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U.S. Patent Nos. 5,228,427; 5,755,213; 5,957,119; 6,260,821; 6,349,711; 6,494,195; 6,644,295; 6,644,296; 6,823,857;
6,694,963; 6,810,871; 7,017,497; 7,044,119.

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DRONE

DRONE® 2
Owners Manual



Drone 2 Model Owners Manual

V1.00

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MacDev Warranty

MacDev offers a 12 month limited warranty period on your MacDev manufactured electro-pneumatic marker. The MacDev electro-pneumatic marker is warranted to be free from all manufacturing and production defects for a period of 12 months from the date of manufacture, unless a proof of purchase is provided (within 30 days of purchase) in which case the 12 month period will begin from the time of original purchase. Warranty cover is dependent on successful completion of warranty registration via www.macdev.net/warranty. Warranty exceptions include, but are not limited to, accidental damage, misadventure, reasonable wear and tear and consumable components such as O-rings, detents, batteries and eyes. Warranty work must be undertaken by an authorized MacDev Tech Centre or at a MacDev sanctioned Tech Support booth.



This is not a toy. Misuse may cause serious injury or death. Eye protection designed specifically for paintball must be worn by user and persons within range. Recommend 18 years or older to purchase. Persons under 18 must have adult supervision.

READ OWNER'S MANUAL BEFORE USING.

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KNOW YOUR DRONE®



Congratulations on purchasing the new Drone 2 marker. The Drone 2 is manufactured using high quality aluminium and features precision machined and moulded components designed to yield the best performance from the marker.

Prior to using your Drone 2 for the first time, please take a moment to familiarise yourself with the key components and assemblies, as it will greatly assist your understanding when reading this manual.

The figure on the left shows the following numbered parts:

1. Shift2 Lite 2 piece barrel with comfort grip
2. Feed clamp lever (used to affix your loader)
3. Drivetrain, unscrew to remove (note: marker must be degassed first)
4. Eye covers and screws
5. Velocity adjustment screw (anti clockwise to increase velocity)
6. Trigger with screw adjustments
7. LED display used to view gun status/settings
8. Membrane pad with power and programming buttons
9. Venting ASA, screw your air system in here
10. Venting ASA on/off cap (used to turn the air on or off)
11. Wrap around grip, remove this side to access battery and tourney lock

QUICK SETUP

Switching your marker on and off

The power button is located on a membrane pad on the rear of the frame. Push the button with the power symbol (🔌), when done correctly, your LED will display a red light (if no ball is loaded) or a green light (if a ball is loaded) and the marker will be set with the beam sensor system on and ready to fire. Turn your marker off by holding the power button down until the LED goes blank.

Firing your marker

If a paintball is loaded in your marker, and the power is switched on, you may fire the marker by pulling the trigger. please refer to the section below named “disabling the beam sensor” to fire the marker without paint.

Understanding the beam sensor

Your marker is equipped with a visible light sensor to determine if a paintball is correctly loaded. This system is used to prevent accidental ball breakage due to misloaded paintballs. The LED indicator on the back of your grip will show you the status of the beam sensor:

Ball loaded - green (or special colour for non semi mode)

Ball not loaded - red

Sensor error - flashing orange

Disabling the beam sensor

To disable the sensor (for dry firing), hold the scroll button on the membrane pad (🔽) until the LED starts flashing. You can re-enable the beam sensor the same way.



Installing a preset air system

Your marker comes equipped with a high quality venting ASA (Air System Adaptor) that is designed for use with commercially available air/nitrogen systems. To install your preset air system, unscrew the ASA cap by approximately 3 turns (do not unscrew it further, as the cap can come off completely). Once this is done, carefully screw your air system into the ASA until it stops.

NOTE: USE ONLY LP OR SLP AIR SYSTEMS. AIR SYSTEMS OVER 600PSI OUTPUT SHOULD NOT BE USED.

