

The Airmith Survival Guide

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The Airmith Survival Guide is written for players and airgun technicians that are experienced with paintball equipment. Before you work on any paintgun, always depressurize the gun and wear paintball approved goggles at all times. Please be careful.

www.jam-products.com

About The Airsmith Survival Guide

Before you start tearing apart all of your paintball gear, or your customer's gear if you are in business, please remember that doing so may void the warranty. Once you've established yourself as a qualified technician, many manufacturers may warranty your work however. Please check with the manufacturer before working on any paintball equipment.

Also, when using this manual, please keep in mind that not everyone is good at everything. I've met many players that were very capable of "airsmithing" their Angel, but were clueless when it came to working on an Autococker, even after some serious time was put in trying to learn. You can easily destroy a \$500 paintgun trying to save a few bucks upgrading it yourself. If you have any questions or concerns about airsmithing your gun, please leave it to a professional airsmith. For your convenience I've listed some contact information to some of the best technicians in the industry.

Bad Boyz Toyz	(708) 418-8888
Gramps & Grizzly	(909) 359-4859
J & J Performance	(330) 567-2455
Pev's Paintball Pro-Shop	(703) 491-6505
Predator Marketing	(916) 482-GAME
Pro Team Products	(904) 439-3600
Smart Parts	(412) 539-2660
Warped Sportz	(308) 234-WARP

There are many qualified airsmiths located in all parts of the country. Please e-mail me at editor@pb2x.com if you are having trouble finding one in your area.

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Paintgun Safety

To quote a friend, "The moment you forget how dangerous this machine can be, is when you'll get yourself hurt." This holds true with a paintball gun. When used properly, a paintball gun is as safe as a toy. However, the minute you let your guard down a paintball gun becomes a dangerous instrument. Here are a few safety procedures you should follow when using or working on your paintgun

1. Never point a paintball gun at anyone not wearing paintball approved goggles. Even at the lowest possible operating velocity, a paintball will cause serious injury should it hit someone in the eye area.
2. Never look down the barrel of your gun with or without wearing paintball approved goggles.
3. Always disconnect your air-source and dry fire the gun before working on or cleaning your paintgun. Always have a qualified airsmith do repairs or modifications to your paintgun.
4. Some paintguns are ready to fire when your air-source is connected. Use the trigger safety whenever you're not playing and always use a barrel plug in your barrel until you enter the playing fields.
5. Only play at commercial playing fields that have a chronograph, referees, and clearly marked safe fields. Chronograph your paintgun before each game to ensure your gun is operating at safe velocities.

Remember, safety is your responsibility. Make sure your gun is not shooting at a dangerous velocity and all participants are wearing the proper paintball safety equipment. You will be held liable if someone is hurt by a paintball fired from your gun regardless of whether it's your fault or not. Know your equipment.

If you are working on a paintgun for someone else, make sure you chronograph the gun below 300 feet per second (fps) before giving it back to that player. Again, you will be held responsible if someone is hurt by a gun you worked on if you do not follow industry standards.

[Click HERE to open www.paintballsafety.com](http://www.paintballsafety.com)

Tools of the Trade

Before you can really do any airmithing, there are some things you'll need to know. First, if you are working on someone else's paintgun, you will be responsible for any damage that you may do to the gun. Don't take any unnecessary chances. Before you begin work on a paintgun (anything more than general maintenance, cleaning etc.), you may want to call the company that makes the gun to find out if you are going to void the warranty with your work.

Tools you will need

Depending on what type of work you plan to do, you will need a good set of tools before you get started. Below is a list of tools that you will need to work on a variety of paintguns and equipment.

Goggles: Paintball approved goggles are the single most important "tool" in your box. Even with the power source disconnected, some paintguns can still fire a shot or two. Always wear goggles when working on paintguns. If you are looking for more information on paintball safety, visit www.paintballsafety.com.

Safety Glasses: When you are sanding, filing, or even filling CO2, be sure to wear eye safety glasses. Don't take chances. Never substitute paintball goggles with safety glasses when working on paintguns.

Screwdrivers: Get yourself a good set of flat-head and phillips screwdrivers--you will need them constantly. Don't skimp here. Get a good brand name set of screwdrivers in a variety of sizes. Remember, if the screwdriver head doesn't match the size of the head of the screw, chances are you'll strip the head and you'll be screwed. I would also recommend getting a set of jewelers' screwdrivers.

Allen wrenches: Allen screws are used on literally every paintgun on the market. Like screwdrivers, allen wrenches can strip the allen screw head if the quality of the wrench is sub-par. What happens is the wrench starts to "round" and does not provide a good grip in the screw head. You really should have t-handle wrenches and a smaller size set--the fold-out type is alright. The t-handle wrench gives you good torque when space is not a problem. In many cases you won't have room for the handle so you'll need a smaller set.

Pick: You will need both straight and bent tip picks to work on paintguns and accessories. Bent tip picks are great for removing springs, o-rings, etc. from within a small area such as the Automag power tube. Straight picks work well for removing o-rings from tanks, bolts, etc. Be careful using picks—they can do some bodily damage if you're not careful.

Wrenches: You should have a good set of open end wrenches. You'll need them

for removing/installing air fittings. You probably will need an adjustable wrench as well. It also won't hurt to have a socket set as well. They come in handy in certain situations. For instance, a 1/4" socket works great when removing the Autococker vertical-bottle adapter. Be careful using adjustable wrenches as they can easily strip the bolt head.

Vice: You will be amazed at how many times you'll wish you had a vice once you get started working on paintguns. Make sure you get one that has removable rubber "feet" so you don't damage the surface of the material you're working on. Remember, you can easily damage metal or plastic parts in a vice.

Pliers: There may be times when pliers will come in handy. Be careful not to use pliers for removing bolts as you will "round" the bolt head every time.

Tap and die set: This is essential for re-threading. You can get a decent set for around \$25 and a real good set for about \$45. A word of warning when using taps and dies—you can damage whatever you are working on if you're not experienced. Practice on scrap metal.

Files: Files come in very handy for removing burs, nicks, or other imperfections in metals, especially aluminum. Be careful not to over-file. You can't put metal back.

Soldering Kit and Accessories: These days it is essential for the serious tinkerer to have a soldering kit. More on this later.

Miscellaneous: Other things to have on-hand will be Teflon tape (sometimes referred to as pipe dope) for your air fitting threads, q-tips for cleaning places you can't reach, a small paint brush for cleaning the small cracks, rags, snap ring pliers, various drill bits, Loctite 217 permanent bond, barrel cleaner, paintgun oil (very important), fine emery cloth, fine sandpaper, set of files, several types of squeegees, and a chronograph to check your gun velocities. For chronographing, a radar type of chrono works best.

If you are financially able to, you should buy yourself a good digital micrometer (a.k.a. calipers). For more serious work, a drill or drill press will come in very handy.

A note about drilling. I would recommend doing all drilling in a drill press when possible. If you don't own one, you may want to introduce yourself to your local machine shop owner. You'll probably be needing their assistance and/or equipment from time to time.

