt timer value is 15 ms.

SCOPE Mode

Most of us have break-beam eye systems that work best with *SCOPE On*. This is the most chop-proof setting, and the one we recommend you use.

SCOPE Off exists primarily for the seven or so people in the world who have reflective eye systems.

Scope Mode	Description
SCOPE Off	Do not check eye status after a ball has loaded.
SCOPE On	Check eyes status after a ball is loaded when shot is registered.

Eye Timer Mode

The eye timer mode determines whether the marker can fire paint even if the eyes do not detect a paintball.

Eye Timer Mode	Description
Drop shot after timer	Marker only fires if eyes detect paint.
Fire after timer	Marker fires 0.25 seconds after trigger pull if eyes do not detect paint.

Most people will want to keep the eye timer mode set to *Drop Shot After Timer*. But, in markers with reflective eye systems or systems where the ball can roll out of the way, this mode lets the marker continue to fire at a rate of four balls per second until the eyes detect paint again.

AE Bypass ROF

The AE Bypass ROF is the rate of fire that the marker assumes if it is placed into eye bypass mode. The default value is 12 balls per second, but you may change this from 9 to 20 bps.

Hopper Model	Typical Feed Rate
Any non-motorized	7 bps
Empire Reloader	15 bps
Empire Reloader B	23 bps
Odyssey Halo-A	16 bps
Odyssey Halo-B	23 bps
Odyssey Halo TSA	15 bps
Viewloader Revolution	12 bps
Viewloader eVLution II	17 bps

Changing the Settings

You can change your marker settings using trigger programming or a V-link software data cable.

Trigger programming

1. Hold down the trigger while turning the marker on to put your marker into trigger programming mode. The LED will light up to signal you are in trigger programming mode.

2. Release the trigger and the LED will turn off. At this point, you are in the option selection level of trigger programming.

3. Pull the trigger the number of times corresponsing to the option you with to change. After about 3 seconds, of trigger inactivity, the LED will blink back the number of pulls it read.

4. If the number is correct, press and hold the trigger in for about 1 second to confirm the selection. The LED will light up to confirm this selection.

5. Release the trigger to turn it off. At this point, you will are now in that setting adjustment level section of trigger programming.

6. Pull the trigger the correct number of times to make you selection of the setting. Wait about 3 seconds for the board to blink back the trigger pulls.

7. If the pulls are correct, press and hold the trigger in to confirm the setting. The board will blink 3 times to tell you it has written the setting to the board, and return you to the option selection level of trigger programming so you can change another setting.

8. Once you are done, simply turn the board off and back on to get into normal operation mode.

Note: If you do not pull the trigger the correct number of times, wait a few seconds after the LED blinks back the trigger pull count, and the LED will light up for a long blink to notify you it didn't take the setting. You can re-pull the trigger the number of times you need to get the option you want. Also, if you pull the trigger an invalid number of times (such as more than the number of valid settings), the LED will light up for a lng blink to notify you it didn't take the selection, and wait for you to pull the correct number of times again.

Trigger programming example

To change the After-Eye Delay to 5ms:

1. Hold down the trigger while turning the marker on.

2. Release the trigger to turn the LED off.

3. Pull the trigger 8 times.

4. After the LED blinks back 8 times, pull and hold the LED until the LED turns on.

5. Release the trigger to turn it off.

6. Pull the trigger 7 times.

7. After the LED blinks back 7 times, pull and hold the LED until the LED turns on.

8. After the LED blinks 3 times, turn the gun off and back on to be back in normal operational mode.

1 BLINK	3 BLINKS	4 BLINKS	5 BLINKS	6 BLINKS	7 BLINKS	8 BLINKS
Dwell	Debounce	Mech. Debounce	Presets	Firing Mode	Rate of Fire	After Eye Delay

[1] Dwell

BLINKS	DESCRIPTION
1	2.5 ms
2	3.0 ms
3	3.5 ms
:	:
15	18.0 ms
16	18.5 ms

[3] Debounce

BLINKS	DESCRIPTION
1	3x multiplier
2	6x multiplier
3	9x multiplier
:	:
9	27x multiplier
10	30x multiplier

[4] Mech. Debounce

BLINKS	DESCRIPTION
1	No Mech. Deb.
2	1x multiplier
3	2x multiplier
:	:
15	14x multiplier
16	15x multiplier

[5] Presets

BLINKS	DESCRIPTION
1	Conservative: Semi-auto, 13bps, 10ms dwell, 7x debounce, 6ms AE delay
2	Normal: Semi-auto, 14bps, 8ms dwell, 7x debounce, 5ms AE delay
3	Fast: Semi-auto, 16bps, 8ms dwell, 7x debounce, 5ms AE delay
4	Extreme: Semi-auto, 18bps, 6ms dwell, 5x debounce, 4ms AE delay
5	Stock Settings

[6] Firing Mode

BLINKS	DESCRIPTION
1	Semi-automatic
2	Turbo
3	Auto-response
4	Full automatic
5	PSP ramping
6	NXL ramping
7	Snapshot Trainer
8	True Ramp
9	Off The Break 1
10	Off The Break 2