Turning the air on and off

To pressurise your marker, screw the ASA cap down until it stops. This will depress the pin on the end of your air system and pressurise the marker (provided you have sufficient air in your air system). To depressurise your marker, unscrew the ASA cap until you hear the air being vented from the cap. Your air system is now turned off and safe to remove.

NOTE: WHEN YOU UNSCREW THE ASA CAP, YOUR MARKER MAY STORE ONE SHOT. POINT THE MARKER IN A SAFE DIRECTION AND FIRE OFF THAT SHOT BEFORE ENTERING A SAFE AREA.

Using a loader with your marker

Your marker can operate using any commercially available loader. The software and beam sensor will compensate for the speed of the hopper, ensuring that the marker fires as quickly as the loader allows.

Installing a loader onto your marker

Open the cam lever as shown. This should allow your loader neck to fit into the feed tube as shown. If your loader does not fit into the feed tube, then you may have to loosen the cam lever - this is done by rotating the cam lever (anticlockwise). Once your loader is pushed all the way down into the feed tube, close the cam lever. If your loader is loose, you may need to open the cam lever, and tighten it (by turning clockwise) to adjust the cam system to hold your hopper tightly. Only ever adjust your cam lever by one turn at a time to prevent overtightening.

Removing your loader

Open the clamp by swinging the lever on its hinge. This will loosen the loader and allow you to remove it easily. If it does not remove easily, then it means that you have the cam lever overtightened.

DO NOT OVER TIGHTEN YOUR FEED CLAMP! OVERTIGHTENING MAY RESULT IN DAMAGE TO YOUR LOADER OR CLAMP.

USING YOUR MARKER

To get the most out of your marker, make sure that you follow the instructions in this section to ensure that the marker is adjusted correctly.

Adjusting the velocity

The velocity of your marker is adjusted via an adjustment screw on the bottom your inline regulator. To increase velocity, use a 1/8" allen key to turn the adjustment screw anti clockwise. Always adjust your velocity gently and use a chronograph.

DO NOT ADJUST YOUR VELOCITY ABOVE 300FPS, AND ALWAYS OBEY LOCAL LAWS AND REQUIREMENTS.

Adjusting the trigger

Your trigger has two adjustment screws, they are located in the front face of the trigger in the following order from top to bottom:

- Switch actuation point
- Pull length

You can easily adjust these screws to personalise the feel of your trigger.



Replacing the battery

Remove the three screws holding the wrap around grip onto the left hand side of your grip frame. Gently remove the battery from the clip on harness. Replace the battery with a high quality alkaline 9V battery (type 6LR61).

ADVANCED SETUP

About the tourney lock

Your board is equipped with a tourney lock system. When the tourney lock system is activated, settings on the board cannot be changed.

The lock status can be changed by opening the left hand side of the marker wrap around grip to gain access to the front of your circuit board. The tournament lock is a white button above the word MACDEV, as shown in the picture on page 12.

When the board is powered on, hold the tourney lock button down. The LED will flash a series of green and red, ending in either green (tourney lock off, or red (tourney lock on).

Programming the marker software

To program the board, first ensure that the tournament lock is off, then turn the marker off. Hold down the trigger whilst turning the marker on. Continue to hold the trigger while the LED shines white. When the LED changes to blue, you may release the button and trigger, and proceed to adjust your settings. Click the trigger if you would like to advance to the next colour. When you would like to adjust a setting, hold the trigger until the LED goes blank. After releasing the trigger, the LED will flash, the number of flashes shows you the last setting. When the board has finished flashing, pull the trigger the number of times you would like to input your new setting.