Sandpaper & Emory Cloth

These days anything with an abrasive grit on paper or other backing is referred to as sandpaper — probably because real sand affixed to paper is not likely to be found anymore. Sand has been replaced by a variety of materials which now are glued onto a backing sheet. Backing sheets are usually either plain paper or cloth. The type of sandpaper you use will greatly affect the outcome of what you are sanding.

For hand sanding (not using any type of power sander), sheet sandpaper or emory cloth are the most common types used. Below are some examples of grit sizes. For most jobs airsmith related, super fine to fine will do the job. The more course grades are too abrasive for most paintball projects.

Sandpaper and/or emory cloth can be used for removing burrs from your marker's bolt or other metal parts, sanding your hopper feed neck, or to remove anodizing or other finishes on your metal parts. One thing to remember is what you sand off can never be put back. Sand only when absolutely necessary.

<u>Grit size</u>	<u>Grade</u>
40-60	course
80-100	medium course
120-150	medium
180-220	fine
240- 320	very fine
320+	super fine

Screw Size Equivalency Chart

<u>Fraction</u>	<u>Decimal</u>	<u>Millimeter</u>	<u>Screw Size</u>
1/64	.015625	.39688	
1/32	.03125	.79375	
3/64	.046875	1.19062	
1/16	.0625	1.58750	#1
5/64	.078125	1.98437	#2
3/32	.09375	2.38125	#3
7/64	.109375	2.77812	#4
1/8	.125	3.17500	#5
9/64	.140625	3.57187	#6
5/32	.15625	3.96875	#7

Standard Screw Thread Info: The first number represents the diameter of the bolt or screw and the second number is the number of threads per inch in length.

1/4 x 20
5/16 x 18
3/8 x 16
7/16 x 14
1/2 x 13

Tap & Die Information

Working on paintguns and accessories will often require you to have to re-tap threaded holes. Occasionally threaded holes will strip out, or a screw may even break off in a threaded hole. You may even need to create a threaded hole from scratch. Taps and dies (and drills) are used for this purpose.

Both taps and dies are threaded. A tap screws into a hole putting threads into it. Dies are used to put threads on a smooth shaft or rod.

The basic method of threading is this. You drill a hole (slightly smaller than the actual screw size), then using the appropriate size tap, you turn the tap into the hole creating the threads.

Be Careful

Be sure to practice tapping on scrap metal before you actually try to thread a "real" hole.

Since taps are made from hardened metals for cutting purposes, they are somewhat brittle. Be careful not to drop the tap. Also, when using a tap, be very careful turning it as they can easily be broken off inside the hole your trying to thread. If this happens you may never get it out. Turning the tap with an adjustable wrench can be risky, since you will be putting uneven pressure while turning. The best method of turning a tap is to use a "T" handle tap wrench.

The Correct Size Hole: It is important to drill the correct size hole if you are tapping from scratch or you may break the tap in the hole if it is too small. If you are re-tapping a hole, choosing the correct size tap is equally important. Below is a chart that will give you the correct matches for drill bits and taps.

Tap Drill Chart For Some Common Sizes

Tap Size	Drill Size	Nearest Fractional Size (inches)
#4-40	#43	3/32
#6-32	#36	7/64
#8-32	#29	9/64
#10-32	#21	5/32
#10-24	#25	5/32
#12-24	#16	11/64
1/4-20	#7	13/64
1/4-28	#3	7/32
4 mm x .70	#30	1/8
4 mm x .75	1/8"	1/8
5 mm x .8	#19	11/64

5 mm x .9	#20	5/32
6mmxl	#9	13/64
7 mm x 1	15/64	15/64

Before you begin, it's a good idea to dip the tap lightly in some oil. This will help make the turning easier and safer. The common procedure for tapping is to turn the tap forward (clockwise) about a half turn, followed by a rearward quarter (or so) turn. Repeat this if necessary, again being careful not to twist or bend the tap. As you turn the tap in the hole, small chips will fall off of the metal you are tapping. The tap has several "flutes" or grooves that allow the excess metal chips to escape. Be sure the flutes do not get clogged or you may break the tap off into the hole.

Some Interesting Tap and Die Links

Using Taps and Dies: (<http://www.reactivemetals.com/data/tapndie.html>)

Taps and Dies:

(http://www.advancement.cnet.navy.mil/products/web-pdf/tramans/bookchunks/14256_ch_38.pdf)

Tool Tips-Taps: (<http://www.sheldonbrown.com/tooltips/taps.html>)

Metric to Decimal Conversions

It's not very often that you'll need to know the millimeter to decimal conversion airmithing paintguns, but it can come up from time to time, especially with many guns now being manufactured overseas.

MM	Decimal
1	0.0394
2	0.0787
3	0.1181
4	0.1575
5	0.1969
6	0.2362
7	0.2756
8	0.3150
9	0.3543
10	0.3937
11	0.4331
12	0.4724
13	0.5118
14	0.5512
15	0.5906

Using a Dremel™ or Rotary Tool

The Dremel or rotary tool is one of the most versatile small power tools you'll find anywhere. It's also a tool that can ruin your work as quickly as any if used carelessly. The rotary tool uses one of many types of heads or attachments. There are sanding heads, cutting heads, grinding heads, buffing heads, and more.

In addition to a huge variety of bits or heads, rotary tools come in a variety of styles including those that have adjustable speed setting or foot speed controls. I would recommend getting an adjustable tool — they allow you to be more precise than a one-speed unit.

A good rotary tool with a variety of bits will cost you somewhere in the neighborhood of \$80. I've used my Dremel rotary tool for cutting springs and other metal parts, for cleaning in tight places with the fine brush attachment, and for various other metal surfacing applications. Like I said using sandpaper, anything you alter with a rotary tool will never be the same again.

Some Interesting Dremel/Rotary Links

Getting Started: (http://www.dremel.com/html/started/started_fr.html)

How To Solder Wires or Joints

With the advent of electronic paintguns and accessories, learning how to solder is a skill that all airsmiths and enthusiasts must learn. Here are some basic guidelines to follow. Tip: Practice as much as you can before you try to solder paintgun wiring harnesses or components.

Before you begin to solder wires (or anything else) you must prepare the surface. If there is old solder on the wires, you will need to remove it before you begin. To do this you will need de-soldering braid, which can be purchased at any electronics store. Follow the instructions for the de-soldering braid to remove the old solder and clean the area with alcohol.

What You'll Need

- C **Soldering Iron:** You can't do much soldering without an iron. This is the basic tool used to supply heat to the wires you are soldering. This is how you will melt the solder. A soldering iron is in my opinion, a better choice than a soldering gun since it is much smaller, lighter, and easier to use for our purposes. I would recommend purchasing a soldering iron stand as well. This will help prevent you from burning your work table (or worse). You should expect to spend about \$20 on a decent soldering iron and another \$8 for a stand.
- C **Solder:** Again, you won't get too far without a spool of solder. Basic 60/40 (tin/lead) solder is all you need. This can be found at any hardware chain or electronics store such as Radio Shack or online at any of the hundreds of solder supply stores. A spool of solder should run you about \$3.
- C **Wire Cutters/Strippers:** You're going to need a method of removing the cover from the wire ends you are soldering. For this job I would suggest a good wire stripper. A wire cutter will work, but strippers have grooved channels that will strip the wire ends more accurately. You will need a pair of wire cutters and a needle nose pliers as well.
- C **Miscellaneous:** There are a bunch of other things you'll need to have lying around for your various soldering jobs -- things like electrical tape, alcohol, extra wire (various types), and a pick.

