Vaporworks
Chaos Pandora

CONTENTS

REQUIRED TOOLS
hex key (Allen wrench), 1/16”
hex key, 1/8”
screwdriver, flathead, 3/16”

The Chaos™ Pandora™ board is an upgrade to the stock circuit boards inside the AKA Viking™ and AKA Excalibur® paintball markers. This replacement board provides reliable and dependable paintball marker operation with the convenience of features such as 0-second boot time and trigger-adjustable fire control settings.

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 Pandora 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. Remove or unscrew tank from marker
2. Place marker into eye-bypass mode
3. Pull trigger repeatedly until all gas is expelled from marker.

Detach Grip Frame

Unscrew the two 1/8" hex bolts that hold the grip frame to the marker body. Detaching the grip frame exposes the circuit board. Your existing circuit board will be one of three identifiable types: Equalizer™ board; Nelson, 1st Generation; or Nelson, 2nd Generation.

grip frame
hex bolts

Intellifeed loader
Warpfeed loader
LED
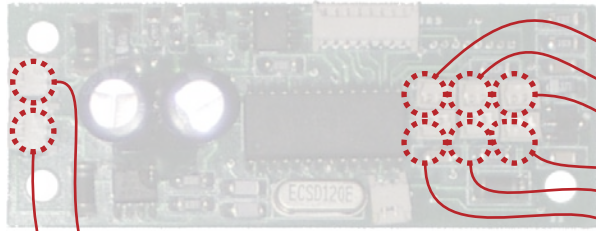
Nelson, 2nd Generation Sockets

2-Pin Solenoid
3-Pin Solenoid

On/Off Switch
Battery
Trigger

Remove Circuit Board

Unscrew the plastic slot-screws that hold the circuit board to the grip frame. You may now remove the circuit board from the grip frame, being careful not to pull harshly on any of the wires.
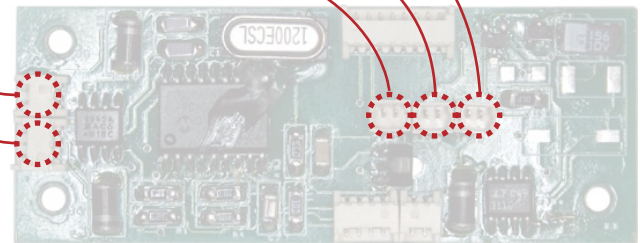
Identify and Mark Connectors

Make a note of which wires are connected to the different sockets of your old circuit board. Please refer to the board diagrams and photographs on this page for the proper designations. This step will save you time when we connect the wires to your new Chaos Pandora board.

Disconnect Connectors From Old Board

Remove the connectors from the circuit board one at a time, 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.

Nelson, 1st Generation Sockets

TIP: THE CLEAR LED IS THE TRANSMITTING EYE, THE BLACK LED IS THE RECEIVING EYE.

Equalizer™ Sockets

Eye, Transmitter
3-Pin Solenoid
2-Pin Solenoid
Eye, Receiver
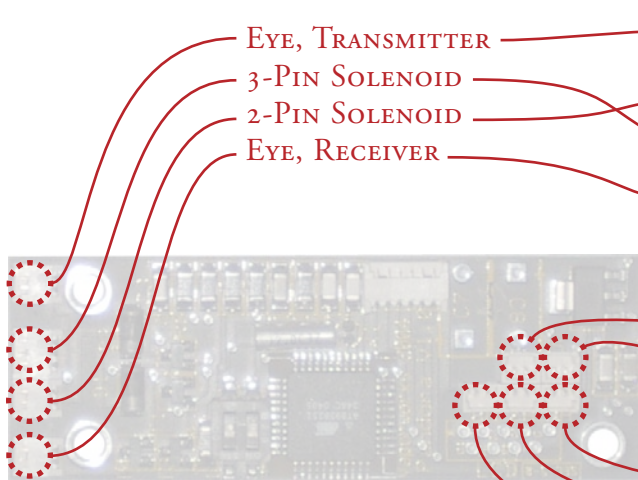
Loader
LED

Chaos Pandora Sockets

On/Off Switch
Battery
Trigger

Tourney Lock | *Tourney Unlock*
Excalibur Mode | *Viking Mode*

PANDORA DIP SWITCHES

Reconnect Connectors to Chaos Pandora Board

Attach the connectors to the Chaos Pandora board. Refer to your notes and to the board diagrams and photographs to determine the proper socket for each connector.