Each setting is colour coded. The colours are given in the following table:

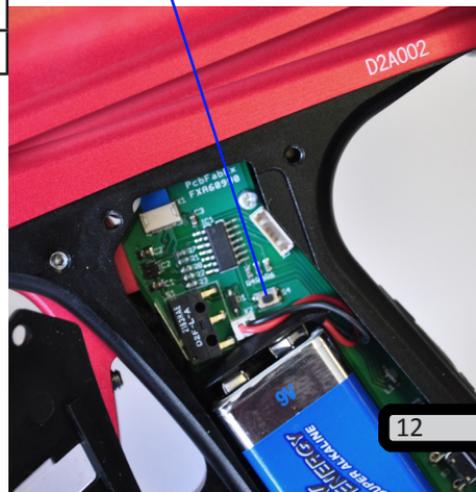
LED Colour	Setting	Default
Blue	Debounce (1/2ms increments)	10
Red	Dwell (1ms increments)	10
White	Fire mode	1 (semi)
Green	Max ROF - capped modes only	10 (12.5bps)
Yellow	Ball settle delay (1/2ms increments)	15
Teal	Anti mechanical bounce	2
Purple	Anti bolt stick	3
Flickering Blue	Factory Setting	-
Flickering Red	Cycle filter	2
Flickering White	Eye mode	2 (forced)
Flickering Green	Bolt tracking delay (ms)	10
Flickering Yellow	Test mode dwell (ms)	2

Each program setting is described in detail below:

Debounce (Blue)

The debounce setting of your marker is used to control the amount of "bounce" in your trigger. A very low debounce setting will result in a lot of bounce. In some tournaments or fields, it will be necessary to reduce the amount of bounce by increasing the debounce setting. Always increase the debounce slowly, because settings higher than 15 will result in your marker feeling unresponsive.

Tourney lock button



Dwell (Red)

The dwell setting controls the amount of time that your solenoid is held open. A very low dwell will result in very poor performance from your marker, whilst a very high value will result in a very slow maximum rate of fire and excess air usage. The factory setting is recommended as a base line, you may use small increments for fine tuning.

Fire mode (White)

Your marker is equipped with 8 different fire modes. These fire modes will allow you to use your marker in many different situations - tournament play, recreational and scenario. Always follow the rules and local regulations when selecting your fire mode. The available fire modes are given below:

- | | |
|-------------------------|----------------------|
| 1 Uncapped semi | 6 Capped full auto |
| 2 Capped semi | 7 (unused) |
| 3 Uncapped 3 shot burst | 8 (unused) |
| 4 Capped 3 shot burst | 9 Capped PSP |
| 5 Uncapped full auto | 10 Capped Millennium |

Rate of fire - ROF (Green)

Your marker can electronically limit its maximum ROF. This is required in some tournaments or fields. In uncapped modes, the ROF will only be limited by the speed of the marker and hopper. If you use a capped mode (like PSP or Millennium), the mode will obey the maximum ROF. The ROF is adjustable from 8bps in 1/2bps increments (1=8, 2=8.5, 3=9 ... 26=uncapped).

Ball Settle Delay (Yellow)

This is a small dwell included to allow the ball to settle into your marker breach before firing. For a very fast loader, this may be set to 1, for slow hoppers it should be higher. If your ball settle delay is set too low for your loader, then you may experience paintballs breaking in the breach.

Anti mechanical bounce (Teal)

Primarily, you should use the debounce register to remove bounce from your marker. However, if you experience excessive bounce, it may be from a mechanical source. This AMB filter is designed to remove excessive bounce, and it should be incremented slowly to remove bounce when bounce cannot be removed using the debounce register.

Anti bolt stick (Purple)

When your marker is idle for long periods, friction and settling effects can cause your bolt or other moving parts to be sticky. The ABS system is used to overcome this on the first shot by temporarily increasing the dwell setting. The ABS is adjustable from 1-10ms where the setting is the temporary increase in dwell, and a setting of 1 removes the ABS completely.

Factory setting (Flickering blue)

This setting is only used by the MacDev Factory, do not alter this setting unless directed by a MacDev tech.