Getting Started

One of the first mistakes people new at soldering make is to put all of the solder directly onto the iron. This is not going to get the job done. If you are soldering to a circuit board, lay the tip of the iron onto the pin on your board (or to your wire if you are splicing two or more wires), being careful not to heat anything else accidentally. The next step is a little tricky. Touch just a very small amount of solder to the tip of your iron. Lay the

end of the solder against the metal you are soldering. Be careful to keep it from touching the tip of the iron at this point. When the solder starts to melt, feed it into the joint, filling the gap.

If you've done a pretty good soldering job, the joint should be shiny and should have a slight bubble shape to it. The tip of the pin should be sticking out slightly. One thing to remember about soldering is that too much solder is not a good thing. A bad soldering joint will have a dull grey color to it.

If you need to redo your soldering job, it is always better to start over from scratch completely cleaning the joint. Before you really know if your soldering job is good or bad, clean it with alcohol. This will remove the flux so you can see what you have. Good luck.

Some Interesting Soldering Links

Basic Soldering Guide:

<http://www.epemag.wimborne.co.uk/solderfaq.htm>

Soldering:

<http://et.nmsu.edu/~etti/spring97/electronics/solder/solder.html>

Introduction to Soldering: <http://www.irational.org/sic/radio/solder.html>

Better Soldering: http://www.elexp.com/t_solder.htm

How to properly fill a CO2 tank



What you will need: First and most importantly, to fill a CO2 tank safely you must use an accurate weighing scale. If you do not have one you will either be overfilling or under filling the tank. Try using an electronic (digital) fishing scale. Also you will need a "fill station" that has a bleed valve, a fill valve, a pin depressor, and all of the correct size fittings to fill CO2. Unless you really are experienced with CO2 filling and handling, and

you're going to build your own, buy a fill station made for Paintball applications. If you're reading this however, you're not ready to put your own fill station together, I guarantee it. You will also need an adjustable or appropriate size box wrench to tighten down the fill station adapter to your bulk tank. Of course you need a bulk CO2 cylinder. It's also a good idea to have some extra tank o-rings, and universal fill adapter seals (plastic washer type).

About your bulk tank: Bulk filling tanks for filling small (3.5 - 20oz.) CO2 cylinders must contain a siphon (dip) tube. Dip tube tanks are either marked with red paint around the top of the cylinder, or they are marked "dip tube" somewhere on the tank. The dip tube hangs inside the bulk tank in the liquid CO2 that's in bottom half of the tank. The tube is used to draw the liquid into the smaller tank you are filling.

To empty the tank: To drain the tank you wish to fill, screw the CO2 tank into your fill adapter (a.k.a. Universal fill adapter) and "bleed" the tank until it is empty. If you are emptying a siphon (liquid) tank, bleed the tank in the upside-down position. This will "chill" the tank which will make filling easier. For regular (gas) tanks, bleed the tank in the upright position. If the tank you are filling has no CO2 left you must chill it somehow or you'll only be able to fill your tank to around 25 percent of its capacity. The two common methods of chilling a tank are to put CO2 (about two ounces) in the tank then drain it completely, or place the tank you are filling in a cooler or freezer for a short time.

To fill the tank: Filling a CO2 tank is simple but it can be dangerous if you are not careful. Screw the tank into your fill adapter and tighten down the pin depressor until you feel resistance. Weigh the tank empty. With the bleed valve closed, open the valve on your bulk tank and fill to the desired weight. Since CO2 expands when it warms up, it is much safer to under fill

your tank by about 15 percent or so. If you are filling a twenty-ounce tank, fill it to about seventeen ounces. This way if the gas expands, your tank pressure will not rise above safe levels. Close your bulk tank valve and bleed the excess CO₂ that's in the line. Unscrew the fill adapter until you feel the resistance of the valve pin decrease sufficiently and unscrew the smaller tank.

Remember, after you've filled your tank you must let it warm up to the ambient room temperature before you use it with your paintgun. If you don't, your gun either won't work right, or it will shoot at dangerous velocities after the tank warms. Please be careful.

Other CO₂ tidbits: CO₂ (Carbon Dioxide) is a colorless, odorless gas that has a density about one and one-half times greater than air (nitrogen or compressed air). CO₂ is present in air, but in very small amounts (about 0.04 percent). CO₂ is most commonly used in manufacturing soft drinks, and as a refrigerant, usually for dry ice. In liquid form, CO₂ is used in the fire extinguisher industry.

Understanding the Characteristics of CO₂



Understanding the characteristics of CO₂ is a bit more difficult than it sounds. CO₂ is a volatile gas, or should I say substance, compared to other gasses used in paintball. The fact that CO₂ can convert from gas to liquid and visa versa easily is a real problem for paintball players and their equipment. CO₂ is greatly affected by temperature changes. A properly filled CO₂ tank will have an internal pressure

of about 850 pounds per square inch (psi) in 70 degree (F) temperatures. A temperature increase of one degree will cause the pressure in your tank to rise by 11 psi. So if you're playing in a cool summer morning of about 70 degrees, when the hot afternoon temperature comes your tank pressure can rise 400+ psi with no trouble at all. This will probably cause your gun to shoot "hot," possibly even dangerously high. Let's take a closer look at why CO₂ is really a problem for paintball players.

Why your tank "chills" when you rapid fire: Have you ever noticed that when you rapid fire your paintgun for any length of time, your CO₂ tank gets cold or even "frosted?" What happens next is a real pain. Your velocity drops off with each shot. Here's why. When you rapid fire your paintgun, you are using a large amount of CO₂ quickly. Your tank gets cold because the liquid CO₂ inside is changing into gas to replace the CO₂ used during rapid firing. This change from liquid to gas is called a change of phase. When you fire your gun (with a chilled tank), you are releasing less CO₂ than if the tank was warm.

Velocity Spikes: If you are shooting a regular (gas) CO₂ tank and you point the gun downward, you will notice frost coming out of your barrel. With some guns (Automag, Autococker, etc.) you will quickly render your gun unusable if this happens. If liquid CO₂ gets into your gun's valve, you will usually get velocity spikes. Let's take a look at why this happens: The liquid and gas CO₂ in your tank are always the exact same pressure because your tank is a "closed system." The pressure in your gun's valve will also be the same pressure. The exception to this rule is if you are using a pressure regulator on your gun. When liquid gets into the gun valve, your velocity will spike because you are hitting the paintball with more CO₂. In other words, the CO₂ in the valve is of a much greater weight than if it were in a gaseous state.

