



## Musashi 3 DM5 Chip Instructions

### Features

- Fully functional in the Dye DM5 and DM4 markers
- Includes three fire modes: uncapped semi-auto, capped semi-auto, and PSP burst
- 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, and fire mode max rate of fire
- 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
- Force shot allows the marker to be fired when the eyes are enabled but no object is present in the breech
- Can be used in either the LBI or non-LBI board
- Low battery indicator software for the DM5 and DM4 LBI Board
- Bad Membrane Recognition allows the user to keep playing when the eye button fails on the membrane pad

### Installation

Removal and installation of the chip on a DM5 or DM4 must be carefully done to ensure the chip and the electronics are not damaged.

Begin by removing the grips from the right side of the marker. This will expose the entire circuit board. The chip is located in a socket near the bottom of the grip frame. To remove, gently pry under each end with a small flathead screw driver. Alternate sides until it is far enough out to remove with your fingers. Insert the new chip, making sure it is aligned properly. A notch in one end of the chip lines up with a notch in the socket and the white drawing on the surface of the board. If the marker will not turn on and it is not due to a low battery, broken membrane or broken battery harness, you may have installed the chip backwards.

### LED Indicator

The multi-color LED that shines out the left side of the grip panels shows which mode of operation the marker is currently in:

Rapid Blinking Red	At startup this indicates a low 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 and 3

### Power Operation

Pressing and releasing the power button turns the marker on. If the battery is low, it will flicker red. If the battery is fine, it will show a blue LED in the grip frame to indicate that the marker is ready to be fired. To turn off, press and hold the power button until the LED turns off, 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. See "Battery Indicator" section for additional details.

Startup Sequence:

1. Press Power Button
2. If battery is fine, skip this step. If low battery, LED rapidly pulses red.
3. LED lights solid blue or blinking blue, depending on whether something is in the breech, ready to fire.

### Eye Operation

The eyes are enabled when the marker is first turned on. The eyes can be toggled by using the eye button. Press and hold the eye button for 1 second and the LED will change colors to indicate the mode change.

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.

### Battery Indicator (for the LBI Board)

This section does not apply to the Standard DM4 Board.  
To determine if you have an LBI Board, refer to the pictures at [www.tadaotechnologies.com](http://www.tadaotechnologies.com).

Newer boards that ship with the DM5 and DM4 have the correct circuitry to utilize a battery indicator if the corresponding software exists on the microcontroller.

The battery indicator software is standard on the Musashi 3 DM5 Chip. When the marker is turned on, the LED will briefly flicker red to indicate a low battery. If it flickers red, the battery should be changed as soon as possible. Your battery may last for another case of paint, but it is close to failing. If the battery is fine, the software will go directly into the firing mode.

### Programming

The tournament lock must be disabled in order to change settings on the chip. The 4<sup>th</sup> dip switch functions as the tournament lock. To disable the tournament lock, make sure the 4<sup>th</sup> dip switch is in the ON or UP position. While the marker is turned off, pull and hold the trigger and turn the marker on. This will initiate the programming mode, showing 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

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 (4<sup>th</sup> dip switch in the UP/ON position).
2. Pull the trigger and push the power button to turn on the marker.
3. The LED 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 out 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.

## Program Reset

To reset all settings to factory defaults hold down the eye 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 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 18 ms. The range is 10 to 30 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 50.

**AMB** – Allows the user to adjust the anti-mechanical bounce feature. Mechanical bounce occurs with the Isis 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).

**ABS Dwell** – Amount of dwell time added for an ABS shot. The range is from 1 to 15 additional milliseconds of dwell. The default is 10. For a more detailed explanation of ABS see the “Additional Features” section.

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

1. Semi-automatic, unlimited rate of fire
2. Semi-automatic, adjustable rate of fire
3. PSP burst, 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 simply limits the maximum balls per second that can be fired. The cap is set by the Max ROF setting.

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

- The first 3 shots of a string are semi-automatic
- After the 4<sup>th</sup> 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 after letting go within 1 second, 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 4<sup>th</sup> shot it will resume a faster fire rate.

**Fire Mode Max ROF** – The maximum rate of fire setting only applies to the 2<sup>nd</sup> and 3<sup>rd</sup> fire modes. The max rate of fire is adjustable from 14 to 20 balls per second in ¼ balls per second increments, plus has an unlimited setting for all modes. 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

## Dip Switches:

- Dip 1 ABS toggle, UP/ON for ABS enabled
- Dip 2 Not used, leave UP/ON
- Dip 3 Not used, leave UP/ON
- Dip 4 Tournament lock, UP/ON for lock disabled

## Additional Features

**Bad Membrane Recognition** – If the eye button on the membrane pad fails, the software recognizes it at boot-up and disables it completely. This allows the user to continue playing with the eye system enabled. It is not necessary to check the power button on the membrane pad. If it goes bad, the marker cannot be turned on.

**Force Shot** – 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 will continue as normal.

**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](http://www.tadaotechnologies.com)