Cycle filter (Flickering red)

Your software allows the buffering of a single shot in case you pull the trigger during a cycle. This filter can be used to reduce the time allowed to buffer this shot. Adjustable from 1 (full buffer) to 10 full cycle filter. Higher settings will reduce the amount of mechanical bounce in the marker, whilst low settings will make the marker feel aggressive and responsive.

Eye mode (Flickering white)

Your marker can utilise the beam sensor (eye) in different ways. This setting can be used to select which way you would like to have the sensor used. The system can use a delayed mode, where if a ball is not detected in the breach, a shot will be fired after a half second delay. This mode is useful if you are using a sound activated loader, or if you would like your gun to indicate to you when you are out of paintballs. Another option is the forced mode. In this mode, the marker will only fire if a ball is detected. However, the user can force a shot to be fired by holding the trigger until the marker fires.

The beam sensor can also be used to test the speed of your marker by watching the bolt during dry firing. To allow this, your marker has two test modes - test mode with full dwell, and test mode with adjustable dwell. When fired in these modes, your marker will report back to you the approximate speed achieved via the colour of the indicator LED.

The colours are given below:

red : less than 10bps	blue : 20-25bps
yellow : 10-15bps	white : 25+bps.
green : 15-20bps	

To set your eye mode, use the following register settings:

1 - delayed	3 - test mode with full dwell
2 - forced	4 - test mode with adjusted dwell

The test mode with full dwell uses the same dwell that you are currently using with your marker, the test mode with adjustable dwell allows you to conveniently change the test mode dwell without changing the usual operating dwell of your marker. To adjust this dwell, use the last register (Test mode dwell).

Bolt tracking delay (Flickering green)

The bolt tracking delay is a parameter used to ensure that bolt tracking is working correctly. Do not adjust this unless you are advised by a MacDev tech.

Test mode dwell (Flickering yellow)

The test mode dwell is used to adjust the dwell used when the user selects the test mode with adjustable dwell in the eye mode register (Described above). The user may adjust this setting from 1-30ms.

Resetting the software

If you would like to reset your software to the factory default settings, gain access to the tourney button your board, then enter the programming mode. While in programming mode, press and hold the tourney lock button. After approximately 10 seconds, your indicator LED will flash all colours indicating a reset has been completed.

MAINTENANCE

If you take 10 minutes after every day of play to maintain your marker, you will be rewarded with consistent reliable performance.

You should perform basic cleaning after every day of play, and you should perform drivetrain and inline regulator maintenance after at least every 2 full days of play or around 10,000 shots. You can clean and maintain your marker more often, it is up to you.

When maintaining your marker, use only MacDev accessories. Your marker is packaged with an allen key set and a small tub of MacDev Militia® lube, only use MacDev Militia® lube to lubricate your marker.

