Dynasty Shocker™ & Nerve™ Board Revision 2 Instructions

Features

- Based on the Musashi 5 software
- Includes five fire modes: uncapped semi-auto, adjustable semi-auto, PSP ramping, PSP burst, and NXL full-automatic
- Low battery indicator hardware and software
- Asynchronously monitors the trigger switch using an interrupt based scan at 1 million times per second to prevent lost trigger pulls
- Super light 25-gram trigger switch
- Adjustable ABS programming prevents first shot drop-off
- AMB and CPF algorithms help to eliminate mechanical bounce and switch 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, cycle percentage filter, and ramp start
- 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
- Automatic 15-minute idle power down saves batteries
- Two eye modes: delayed and forced with force shot

Installation

1. Remove the grips from the grip frame.
2. Push out the two steel retaining pins that are slightly below and forward of the top grip screw.
3. Unplug the battery from the stock board's wiring harness.
4. Gently pull back on the top half of the stock board so the trigger switch can clear the frame.
5. Rotate the stock board out of the frame to one side, starting from the bottom of the board.
6. Unplug the 10-wire cable from the back of the stock board.
7. Plug the 10-wire cable into the Dynasty board.
8. Insert the Dynasty board into the frame, starting with the top half that has the trigger switch. The trigger switch should face the trigger.
9. Rotate the Dynasty board into the frame. The edge of the Dynasty board slides into a retaining slot at the bottom of the grip frame.
10. Look through the 2 retaining pin holes and line up the trigger switch. Insert the 2 steel retaining pins into the frame and through the trigger switch mounting holes.
11. Plug the battery into the Dynasty board's wiring harness.
12. Make sure the 10-wire cable is tucked up and out of the way of the power switch. Insert the battery into the frame.
13. Put the grips back on the frame.

Power Operation

By pressing and releasing the power button, the marker turns on and is instantly ready to be fired, as indicated by a blue LED in the grip frame. To turn it off, press and hold the power button until the LED turns off or stops blinking, then release. Every time the marker is turned on, the eyes are enabled. The marker can be turned off regardless of the state of the eyes.

Battery Indicator

Upon startup the multi-color LED on the backside of the board will flash red, yellow, or green to indicate the current battery level. In the event the user is not able to see this LED without removing the grips, the power button LED will also give an indication of battery life. The blue power button LED will flicker continuously when the battery reaches a low level.

At startup:

Flickering red	Battery exhausted, replace as soon as possible
Flickering yellow	Low battery, 1-2 cases of paint can still be shot
Flickering green	Good battery

During use, if the battery level reaches the "low battery" state, the blue power button LED will continually flicker.

Eye Operation and Logic

The eyes are always enabled when the marker is first turned on. To toggle the eyes on and off, quickly push and release the power button. The LED will change from solid blue to blinking blue to indicate the eyes are disabled. 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 about 12 balls per second to prevent further chopping. The only way to show the true speed of the Dynasty board is to fire the marker with paint and air. When the eyes are off, the rate of fire is limited to 20 balls per second unless in fire mode 2-5, in which case the rate of fire is selected by the user.

Programming

The tournament lock must be disabled to enter programming mode. While the marker is turned off, push the side mounted switch on the circuit board. This will toggle the tournament lock, flashing red (locked) or green (unlocked) after each press to indicate the status of the lock. To initiate programming mode, make sure the marker is off, then pull and hold the trigger before pushing the power button. The board will boot into programming mode by showing a rainbow sequence, followed by solid green on the programming LED located on the backside of the board.

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

Green	Debounce
Purple	Dwell
Yellow	Loader delay
Blue	AMB (anti-mechanical bounce)
Red	ABS dwell
White	Fire mode
Teal	Fire mode max rate of fire
Flickering Green	Eye mode
Flickering Purple	CPF (cycle percentage filter)
Flickering Yellow	Ramp start

While the LED is lit for the desired setting you would like to change, press and hold the trigger until the LED goes out. When you release the trigger, the LED will show the current setting by blinking. 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. After all settings have been changed to the desired amounts, turn the marker off using the power button.

Programming Example

If you wanted to set the dwell to 12:

1. Make sure the marker is powered off.
2. Make sure the tournament lock is disabled.
3. Pull and hold the trigger, then push the power button.
4. The programming LED shows a rainbow sequence, then stops on solid green. This is the debounce mode.
5. Quickly pull and release the trigger 1 time to switch to the dwell mode. The LED will show purple.
6. Pull and HOLD the trigger until the LED turns off.
7. Release the trigger. The LED will blink out the current setting.
8. When the LED stops blinking, enter the new setting by pulling the trigger 12 times.
9. Wait until the LED turns back on, indicating programming has completed.
10. Turn the marker off using the power button.