When your tank gets hot: One of the real dangers of CO₂ is what can happen if you leave your gun and tank in the hot sun. CO₂'s "critical point" is about 90 degrees. This means that the CO₂ in your tank cannot turn into liquid in temperatures above 90 degrees. This is really a matter of chemistry. Here is a shortened version of what Air America's Dan Colby once told me in an interview for *PCRI*. "The critical point of a gas is the point on the temperature scale above which no amount of pressure will hold that gas in a liquid state. Unfortunately for us, CO₂ has a critical point of around 89 degrees (F). Temperature is simply a measure of average molecular velocity. The hotter the material is, the faster the individual molecules are moving. Matter in a liquid state behaves like a liquid because of the attractive force between molecules. The strength of the force depends on the molecular structure of the gas in question. This is why different gasses have different critical points. When you heat the matter up, the molecules move faster and faster until a point is reached where the individual molecules have enough energy to overcome the intermolecular attraction. Once that happens the matter ceases to act like a liquid and starts behaving like a gas." Basically, if you leave your tank in the sun, all of the liquid in the tank will expand and the gas will have nowhere to go. At this point only two things can happen (assuming you have the right rupture disk in your tank). Either your tank's rupture disk will burst, preventing your tank from rupturing, or your velocity will rise to very dangerous levels.

Okay, now that I've probably bored you with technical mumbo-jumbo, I'll try to get back on track. If you're shooting CO₂, you need to do whatever is necessary to keep your gun shooting gas. Again, there are exceptions to this one. Tippmann guns (Prolite, 68 Special, etc.), the Icon series (older incarnations of the gun), and a few others work best on liquid-only CO₂. We'll get into that later. There are ways of doing that, but we'll address those issues in each individual gun chapter later in this manual. We'll also address why high pressure gasses like nitrogen or compressed air work best for most guns.

Handling Bulk CO2 and High Pressure Tanks Used for Filling



If you plan to fill CO₂ or high pressure tanks you will need to set up an account with a compressed gas company. You can find companies like Robert's Oxygen, Lee's Gas and others in your local phone book under welding. Most of these companies will lease bulk filling tanks to you and will deliver and pick up tanks as you need them. Generally they will bring full tanks and exchange them for your empty tanks on an as-needed basis.

Depending on where you live or work, there are very specific laws, rules, and guidelines

regarding handling, moving, and storing compressed gas tanks. This includes CO₂ tanks as well as nitrogen/compressed air tanks. Check with the Compressed Gas Association for details in your area.

General Safety Guidelines

First and most importantly, if you are renting, leasing, or buying a bulk filling tank of any kind, make sure there is a label or stamped identifier on the tank. This is also true with any smaller compressed gas/air tank. Do not accept any tank that is not clearly identified.

Looking at a bulk filling tank you will notice a screw-on valve cover. Leave this on whenever transporting or not using the tank. This will ensure that the tank valve cannot be accidentally broken off should the tank fall over, roll, etc. It is important (and the law in most states) that your tanks be chained to a wall, fence, or some other stabilizing unit. Never leave your

tank is a position where it can roll or fall over.

When transporting your tank also make sure it is secured safely so it cannot roll over, move or shift. When moving tanks by hand, use a hand-truck that has a belt or chain that can be wrapped around the tank and secured to the truck.

Always store your bulk filling tanks away from extreme heat or cold.

To learn more about compressed gasses, nitrogen, CO2 or any other paintball propellant you can contact the Compressed Gas Association in Arlington, Virginia. Ask for CGA pamphlets P.1 and G-6.3

Also contact Catalina Cylinders in Eastlake Ohio at (216) 946- 2573 (fax number). This is the manufacturer of most of the tanks we use in Paintball.

For information regarding insurance questions concerning high pressure call the American Paintball League (APL) at 1-800-541-9169.

Understanding High Pressure

When someone refers to high pressure in regards to paintball, they generally are speaking about nitrogen or compressed air. For paintball purposes both are the same. A high pressure system can be filled with either nitrogen from a bulk tank, or compressed air from a compressor, or a scuba tank that was filled from a compressor. The reason these systems are called high pressure systems is that they are filled (by pressure, not weight as with CO₂) to 3,000 - 5,000 psi. High pressure systems are regulated down to 600-800 psi output pressure. This means that a constant pressure flow to your gun can be safely achieved. If you could put 3000 psi directly into your gun, chances are that you would only be able to do it once. We'll discuss the safety issues and concerns later though.

The advantages of high pressure: Nitrogen and compressed air have virtually the same characteristics. Compressed is the air that you breath every day that is compressed into a higher pressure than its normal state. Compressed air is around 78 percent nitrogen and 21 percent oxygen. Under normal conditions, nitrogen and compressed air are unaffected by temperature changes and fluctuations. Unlike CO₂ which boils at about 89 degrees Fahrenheit, nitrogen boils at the very high temperature of 196 degrees Celsius. So for paintball, no matter how hot or cold it gets or no matter how many shots you fire off rapidly, your gun will be supplied with consistent pressure from the regulated tank (assuming your equipment is working properly). This means that your velocity will stay much more consistent than you've come to expect using CO₂. That fact alone makes high pressure more appealing to Paintball players than CO₂. Another advantage with high pressure is that you do not have to wait for your tank to warm before you use it and you don't have to chill the tank to fill it. To get a complete fill however, you need to fill to 3000 psi, wait a few minutes for the tank pressure to stabilize, and top off with 300 - 400 psi. We'll talk more about that later. There are many more smaller advantages to using high pressure. High pressure systems allow you to play all year, whereas CO₂ does not really work well in any gun in the extreme cold. What happens if you burst a hose or damage your system using high pressure is actually less dangerous than the more volatile CO₂. Again we'll cover that one in a later chapter.

The disadvantages of high pressure: High pressure systems are generally more expensive than CO₂, mostly because of the pressure regulator. In addition, the aluminum/fiberglass wrapped bottles (also known as composite bottles) are a bit expensive. Not all pro shops and fields fill high pressure currently, although most do. High pressure is a bit harder to carry as well. A 114 cubic-inch high pressure tank is much larger than a twenty-ounce CO₂ tank and yields about the same number of shots

(using a 3000 psi system). That statement is sort of generic, but pretty close to accurate with most guns. From a performance point of view I can't think of one disadvantage with nitrogen compared to CO2, unless you're using a gun specifically designed for CO2.

High Pressure Safety

Composite bottles used for paintball are rated for a working pressure of 3,000 - 5,000 psi. The industry standard (compressed gas industry) has a four-to-one safety margin built in. In other words, a 3,000 psi rated tank should be safe at pressures of up to 12,000 psi...in theory. All high pressure systems I have seen have at least one and usually more safety burst disks, similar to those used on CO2 tanks. If you were able to fill your (3,000 psi) tank above 3,000 psi, somewhere around 3,500 psi you would rupture the safety burst disk. You'll hear a pretty loud pop and the nitrogen or compressed air will disperse from the tank. Unlike CO2 which will go through a change of phase when your burst disk ruptures, compressed air reacts much less violently. Your tank won't fly across the room, blow up, or freeze over. Likewise if your hose should break, it won't whip around as it would with CO2. It will fall toward the ground and the air will rush out.