Maintaining the drivetrain

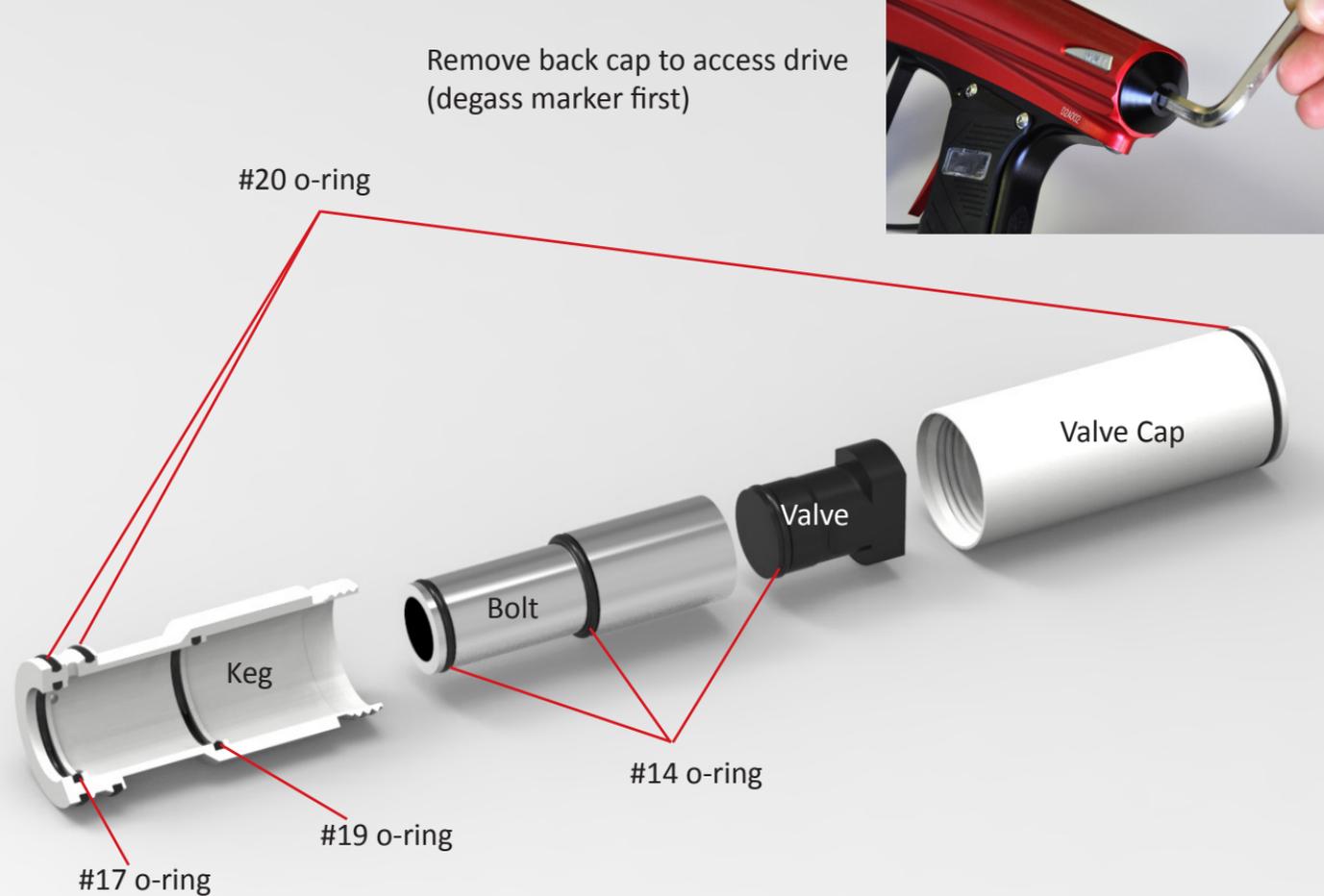
Before working on your drivetrain, ensure that your marker is degassed. After degassing your marker, always safely fire a shot - this will ensure that a shot is not stored in your marker. Unscrew the back cap, and pull the drivetrain out of your marker. Set aside your marker so that you can focus on the drivetrain.

The disassembled drivetrain is on the next page. To maintain your drivetrain, clean and relubricate the following o-rings; keg inner o-rings (#17 and #19) and valve (#14). Clean and grease the outside surface of the bolt, along with the large inner diameter of the bolt (where the valve is installed).

After working on your drivetrain, reassemble it, then slide it back into your marker.

If your drivetrain is difficult to install or remove from your marker, use some lube on the outside o-rings of the drivetrain so they can slide freely.

Over the life of your marker, some of the drivetrain o-rings will wear out. Replacements of common o-rings are supplied with your marker, however, if you require more, you should use only genuine MacDev o-rings.