[7] Rate of Fire

BLINKS	DESCRIPTION
1	Unlimited
2	22 bps
3	20 bps
4	19 bps
5	18 bps
:	:
15	8 bps
16	6 bps

[8] After-Eye Delay

BLINKS	DESCRIPTION
1	Bypass eyes
2	0 ms delay
3	1 ms delay
4	2 ms delay
:	:
14	16 ms delay

9 BLINKS	13 BLINKS	14 BLINKS	15 BLINKS
Eye Mode	Anti-Bolt Stick	Bolt Timer	Ramp Start BPS

[9] Eye Mode

BLINKS	DESCRIPTION
1	Bolt timer; scope off; drop shot after timer
2	Bolt timer; scope off; fire after timer
3	Bolt timer; scope on; drop shot after timer
4	Eye-monitored; scope off; drop shot after timer
5	Eye-monitored; scope off; fire after timer
6	Eye-monitored; scope on; drop shot after timer

[13] Anti-Bolt Stick

BLINKS	DESCRIPTION
1	0.0 ms added
2	0.5 ms added
3	1.0 ms added
:	:
13	5.0 ms added

[14] Bolt Timer

BLINKS	DESCRIPTION
1	2 ms
2	4 ms
3	6 ms
:	:
16	32 ms

[15] Ramp Start BPS

BLINKS	DESCRIPTION
1	20 bps
2	19 bps
3	18 bps
:	:
15	6 bps

V-Link Programming

The V-Link programming cable connects the *parallel port* (also known as the *printer port*) of your computer to the programming port of your Chaos Freestyle board

To access the programming port of your Chaos Freestyle board, you must remove the grip and clamshell half that covers the circuit board. The programming port is 6 pin square connector located on the switch side of the board.
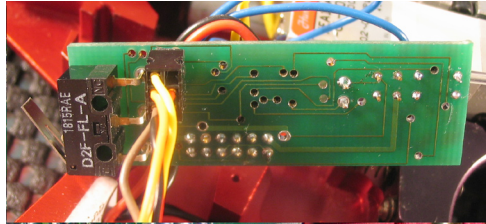
WARNING! DE-GAS YOUR MARKER BEFORE USING V-LINK PROGRAMMING.
THE SOLENOID MIGHT ENGAGE DURING THE PROGRAMMING CONNECTION AND FIRE THE MARKER.

The V-Link Application software lets you upload new settings to the board. It also lets you update the firmware. The latest versions of the V-Link Application software and the Chaos Freestyle firmware are available on the web at:

http://www.vaporworks.net/docs.shtml

The following settings and modes can only be accessed using the V-Link Application:

AE Bypass ROF
The AE Bypass ROF is the rate of fire that the marker assumes if it is placed into eye bypass mode. The default value is 12 balls per second, but you may change this from 9 to 20 bps.

Operation Mode
The Operation Mode lets you fool the board into thinking that the eyes detect a ball even if one is not present.

The standard mode lets the eyes detect balls normally.

The Test CPS mode simulates a ball in the breech, and is useful for simulation purposes. Remember to set this to standard mode before taking your marker back on the field.
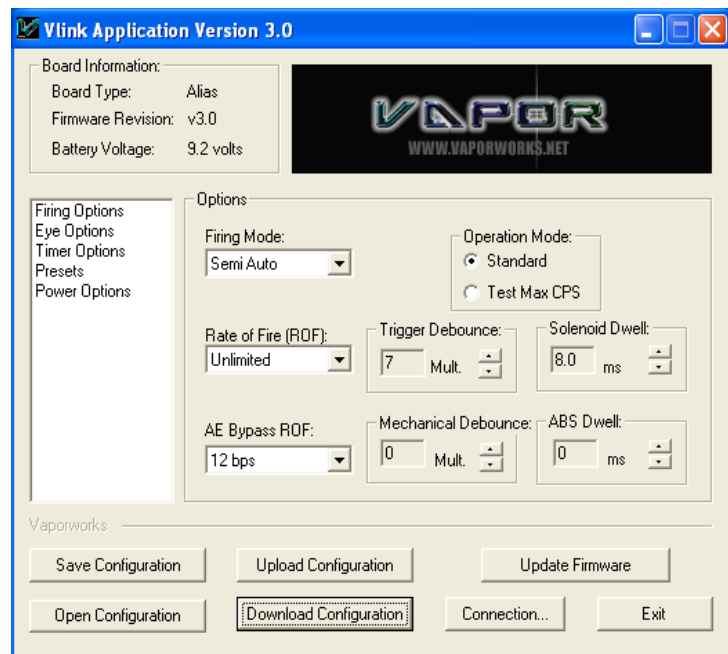
Update Firmware
The Update Firmware button lets you update the firmware, the master programming of the Chaos Freestyle board. By updating your board with new firmware, you can add new features that your current Chaos Freestyle board may not have.

The firmware files that you download from the Vaporworks website are stored within ZIP archives. Windows® XP users may view the contents of ZIP archives directly, but Windows 95, 98, and 2000 users must use the Winzip program (http://www.winzip.com).

There are two different files for each version of the Chaos Freestyle firmware. One is the semi-automatic only firmware that locks the firing mode into semi-auto. The other is the unrestricted firmware that gives you full control over all settings.

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