Okay so you've got 3,000 psi in your tank, what happens if you adjust your regulator wrong and you send all of that pressure into the gun? If it could happen you could turn your paintgun into a hand-grenade, unless it was an Automag which is the only complete paintgun rated above 3,000 psi that I know of. But guess what? The regulators that are used with high pressure systems won't allow you to set your outgoing pressure above 1,000 - 1,500 psi. With Air America systems for instance if the outgoing pressure should reach 1,100 psi, the system will vent gas out the back end of the regulator. We use CO2 every day in the summer at pressures in that range. If you really want to prevent any chance of overloading your fittings, you might want to consider using stainless or nickel fittings, quick disconnects, etc. These are rated at working pressures of 2,500 psi and above. We'll cover fittings in detail later in this manual. If you use a remote or have external hoses on your paintgun, all of the wire-braided types I have seen are rated at 2,500-plus psi. The black hard rubber types are rated somewhere in the 1,800 - 2,600 psi range. Important note: Never use fittings rated under 3,000 psi (working pressure) between your high pressure tank and it's regulator.

A question I get very often is, "Can I use nitrogen on my Spyder, Prolite, or Bobcat?" Sure. With the prices of high pressure systems coming down seemingly every day, it makes more sense than ever before to use "air" on an inexpensive paintgun.

A word about fittings...

The fittings used for paintball guns are almost always 1/8" NPT (National Pipe Thread). This has become the standard for the paintball industry (on U.S. made products). As I stated earlier, you shouldn't have to change your gun's fittings to use high pressure. The one exception to this is if you are using fittings between the high pressure tank and the regulator. There is one important thing to think about however; brass does not have the impact resistance of stainless steel, aluminum, or nickel. As you know a paintball gun takes a pretty fair amount of abuse and steel filings may just prevent your gun from going down in a game.

When installing fittings of any type remember they do not need to be super tight. In fact, over tightening your fittings will actually shorten the life of the fittings. Here's how fittings are designed: Pipe threads (which all fittings have) are designed to taper outward. As you tighten the fittings the widest part of the threads wedges into the female side. This is what makes a seal. Teflon tape (pipe dope) is used as a secondary seal and as a lubricant for the threads. Use the half-inch tape size and wrap clockwise (tightly). If you use the same male fittings over and over, they will thread further and farther into the female fitting. At some point, the fittings will become unusable and will begin to leak.

Some of the various types of fittings:

1. Quick disconnect — two pieces, male/male, female/female.
2. Female elbow
3. Male elbow
4. "T" — two female and one male end.
5. 90 Degree elbow — one male and one female end.
6. 45 degree elbow — one male and one female end.
7. Hex coupler — has two male ends.
8. Coupler — has two female ends. Used for joining two male parts.

Hydrotesting

What is Hydrotesting you ask? Hydrotesting is a procedure (done by qualified testers) in which CO₂ and nitrogen/compressed air tanks are tested for damages that may render the a tank dangerous. The process involves visual inspection of the tank and valve, and pressurizing the tank internally to measure the volumetric expansion of the tank. Tanks that are deemed safe are stamped with a new "expiration" date. Those that are not, are destroyed. Hydrotesting procedures are done using CGA (Compressed Gas Association) and DOT (Department of Transportation) guidelines.

By federal law all nitrogen/HPA tanks need to be tested every thee years and CO₂ tanks more than 2-1/2" in diameter need to be tested every five years. All smaller CO₂ tanks do not require hydrotesting.

All cylinders (which require hydrotesting) are marked or stamped in some way with an expiration date. All players should check date dates often. It is illegal (and extremely dangerous) to play with, or fill tanks with expired dates.

Custom Finishes for Your Paintgun or Parts



Anodizing: Anodizing is an electronic finishing process that can be done only to aluminum. It is a process in which the surface of aluminum is converted into a colored or clear coating by electrolytic oxidation. Unlike most other metal finishing, anodizing is not a coating that is deposited on the surface of metal. It actually grows inward from the surface.

Parts that can be anodized include the Angel main body, All American barrels, Automag frame rail, Autococker body, block, etc. There are several companies that offer custom anodizing as well as "stock" anodized parts for the Autococker, Angel, Spyder, etc. Smart Parts, Inc., offers a huge variety of "splash" and solid color anodized parts for various guns. Pro Team Products/Gun f/x also offer a variety of custom anodized parts for the Automag and 'Cocker including their Armson internally rifled barrel.



One thing to note about anodizing is that all non aluminum parts must be removed from the aluminum ones before the process can be started or you risk damaging all of the parts.

Polishing: Stainless steel barrels and other components are polished as well. Although polishing can be done to aluminum, it will usually take on a grey look rather than a gloss silver look like stainless steel.

Powder Coating: Powder Coating is commonly used in the automotive industry due to it's tough finish. Powder Coating is a finish that is actually baked onto the surface and is available in hundreds of colors. It is however, not as "neat" as anodizing since it is sprayed on. Power coating also increases the size of your parts more than anodizing.

Chrome Plating: Chrome plating is a fairly expensive process that can be done to give your stainless steel parts a bright shiny finish. Chrome plating is a metal that is actually deposited on the surface of another metal.

In addition to changing the finish of your paintgun, you can sometimes have your parts, or your gun's main body machined to give them a unique look. Companies like Chipley Machine (www.chipleymachine.com), Bad Boyz Toyz (www.badboyztoyz.com), Doc's Machine (www.docsmachine.com) and others offer custom machining and decorative milling services.

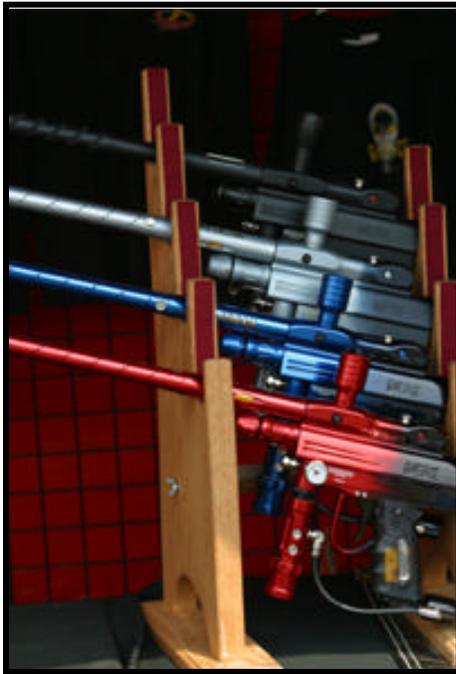
Interesting Anodizing Links

www.anolaze.com/trickanodizing.htm

www.pkselective.com

Materials Used in Manufacturing Paintguns and Accessories

Some of the most commonly asked questions I've gotten since I've been in the paintball industry are regarding the materials used in manufacturing paintball guns and equipment. Below I've listed some of the more common materials used today.



Aluminum is inexpensive, easy to machine, and can be anodized.

Aluminum: Probably the best known quality of aluminum is its light weight. Aluminum is about one-third the density of stainless steel. Even though aluminum is very lightweight it can be strengthened to compete with metals that are heavier and more expensive. Like stainless steel, aluminum is highly resistant to corrosion and can be machined, formed, or molded to tight specs. Aluminum can be polished or anodized in a variety of colors including "splash" or "fade" finishes.

Titanium: Like aluminum, but even more so, titanium has a very strong strength to weight ratio, making this a very desirable metal for many industries. Titanium also has strong corrosion-resistance properties.

Like stainless steel, titanium can be formed, forged, and machined at room temperatures. But even better than stainless steel, titanium can be anodized and is lightweight.