Maintaining the inline regulator

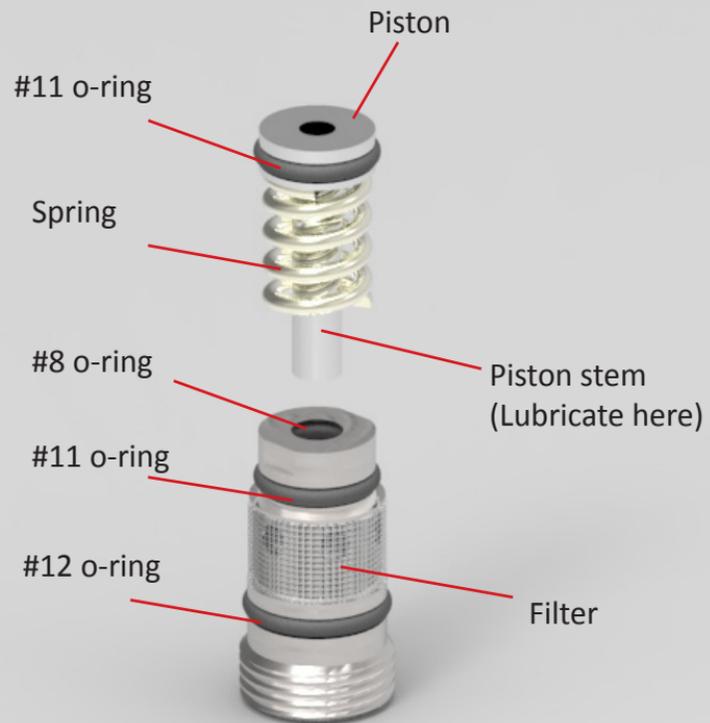
Your inline regulator, regulates the pressure from your air system down to the pressure used to fire your marker. It is very important that your inline regulator is working well, if not, you may experience problems with velocity fluctuation or shutdown.

Before working on your inline reg, make certain that the air supply is turned off (via the venting ASA), and safely fire any gas out of the gun to ensure it does not have any residual pressure.

To access the regulator, remove the left hand side of your wrap around grip. This will allow you to unscrew the body of the regulator.

Clean the inside of the frame bore with a q-tip, and remove old grease from the regulator piston. Apply new grease to the piston shaft, and the #11 o-ring on the piston, as well as the #8 o-ring.

Apply new grease to the inside of the frame bore before re-installing your regulator.



Unscrew regulator from frame
(degass marker first)

TROUBLESHOOTING

If you are experiencing difficulties with your marker, please check this table first to see if there is an easy solution listed. If at any time you are unsure about how to work on your marker, please contact a certified MacDev technician or service centre, details on page 23.

Symptom	Possible Cause	Solution
Although a fresh battery has been fitted, your marker will not turn on	The battery has not been fitted correctly	Ensure that the battery is firmly connected to both terminals. Ensure that the positive (+) terminal is connected to the positive terminal on your battery.
Your marker leaks from the solenoid	Leaking keg o-ring	Clean and relubricate the drivetrain with particular attention to the keg inner #17 and #19 o-rings. Replace if necessary.
	Low air pressure	Ensure that your air system is full, and that the velocity adjustment is not set too low.
	Overpressure	Ensure that your regulator is not set too high. If the gun has been overpressured, there is a chance the solenoid seals have been damaged by pressure, contact a MacDev tech.
Your marker uses excessive air	Dwell set too high	Check that your Dwell setting is not over 10ms.
	General leak	Make certain that there are no leaks from your gun or air system wasting your air supply.