Program Reset

To reset all settings back to factory defaults, hold down the lock toggle button for 10 seconds while in programming mode. The LED will rapidly cycle through every setting color to indicate that the process has completed.

Settings

Debounce – The M5 Dynasty board software features an interrupt based debounce algorithm that effectively "scans" the trigger at 1 million times per second. It runs completely independent of code execution on the microcontroller so your trigger

pulls are always registered. The debounce setting is in increments of ½ milliseconds. Users should be aware that low debounce settings 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 14 ms. The range is 1 to 20 ms. Too low of a dwell may lead to inconsistency or drop-off. 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 25.

AMB – Allows the user to adjust the anti-mechanical bounce feature. Mechanical bounce occurs with the Shocker™ or Nerve™ 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. AMB is only used in fire modes 1 and 2 (semi-automatic unlimited and capped). In the PSP or NXL modes AMB is disabled.

ABS Dwell – Amount of dwell time added for an ABS shot. The range is from 1 to 10 additional ms of dwell. The default is 1, which is off. For a more detailed explanation of ABS see the "Additional Features" section.

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

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

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 first PSP 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 fires faster than the ramp start setting. For example, if the ramp start setting is 5, the user must pull 5 times per second or faster for the software to add additional shots.
- 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.

Setting 4 is the second PSP fire mode that works as follows:

- The first 3 shots of a string are semi-automatic.
- After the 4th shot the marker will fire 2 or more shots per pull as long as the user continually pulls and releases 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.

PSP ramping and PSP burst differ in that PSP ramping requires the user to maintain the ramp start rate of fire for software assistance, whereas the PSP burst mode will fire at least 2 shots per pull, regardless of rate of fire. Some players prefer multiple shots every time they pull the trigger after the initial 3 semi-automatic shots, while others like to shoot 1 ball at a time until they achieve a certain rate of fire.

Setting 5 is the NXL full-automatic fire mode. It functions similarly to the PSP fire modes except, after the 3rd semi-automatic shot, the user may pull and hold the trigger for the marker to fire in full-automatic.

Fire Mode Max ROF – The maximum rate of fire setting only applies to the 2nd, 3rd, 4th, and 5th fire modes. The max rate of fire is adjustable from 14 to 20 balls per second in ¼ balls per second increments. It also has an unlimited setting. The default is 4, which is roughly 14.75 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 w/eyes on

Eye Mode – Two eye modes are available:

1. Delayed – The marker fires ½ second after every trigger pull regardless of a ball in the breech. This is useful for sound activated loaders because it insures 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.

Cycle Percentage Filter (CPF) – The cycle percentage filter allows adjustment of the point within the current firing cycle that a new buffered shot is allowed. Almost all electronic paintball markers allow a single shot to be buffered in the event the user is fast enough to release the trigger and pull again during the current firing cycle. The CPF setting is adjustable from 1 to 10. Setting 1 turns the CPF off, allowing buffered shots at any point in the firing cycle. Setting 2 through 10 sets the percentage of the firing cycle that must pass before shots may be buffered:

1. CPF turned off
2. 10% of the firing cycle must pass before a buffered shot is allowed
3. 20%
4. 30%
5. 40%
6. 50%
7. 60%
8. 70%
9. 80%
10. 90%

A higher CPF setting results in less unintentional bounce. For instance, it is possible that if your debounce setting is border line, you can fire the marker a few times then hold it loosely and allow it to brush against your finger, going full-automatic. Since most switch bounce from either a low debounce setting or mechanical bounce occurs almost immediately after the trigger is released, CPF can be very effective at eliminating falsely generated trigger activity.

Ramp Start – The ramp start setting is only used for the PSP ramping fire mode (mode 3). It sets the minimum pulls per second that must be maintained for the software to add shots or ramp up to the maximum rate of fire setting. The default is 5 and is adjustable from 4 to 12 pulls per second.

Additional Information

Force Shot feature – If using the forced eye mode, in the event the eyes are enabled, the breech is empty, and the user wants to fire a clearing shot, a force shot can be initiated by pulling and holding the trigger for ½ second. This is useful with force fed loaders that sometimes push a ball slightly into the detents where the eyes are unable to see it. After force firing, the next ball will load and operation can continue as normal.

A tip for setting the debounce, AMB, and CPF – This only applies to semi-automatic fire modes (modes 1 and 2) since AMB is disabled in the PSP fire modes or NXL mode.