Set DIP Switches on Chaos Pandora Board

Configure the operating mode by setting the DIP switches on the circuit board.

Switch 1 tells the board whether it is being used in an AKA Excalibur or AKA Viking marker. Select the appropriate mode for your marker.
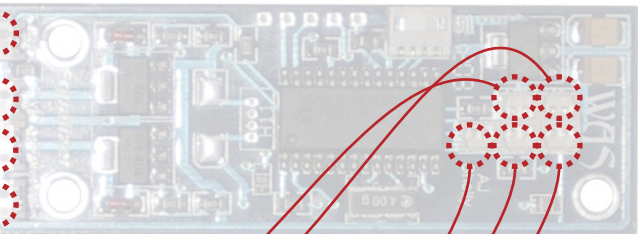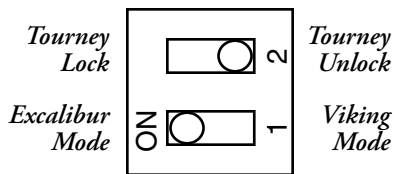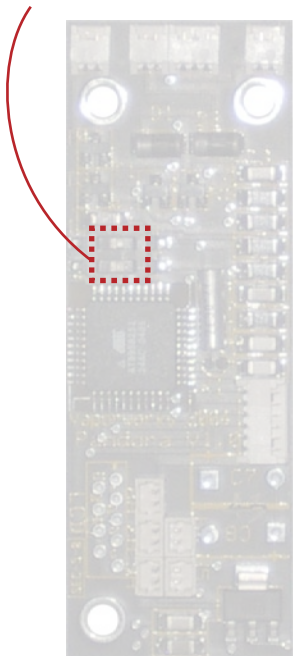
Switch 2 is the tourney lock option that locks the board into semi-automatic mode for tournament play. If the tourney lock is engaged, you cannot change the dwell, debounce, or firing mode from their preset, semi-automatic settings.

With firmware v2.20, we introduced a tourney mode indicator: If your marker is not in tourney mode when you turn it on, the LED blinks every 0.5 seconds. If your marker is in tourney mode, the LED remains solid.

TIP: SHOW YOUR SOLID LED TO A REFEREE AS PROOF THAT YOUR MARKER IS IN TOURNEY MODE.
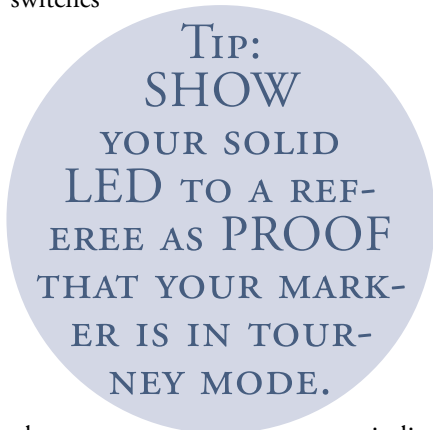
Test the Board

Turn on the marker. The LED should light up. If the LED does not light up, check your battery and your battery connector.

Place the marker into eye-bypass mode by holding the trigger down for three seconds. Pull the trigger a few times. You should hear a faint clicking from the solenoid(s) each time you pull the trigger.

If you do not hear any clicking, you may have crossed some of the connectors or set a DIP switch incorrectly. Verify that your wires are connected according to the diagrams on the preceding page and try the test again. Also verify that you have selected the appropriate DIP switch settings for your board.

Turn off your marker after the test.

Secure Chaos Pandora Board to Grip Frame

Place the circuit board back into the grip frame, component side down. You may have to tug and fold some of the wires to seat the board flat. Use the plastic slot-screws to secure the circuit board to the grip frame.

Re-attach Grip Frame to Marker Body

Attach the grip frame back to the marker body. 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 grip frame flush with the marker body. Secure the grip frame in place with the 1/8" hex bolts.

Your marker is good to go!

Description of Board Settings

The Chaos Pandora 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.