Stainless steel Freak sleeves

Stainless Steel: Stainless steel is an iron-based alloy that has a high resistance to rusting and corrosion and is very durable. Stainless steel can be shaped, formed and machined to precisely detailed specs. Stainless steel can be polished, nickel-plated, or powder-coated to enhance its appearance. Steel cannot be anodized.

Brass: Brass is a soft metal often used in the manufacture of fittings (elbows, quick disconnects, etc) and sometimes barrels. Brass is fairly heavy and definitely not as durable as stainless steel, but easy to machine.

Composite plastics: Over the last few years, the technology in plastics has increased tremendously. In the past, plastics were structurally weak, pliable, low in density and brittle. With the introduction of fillers or reinforced fibers, plastics can be as strong and durable as many heavier more expensive metals. Carbon fibers (and other synthetics) are used to produce extremely strong, lightweight materials. Some examples of composite plastics are the Stingray main body, Automag grip frame, and the Trracer lower receiver.

Chronographing A Paintgun



A chronograph is an electronic device that is used to measure the speed of which a ball is fired from a paintgun. The chronograph gives you a reading in feet per second (fps)--300 fps is the legal limit for outdoor play, and some insurance carriers require a lower velocity than that. Check with the field you'll be playing at.

As you learned earlier (or you already knew) your gun's velocity can change several times during the day, regardless of whether you're using CO₂, nitrogen, or compressed air. There are many reasons for this including temperature changes, liquid CO₂ in your system, bad seals or o-rings, etc.

I once witnessed a paintgun jump in velocity by more than 150 feet per second because the velocity adjusting screw backed out.

What type of chronograph to use: Without a doubt, the radar type works best, but they are expensive. Unlike most less expensive chronographs, a radar chronograph does not require light to work properly. This gives you an accurate reading every time indoor or out. If you are using a non-radar chronograph, (dual sensor type) make sure that you have good indirect natural light available. Both low light or direct sunlight will affect your chronograph reading.

How to chronograph your gun: If you are using a radar chronograph (table mount type), place the barrel of your gun lightly on the rubber barrel rest. If you put downward pressure on the barrel you will get a lower reading. This technique was perfected by tournament teams as a way to "cheat" the chronograph. Don't try it now because every decent chrono Ref knows the trick. Also, keep your gun barrel level or slightly elevated to get the best reading.

If you are using a dual sensor type of chronograph, your paintgun barrel should be about four inches above and behind the chronograph when shooting. Remember, good lighting is important.

If you are getting your gun (or someone else's) ready for a day's play, make sure it is clean internally before you chronograph it. This includes

the barrel and internal components. The gun's velocity will vary greatly with broken paint in the barrel or dirt in the internals. You will also find that a pump-gun's velocity will jump if the internals are not properly lubricated.

Interesting Chronograph Links

www.sportssensors.com — Radarchron chronograph

www.paintballsafety.com/chrono001.html — Article, "It's All About the FPS"

http://www.peps.ku.ru/views/chron_faqs.html - Dirty Dan's Chronograph page

How Paintguns Work



AGD's X-Mag

There are several types of paintguns that work in different ways. For instance, pumps guns work very differently than semi-autos. Even more specifically, there are many different semi-auto designs that each have their own method of getting the ball out the end of the barrel. We'll cover each different type of paintgun in their own chapters. Here we'll just

look at what makes the average paintgun tick.

All guns, whether they are pump guns, semi-auto, or full autos have certain similar parts. Obviously all paintguns have a barrel, grip, trigger, air source adapter, etc. Internally most guns work like this. Air (CO₂, nitrogen, etc.) is supplied to the valve or power tube. When the trigger is pulled the sear is released from the bolt and the hammer is driven into the valve releasing CO₂ (or nitrogen) to fire the ball. If you have a pump gun, you must manually cock the gun which engages the trigger sear to the bolt again. Most semi-autos use CO₂ to recock the gun...some use a spring or some other method.



ACI Hornet

Pump guns: As the name infers, pump guns must be manually "pumped" (cocked) to load a paintball in the chamber. CO₂ from your tank or 12-gram cartridge flows through the valve via the air source adapter. When you cock the gun, a paintball drops into the breach and the main spring is compressed.

When you push the pump handle forward the ball is pushed into the barrel of the gun. When the trigger is pulled, the sear slips off of the bolt and the hammer is pushed by the spring into the power tube. This releases the CO₂ burst that fires the paintball.

Semi-autos: Semi-automatic guns work very differently from pump guns, and from each other. The basic concept is this: CO2 (or another power source) is supplied to the gun's valve or reservoir. When the trigger is pulled, the striker or hammer hits the valve releasing CO2 to recock the gun and fire the paintball. A semi-automatic paintgun fires one ball per trigger pull.



Rebel bottom line



VF-Tactical

Auto-cocking guns: We'll cover auto-cocking guns more specifically in the Autococker chapter later in this manual. Basically, auto-cocking paintguns are guns originally designed as pumps and converted to automatically cock and fire with each trigger pull.

ns work very similarly to other semi-automatic guns with some exceptions. A trigger activated micro switch is used to begin the firing sequence. The introduction of electronics into the paintgun allow a ton of neat things to be added -- things like shot counters, multi-fire modes, timers, etc.

Full Autos: There are only a few fully automatic non-electronic paintguns available, with the Tippmann F/A and Tagline TS-1 Select being the two most popular. In simple terms, a full auto fires continually as long as the trigger is depressed.

Electro-pneumatic: Electro-pneumatic gu



Intimidator

Paintgun Oils

What type of oil do I use in my paintgun? That's one of the most often asked question every airsmith gets. The simple answer is to use an oil that is designed specifically for paintguns. Gold Cup, Empire, Pro Team Products, Allen Paintball Supply, KC Trouble Free, and J & J Performance all make or distribute paintgun oil, and all work well in most circumstances. Most manufacturers also sell oil for their guns. These are the only oils I would recommend for paintgun use. Because this is such a hot topic, I decided to do some research about oils myself--here's what I've found.

First, the oil you use in your paintgun needs to be compatible with your gun's o-rings and seals. Secondly, the oil must be have an acceptable temperature range. In other words, you don't want to use an oil that will freeze or get "thick" in the cold weather. Finally, you probably want to use an oil that is not toxic, irritating to the skin, or environmentally damaging.

What function does oil perform?

The primary function of oil in regards to your paintgun is to reduce friction in the moving internal components. This will minimize the wear of the parts while increasing the speed and smoothness of the operation. If you are going to use an oil that is not specifically designed for paintguns there are some important issues to look at. First, the temperature of liquid CO2 is somewhere in the -50 to -60 degree Celsius range. You'll need an oil that does not thicken in that temperature range. Motor oil for instance, is designed to work in hot temperatures and will thicken in the cold. This will cause the internal parts of your gun to slow down or even cease. The "thickness" of an oil is called viscosity. Some oils tend to have viscosity break-down in extreme hot or cold temperatures--some do not. There is actually a viscosity index which will tell you how "durable" an oil is in hot or cold temps. Paintgun oil should have a viscosity index of 300+ and should be able to handle temperatures of -60 to +60 degrees C.