Debounce, AMB, CPF setup steps, while using air (no paint):

1. Turn AMB and CPF off (set both to 1).
2. Starting at debounce 1-3, raise the debounce setting a notch at a time until excessive trigger bounce goes away. The goal is to have one pull, one shot, regardless of rate of fire. Do NOT slow pull test for bounce during this phase. Instead, pull the trigger rapidly or walk it, listening for double or triple fires.
3. When it appears that it is only one shot, one pull for solid trigger pulls, try the slow pull test. Holding the marker steady, slowly pull the trigger and see if multiple shots can be generated from the single pull.
4. Increase the CPF setting a notch at a time until the slow pull bounce starts to disappear. An additional test is to fire a few rounds quickly, then hold the trigger right on the activation point to see if the marker will run away.
5. If you reach setting 10 with CPF and the marker can still be slow pulled to fire full-automatic, then your debounce setting is probably too low. Go back to step 2.
6. AMB should not be set above 3, if possible, since it is not as transparent to the user as CPF. Even a CPF setting of 10 will not be noticed by the user.

A tip for setting the dwell and ABS dwell – Lower dwell times will decrease the sound output and increase the efficiency of a Shocker™ or Nerve™. Try turning down the dwell 1 ms at a time until the marker will no longer cycle, then go back up 2 ms. Now shoot with paint over a chronograph. After setting it around 290-300 feet per second, watch the consistency while shooting slowly and see if there is drop-off while shooting fast. If you experience greater than a 20 feet per second swing or you have drop-off while shooting fast, increase the dwell until this goes away and make sure your inline regulator is clean and has been lubed recently.

Your ABS dwell time is the additional dwell time added when an ABS shot occurs. If you leave your marker on and don't fire for 15 seconds, ABS will kick in for the next shot, adding the ABS dwell time to the existing dwell setting. For example, if the dwell is set to 8 ms and the ABS dwell is set to 5 ms, an ABS shot will fire with a 13 ms dwell time. Additional shots will use the 8 ms dwell time until the marker has not been fired for another continuous 15 seconds. This setting is adjustable, so you can tune it to fit your particular marker. Stock bolts will almost always fire a slightly higher velocity shot with ABS, but the HE and Evolve bolts will not if their o-rings are in good condition.

Vision Eye Troubleshooting – The Dynasty board changes the eye logic so it works like a break beam system. If an object is in front of the sensor, it detects it and allows the marker to fire. If you install the Dynasty board and the vision acts as if an object is always in the breech, then the vision sensor is "seeing" the top edge of the breech wall. The stock board works fine in this case because it only sees movement, so the overlapping breech wall is not detected as a ball.

There are multiple ways to remedy this problem. First, try taking off the vision side ball detent and eye cover. Loosen the vision ribbon retaining screw and move the ribbon down as far as it will go. Retighten the screw. If your vision functions fine, then the sensor was moved down far enough to let it clear the breech wall. If this does not fix the problem, try a new vision ribbon, since the angle that the sensor is attached to the ribbon varies greatly from batch to batch. As a last resort an experienced airsmith can change the angle of your vision sensor with a soldering iron, or use a grinding tool to shave away the upper part of the breech wall that is blocking the vision sensor.

Example Setting Profiles:

1. Tournament legal semi-automatic (NPPL)
    a. Fire mode 1 or 2 (semi-auto unlimited or capped)
    b. Debounce 5-20
    c. AMB 2
    d. CPF 2-5
    e. Loader delay set to match your loader (1-4 for Halo, 4-10 for gravity feed)

2. PSP X-Ball, CFOA, Millennium
    a. Fire mode 5 or 6 (PSP ramping or PSP burst)
    b. Max rate of fire set to 3-5, depending on Pact Timer readings. To be safe use setting 3 (14.5 balls per second).
    c. Debounce 5-20
    d. Ramp Start 5 or higher if using PSP ramping
    Loader delay set to match your loader (1-4 for Halo, 4-10 for gravity feed)

3. NXL
    a. Fire mode 7 (NXL full-automatic)
    b. Max rate of fire set to 3-4, depending on Pact Timer readings. To be safe, use setting 3 (14.5 balls per second).
    c. Debounce 5-20
    d. Loader delay set to match your loader (1-4 for Halo, 4-10 for gravity feed)

4. Ludicrous Speed (absolute fastest/bounciest)
    a. Any fire mode
    b. Max rate of fire set to 26 (unlimited)
    c. Debounce 1
    d. AMB 1 if using semi-automatic
    e. CPF 1
    f. Ramp Start 4 if using PSP ramping
    g. Loader delay 1

Additional Information

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