Firing Mode

The firing mode setting lets you select between four modes:

Firing Mode	Description
Semi-automatic	Fires one ball for each trigger pull.
Turbo	Alternates between firing one and two balls for each trigger pull
Autoresponse	Fires one ball for each trigger pull, and another ball upon trigger release
Full-automatic	Fires balls continuously until the trigger is released

Rate of Fire

The rate of fire determines how many balls may be fired each second. The lowest rate of fire you can select is 9 balls per second. The fastest rate of fire you can select is 20 balls per second. However, without anti-chop eyes, the risk of chopping paintballs increases with the firing rate. To reduce this risk, select a rate of fire that is lower than the feed rate of your paintball hopper.

In markers equipped with eyes, the fastest setting does not limit your rate of fire at all. Instead your rate of fire is determined by how fast the eyes detect paint. If your hopper can feed paintballs at 25 balls per second, the eyes in your marker let you shoot just as fast.

Hopper Model	Average 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

Sacrificing chickens won't help you find a good dwell timing for your marker.[†] But following the advice of AKA Master tech Dan Voils just might:

"Excals with [MAC solenoids] should be running 10. Vikes with macs should be running 17, but since you can't do an odd number with the trigger programming, 18 is the next choice."

"Ex's with [Humphrey solenoids] run at 6 and vikes with Humps run 10."

—Metrocube

Solenoid and Bolt Timings

The *solenoid dwell* (aka *hammer drive*) represents the "on" time of the solenoid. While active, this solenoid keeps the valve open, releasing gas for the duration of the "on" time. Thus, too short of a dwell time may not release enough gas to propel your paintball at proper velocity. A dwell time that is too long can 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. You must experiment to find the best settings for your solenoid.

The solenoid dwell timing can be adjusted from 2 ms to 30 ms.

Minimum Bolt Open

The Excalibur marker contains two solenoids. One solenoid operates the hammer, as in the Viking marker. The other solenoid operates the bolt. The second solenoid dwell timing is called the *minimum bolt open* (aka *bolt drive*) and can be adjusted from 0 ms to 60 ms. If you have anti-chop eyes, this value is the minimum time that the bolt stays open (if the eyes don't detect paint, the bolt stays open until they do). If you don't have eyes, this value represents the absolute time that the bolt stays open.

† With due respect to our world's variety of cultures and religions, the arguments that poultry-based divination can be a valid indicator of dwell time are not entirely convincing.

Other settings related to the Excalibur marker's bolt operation are:

Bolt Delay Offset

(aka *hammer release*): the delay between the hammer firing and the bolt activating. This delay prevents excess gas from "blowing back" into the feed tube.

The factory setting for this setting is 5 ms. The bolt delay offset is adjustable from 1 ms to 14 ms

After Shot Delay

(aka *bolt release*): the delay between the bolt solenoid turning off, and the bolt returning to the closed-position. This delay lets the bolt close completely before the marker opens the valve for the next shot.

The factory setting for this setting is 25 ms. The after shot delay is adjustable from 1 ms to 30 ms.

THESE SETTINGS ARE ALL MEASUREMENTS 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.

A HIGH RATE OF FIRE IS THE GOAL... TO PUSH IT WITHOUT CAUSING SKIPPED SHOTS, BLOWBACK, AND OTHER SORTS OF PROBLEMS.

-COUNTERMEASURE

Trigger 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 debounce filter strength multiplier is adjustable from 0.5 to 7.5.

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 Pandora board lets you customize several eye-related settings:

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.

> DON'T LEAVE BROKEN PAINT IN YOUR MARKER. PAINT MAY FEEL SLIPPERY LIKE A LUBRICANT, BUT IT IS ACTUALLY AN ABRASIVE SUSPENSION OF PIGMENT PARTICULATES — LIQUID SANDPAPER.

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. While the eyes are bypassed, your rate of fire is reduced to 12 balls per second.[‡]

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 the eyes are clear of paint and functioning again, the marker automatically resumes normal operation.

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!

-Goldie

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

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 6 ms.

Eye Scope Mode

The eye scope mode determines whether the marker retests the eye condition after a paintball has loaded.

Most of us have break-beam eye systems that work best in Scope Mode B. This is the most chop-proof setting, and the one we recommend you use.

Scope Mode	Description
A	Do not check eye status after a ball has loaded.
B	Check eyes status after a ball is loaded.