Compatibility

Plastics, rubbers, and other non-metallic components can be effected by the oil you choose. Some oils will damage rubber o-rings for instance. Teflon and urethane o-rings are much more durable and may be more forgiving if you choose the wrong oil. If you are not familiar with oil compatibility, stick with an oil designed for paintguns.

Information on O-rings and Seals

If you've taken apart even the most simple paintgun, you've probably seen several o-rings or seals. O-rings and seals come in all shapes, sizes, and materials. Basically they all perform the same function--to provide a seal between two or more internal components. There are two basic types of seals. A static seal is one in which parts do not move in relation to each other. A good example of a static seal would be your tank o-ring. It's more of a gasket than an active seal. The second type of seal is a dynamic seal. A dynamic seal is one that has moving parts that move in relation to the seal. The power tube o-ring on the Automag is a dynamic seal.

When a paintgun manufacturer designs a gun, they must consider many things when choosing o-ring and seal materials. For instance, an o-ring that comes in contact with a metal component for an extended period of time when a paintgun is fired needs to have very strong tear resistance and abrasive resistance. Teflon o-rings are super durable and would probably work well in most situations of this nature. On the other hand, Teflon does not "give" so it will not work well if compression is needed. Rubber o-rings don't work well on your CO2 tanks because they are not resistant to the cold. The change of phase that occurs when you unscrew your CO2 tank too fast will freeze your rubber o-rings and cause them to crack.

Some manufacturers may use a less expensive o-ring on their gun (especially with budget priced paintguns) to save money. If you do some experimenting you may be able to improve a gun's performance by upgrading the o-rings to a more durable type. To do this change only one o-ring at a time so that you can see immediate results--good or bad.

Airgun Designs 68 Automag



In This Chapter of the Airsmith Survival Guide

[Introduction](#) - Various versions of the 68 Automag

[Downloads & Web Links](#) - Clickable links to download Automag manuals and instructions, manufacturers' websites, accessory company websites, reviews sites, and more.

[Basic Components](#) - All you need to know about the receiver, grip frame, regulator, bolt, and the rest of the gun's components

[Complete Disassembly](#) - Breakdown instructions

[Impulse Maintenance](#) - Learn how to do basic maintenance on your Automag

[Tools](#) - A list and description of tools you'll need to work on your 'Mag

[Upgrading](#) - Some suggestions on upgrading your Automag

[Troubleshooting](#) - Instructions on how to troubleshoot and fix your Automag

[Click HERE to open the AGD Automag](#)

Airgun Designs 68 Automag

About the Automag

The 68 Automag from Airgun Designs was once the most popular tournament paintgun. Its rate of fire, upgradability, consistency, and ease of use (once you know what you're doing) is still fantastic. Over time and with the development of the electronic gun, the Automag has become a popular gun on the rec-ball scene, especially on the scenario fields.

How the Automag Works



AGD Minimag

The 68 Automag is a blow forward (from an open bolt) semi-automatic paintgun. The Automag has three functional components...the pressure regulator, on/off valve, and power tube. CO₂ from the tank supplies air to the regulator at 500-1200 pounds per square inch (psi), depending on the temperature (the pressure can actually be higher or lower in extreme conditions). The regulator takes the pressure down to about 450 psi, where

it flows through the on/off valve and fills the air chamber. When the trigger is pulled, the on/off valve is closed and the bolt is released from the sear. The bolt moves forward until the piston exits the power tube and air is released into the bolt cavity firing the ball. The bolt spring returns the bolt to the cocked position. The trigger is released and the on/off valve pressurizes the air chamber. CO₂ is not used to re-cock the gun.

Airgun Designs Online Tips and Manuals

Misc Links

<http://store.airgun.com/acb/Category.cfm?&DID=17&CATID=6> - Order Automag parts and accessories

<http://www.automags.org/> - Automags.org, official internet site for Airgun Designs products

Tech Support Links

<http://www.airgun.com/Techinfo.shtml> - Automag tech support page

<http://www.automags.org/resource/tech/tomstech/index.shtml> - Tom Kaye's Tech Tips

<http://www.warpig.com/forums/tech/agd/index.shtml>

Automag Reviews

<http://www.paintball-gun.net/automag.html>

<http://www.pballcanada.com/automag.html>

<http://www.technopaintball.com/automagreview.html>

<http://www.pcri.net/gun22.html>

Three main types of Airgun Designs Automags

In the past there were three basic types of Automags manufactured by Airgun Designs. The Minimag, which once retailed for around \$550, about \$50 more than the Crown Point Power Feed version. The least expensive Automag, the "Standard" sold for about \$400 back in "the day.". All three of the Airgun Designs Automags were and are still identical internally. They all have the same valve, bolt, etc., and only differ in configuration, look, and feel.



MiniMag circa 1995

Minimag: The Minimag is Airgun Designs' high-end "out of the box" non-electronic paintgun. The Minimag comes standard with an extended Power Feed main body and vertical CO2 set up. The vertical bottle adapter incorporates a quick disconnect to the regulator. This allows the user to remove the internals in just a few seconds. The Minimag comes with an aluminum non-ported barrel.

Classic Automag: This is by far the most popular Automag on the playing fields today. The Classic comes with a Power Feed main body, no barrel and no air connection. This makes it easy for players to set up the gun to their liking. The Classic is also available in a non-Power Feed version if you're looking to save a few dollars.

In addition to the two Airgun Designs Automags, there are a few companies that made custom Automags. You'll still see these on the field from time to time.

Gun f/x/Pro Team Products

Micromag: The Gun f/x Micromag uses the standard Airgun Designs Automag internals in conjunction with a replacement all-aluminum main body. The Micromag incorporates a 45-grip frame with a great trigger, removable threaded barrel, ball detent, bottom-line CO2 adapter (from the valve, down to the bottom of the 45-grip frame) and bolt-on Power Feed system. The



MicroMag

Micromag is manufactured under license from Airgun Designs and had (back in the 90s) a starting retail price of about \$495. The Micromag was/is available in a variety of anodized finishes including several unique "splash" patterns and colors.

Oh Pawlak Signature Series Automag: Oh Pawlak's Signature Series Automag is a fully upgraded tournament ready Automag. This gun comes with a vertical bottle CO2 set up, custom spiral drilled barrel, 45-grip frame, bolt-on Power Feed, polished main body, and a three color "splash" anodized finish. The Oh Pawlak Signature Series Automag is available from Predator Marketing of Sacramento, California, and retails for about \$695.00.

The Automag's Basic Components

Crown Point barrel (no longer available): The Automag's Crown Point barrel is eleven inches in length and has three "diamond" shaped ports (Crown Points) machined into the muzzle end. Internally the Crown Point is hard anodized for a smooth bore finish. The Crown Point barrel is manufactured from aluminum and weighs just over six ounces. The Automag has a twist-lock barrel that is installed by lining up the machined groove in the barrel with the stainless detent pin (mounted in the rail) and pushing forward to the "stop." Turn the barrel clockwise until it stops and you're ready to go. The Crown Point barrel comes standard on the Crown Point/Power Feed Automag.



*Automag Power Feed
main body*

Power Feed Main Body: The Power Feed Main Body is manufactured from "300 series" stainless steel and is by far the toughest component of the Automag to produce. The Power Feed main body uses CO2 blowback to help chamber the paintballs faster and more efficiently. Both the Crown Point/Power Feed and Minimag versions come with Power Feed main bodies. To use the Power Feed as an additional safety, simply twist the plug until it closes off the breech.