Symptom	Possible Cause	Solution
Your marker is chopping paintballs	Beam sensor is turned off	Always play with the beam sensor enabled.
	Beam sensor is dirty or blocked	Clean the breach, bolt and sensor.
	Loader is set on a force setting too high for your paintballs	Some force fed loaders can apply enough force to break a fragile paintball. If this is the case, consult your loader manual to reduce the force setting.
	Detents are missing or incorrectly installed	Replace or re-install your detents.
Your marker will not fire	Ball settle delay too low	Increase the ball settle delay
	The trigger is set up incorrectly	Ensure that the trigger actuates the micro-switch by adjusting the actuator screw.
	The beam sensor is on, and there are no paintballs loaded	Load some paintballs.
Your marker fires high on the first shot or inconsistently.	The solenoid is not plugged in	Plug the solenoid into the board.
	Creeping inline regulator	Clean and lubricate the inline regulator, ensure that the seat and piston are in good condition.
Your marker fires low on the first shot	Sticking drivetrain	Clean and relubricate the drivetrain. If you continue to have problems: -increase the dwell by 1-2 ms. -increase the ABS parameter on your board.

MACDEV TECHNICAL ASSISTANCE

If you require technical assistance, please contact your local MacDev service centre. You can also find assistance on the MacDev support website www.macdev.net (select support from the main menu), or by emailing support@macdev.net.

Please note that all parts are available for purchase on macdev.net, along with detailed schematics available for download.

Alternatively, you can contact MacDev directly.

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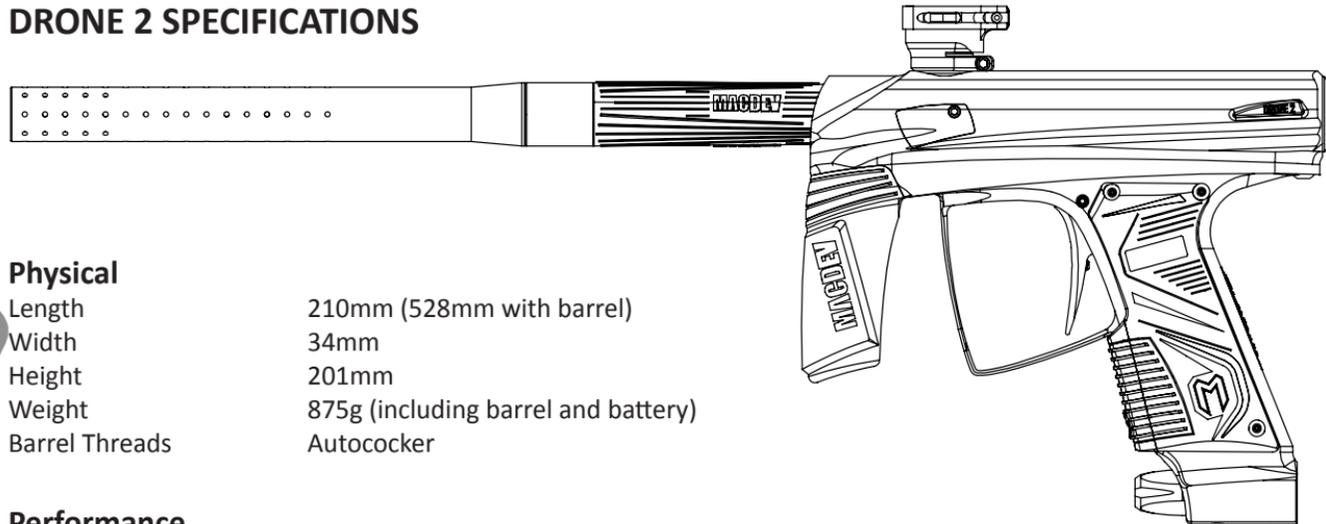
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DRONE 2 SPECIFICATIONS



Physical

Length	210mm (528mm with barrel)
Width	34mm
Height	201mm
Weight	875g (including barrel and battery)
Barrel Threads	Autococker

Performance

Operating pressure	100psi
Rate of Fire	30 BPS

Electronics

Software	Militia Soft LED Version 7.0
Hardware	Militia LED Version 3.0 (Lead Free)
Display	Tri colour LED high visibility
Power	9V standard battery 6LR61
Fire modes	Semi, burst, full auto, PSP, Millenium (where available)
Solenoid	5V 1W, 2 port