Scope Mode A exists primarily for the seven or so people in the world who have a Viking or Excalibur marker equipped with a reflective eye system.

Eye Timer Mode

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

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.

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.

Why 4 bps in eye timer mode? Well, when the timed mode was first introduced, motorized loaders were still uncommon. 4 bps was about as fast as you could get and be relatively "safe". So, it was concievable that a ball could take nearly a quarter of a second to load.

-Defiance

Changing the Settings

You can change your marker settings by two different methods:

Trigger programming

Hold down the trigger while turning the marker on to put your marker into trigger programming mode. In trigger programming mode, holding down the trigger makes the LED blink in a sequential pattern. Release the trigger when the appropriate number of LED blinks have passed to change the settings.

V-Link programming

Connect the V-Link cable between your computer and your marker to change your settings using the V-Link Application software. V-link programming lets you change more settings, but it requires a computer.

WARNING! DE-GAS YOUR MARKER BEFORE USING V-LINK PROGRAMMING. THE SOLENOID MIGHT ENGAGE DURING THE PROGRAMMING CONNECTION AND FIRE THE MARKER.

> TOURNEY-LOCK MODE DISABLES FIRING MODE, DWELL, AND DEBOUNCE PROGRAMMING.

Viking Trigger Programming

1 BLINK	2 BLINKS	3 BLINKS	4 BLINKS	5 BLINKS	6 BLINKS	7 BLINKS	8 BLINKS
Presets	Firing Mode	Rate of Fire	Dwell	Debounce	AE Delay	Eye Timer	Scope

Presets

BLINKS	DESCRIPTION
1	Conservative Preset Mode: Semi-auto, ROF: 13, dwell: 10ms, debounce :7, AE delay: 6, eye-timer: drop shot
2	Normal Preset Mode: Semi-auto, ROF: 14, dwell: 8ms, debounce :7, AE delay: 5, eye-timer: drop shot
3	Fast Preset Mode: Semi-auto, ROF: 16, dwell: 8ms, debounce :7, AE delay: 4, eye-timer: drop shot
4	Extreme Preset Mode: Semi-auto, ROF: 18, dwell: 6ms, debounce :5, AE delay: 4, eye-timer: drop shot

Firing Mode

BLINKS	DESCRIPTION
1	Semi-automatic
2	Turbo
3	Auto-response
4	Full Auto

Rate of Fire

BLINKS	DESCRIPTION
1	20 bps / Unlmtd.
2	18 bps
3	16 bps
4	14 bps
5	13 bps
6	12 bps
7	10 bps
8	9 bps

Dwell

BLINKS	DESCRIPTION
1	2 ms
2	4 ms
3	6 ms
4	8 ms
5	10 ms
6	12 ms
7	14 ms
8	16 ms
9	18 ms
10	20 ms
11	22 ms

Debounce

BLINKS	DESCRIPTION
1	1x filter mult.
2	2x
3	3x
4	4x
5	5x
6	6x
7	7x
8	8x

AE (After Eye) Delay

BLINKS	DESCRIPTION
1	disable eyes
2	0 ms
3	1 ms
4	2 ms
5	3 ms
6	4 ms
7	5 ms
8	6 ms

Eye Timer

BLINKS	DESCRIPTION
1	Drop Shot After Timer
2	Fire After Timer

Scope

BLINKS	DESCRIPTION
1	Mode A
2	Mode B

Excalibur Trigger Programming

1 blink	2 blinks	3 blinks	4 blinks	5 blinks	6 blinks	7 blinks	8 blinks
Presets	Firing Mode	Rate of Fire	Dwell	Debounce	AE Delay	Eye Timer	Scope

9 blinks	10 blinks	11 blinks
Bolt Delay	Bolt 2 Minimum	After Shot Delay

Presets

Blinks	Description
1	Conservative Preset Mode: Semi-auto, ROF: 13, dwell: 10ms, debounce :7, AE delay: 6, eye-timer: drop shot
2	Normal Preset Mode: Semi-auto, ROF: 14, dwell: 8ms, debounce :7, AE delay: 5, eye-timer: drop shot
3	Fast Preset Mode: Semi-auto, ROF: 16, dwell: 8ms, debounce :7, AE delay: 4, eye-timer: drop shot
4	Extreme Preset Mode: Semi-auto, ROF: 18, dwell: 6ms, debounce :5, AE delay: 4, eye-timer: drop shot

Firing Mode

Blinks	Description
1	Semi-automatic
2	Turbo
3	Auto-response
4	Full Auto

Rate of Fire

Blinks	Description
1	20 bps / Unlmtd.
2	18 bps
3	16 bps
4	14 bps
5	13 bps
6	12 bps
7	10 bps
8	9 bps

Dwell

Blinks	Description
1	2 ms
2	4 ms
3	6 ms
4	8 ms
5	10 ms
6	12 ms
7	14 ms
8	16 ms
9	18 ms
10	20 ms
11	22 ms

Debounce

Blinks	Description
1	1x filter mult.
2	2x
3	3x
4	4x
5	5x
6	6x
7	7x
8	8x

AE (After Eye) Delay

Blinks	Description
1	disable eyes
2	0 ms
3	1 ms
4	2 ms
5	3 ms
6	4 ms
7	5 ms
8	6 ms

Eye Timer

Blinks	Description
1	Drop Shot After Timer
2	Fire After Timer

Scope

Blinks	Description
1	Mode A
2	Mode B

Bolt Delay

Blinks	Desc.
1	1 ms
2	2 ms
3	3 ms
4	4 ms
5	5 ms
6	6 ms
…	…
16	16 ms

Bolt 2 Minimum

Blinks	Desc.	Blinks	Desc.
1	12 ms	9	36 ms
2	15 ms	10	39 ms
3	18 ms	11	42 ms
4	21 ms	12	45 ms
5	24 ms	13	48 ms
6	27 ms	14	51 ms
7	30 ms	15	54 ms
8	33 ms	16	57 ms

After Shot Delay

Blinks	Desc.	Blinks	Desc.
1	2 ms	9	18 ms
2	4 ms	10	20 ms
3	6 ms	11	22 ms
4	8 ms	12	24 ms
5	10 ms	13	26 ms
6	12 ms	14	28 ms
7	14 ms	15	30 ms
8	16 ms	16	32 ms

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 marker.

To access the programming port of your marker, you must remove the port cover. The hex bolts that keep the port cover in place can be unscrewed with a 1/16" hex key.

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 Pandora firmware are available on the web at:

http://www.vaporworks.net/software.htm

The Chaos Pandora board contains some settings and modes that can only be changed by 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 Pandora board. By updating your board with new firmware, you can add new features that your current Chaos Pandora board may not have. For example, in the v2.20 version of the Chaos Pandora firmware, we added a blinking LED to represent the status of the Tourney Lock dip switch.

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 Pandora 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.
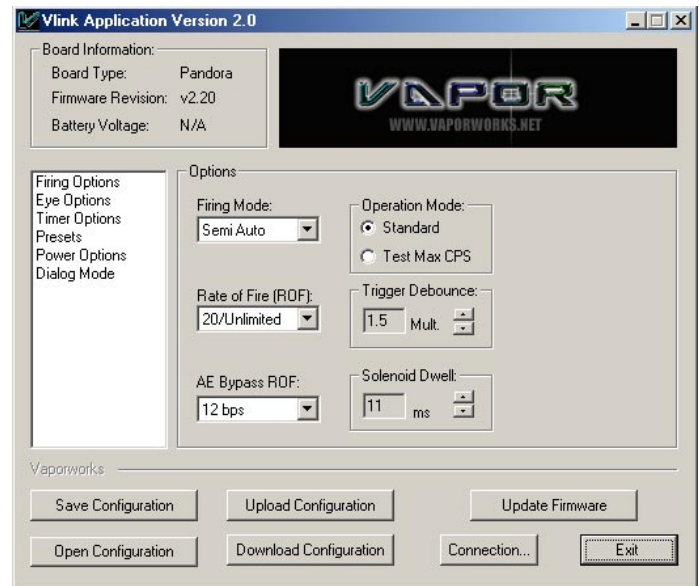
Filename	Description
PANMX*xx*.efw	Unrestricted Pandora firmware
PANSO*xx*.efw	Semi-only Pandora firmware

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VAPORWORKS