Non Power Feed Classic body

Standard Main Body: The standard main body is also manufactured from 300 series stainless steel. The standard main body is not as effective in chambering paintballs as the Power Feed version. CO2 blowback causes the paintballs to be pushed back into the feeder between shots. This will prevent you from taking advantage of the Automag's excellent rate of fire.

Frame Rail: The Automag's frame rail is manufactured from aluminum and lies between the grip frame and main body. The rear field-strip screw goes through the grip frame and the frame rail, and threads into the regulator. The front allen screw goes through the grip frame and the frame rail and threads into the main body. The frame rail also houses the barrel detent and the trigger sear assembly and is machined to accommodate the back-bottle adapter. The frame rail is "z-grooved" to allow the regulator to be "twist locked" into the rail for safety reasons. The front end of

the rail is "scored" to allow the user to "punch" out the pre-cut hole for the vertical-bottle adapter. The new Automag frame rails are machined to allow the user to convert the gun to pump style.

Back-Bottle Adapter: The back-bottle adapter is manufactured from aluminum and is screwed into the rear end of the frame rail of the Crown Point/Power Feed Automag and the Standard Automag. A nine-inch steel braided hose connects the back-bottle adapter to the regulator.



Composite grip frame shown with bottom line adaptor

Composite Grip Frame (on all post 1994 guns): The Automag's grip-frame (handgrip) is manufactured from an extremely durable carbon fiber material. The hand grips are interchangeable with Worr Games Products' grips. In addition, several manufacturers are marketing replacement molded grips, wood grips, etc. for both the composite and original grip frame. The bottom of the grip frame is drilled out or threaded to allow the user to attach a bottom-line adapter.

Original Grip: The original Automag grip frames were manufactured from aluminum which was a bit heavier and more costly. The bottom of the original grip frame is threaded to allow you to easily adapt a bottom-line CO2 set up.

Field Strip Screw: The rear field strip screw is manufactured from stainless steel and is knurled to enhance your grip. The rear field strip screw also has a recessed allen head so it can be "locked" in place.

Power Feed Plug: The Power Feed plug is manufactured from a carbon fiber material and fits into the bottom of the Power Feed. The plug can be used as a secondary safety device (see Power Feed).

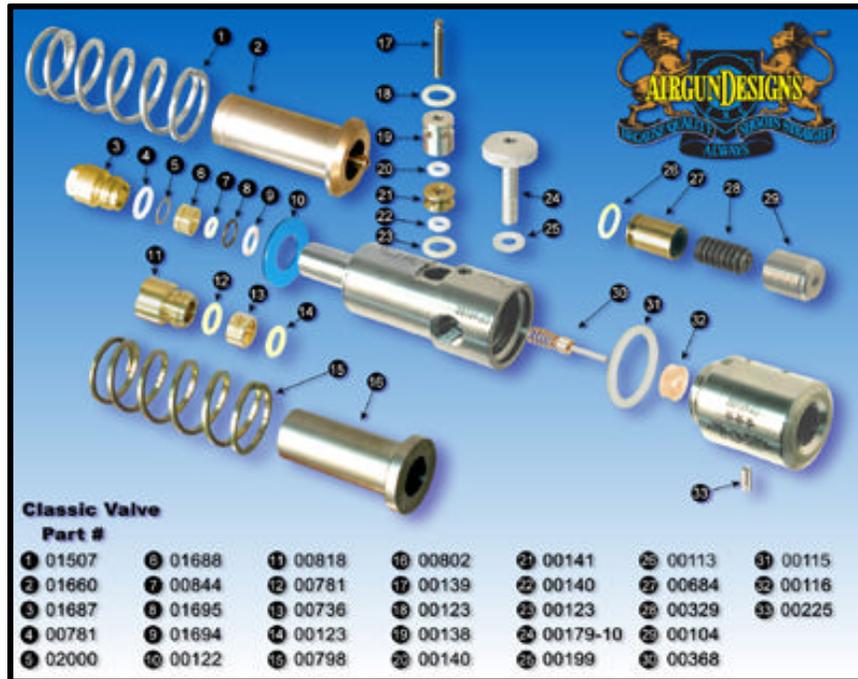
Vertical Bottle Adapter (*Minimag only*): The vertical bottle adapter is mounted to the front end of the frame rail with a counter-sunk allen screw. A hose runs between the adapter and the Minimag's regulator. A quick disconnect makes removing the regulator a breeze.



MiniMag vertical bottle mount

Wire Nubbin: The Wire Nubbin is fitted into the machined groove in the Automag barrel and is held in place by two barrel o-rings. The Nubbin protrudes into the bore and prevents paintballs from double feeding. When adjusting the nubbin always try to maintain the "V" shape. The nubbin is now available made from a carbon fiber plastic.

Internals



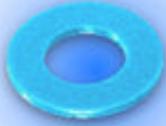
Power Tube Assembly & Bolt (*power tube tip, o-ring, spring*)

Power Tube Tip: The power tube tip is manufactured from brass and unscrews exposing the power tube o-ring and spring.



Main Spring (power tube spring): The main spring is manufactured from high tensile "square" music wire. The flat edge of the wire allows the spring to collapse tighter than "round" wire. The power tube spring should measure .270 - .310 (1000's of an inch). The power tube spring is located just below the power tube tip.

Power Tube O-Ring: The power tube o-ring is a 90 durometer urethane o-ring. The power tube o-ring will be one of the first o-ring to freeze if liquid CO2 gets into the valve. The power tube o-ring can be accessed by removing the tip and spring and removed using a bent-tip pick. The power tube o-ring is interchangeable with the larger on/off valve o-ring.



Bumper: The rubber bumper is used for recoil of the bolt. The bumper almost never needs to be replaced.

Spiral Clip (on pre level-7 guns): The spiral clip holds the power tube in place. If your Automag "locks up" check the spiral clip. If you remove the spiral clip the air chamber will be exposed.

Bumper

Bolt: The bolt is manufactured from stainless steel and has a foam rubber "foamie" attached to the front end. The foamie is used to cushion the paintball as the bolt pushes it into the barrel. During the early part of 1995, Airgun Designs released their "Foamie-less" bolt. The new one-piece bolt is designed to work without the foamie tip. The bolt slides over the power tube and is released by the trigger pull. The bolt pushes the paintball into the barrel where the CO2 burst fires the ball.



Bolt

Bolt Spring: The flat wire bolt spring is used to return the bolt to its cocked position.

On/Off Valve (on/off pin, top, bottom)



On/off assembly

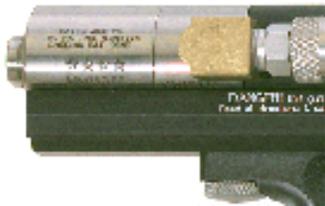
The **On/Off Valve** is found on the bottom of the valve body. The on/off valve is used to shut off CO2 flow to the air chamber when firing, and allow CO2 to refill the chamber on the trigger release. There are three main components to the on/off valve.

On/Off Pin: The on/off pin is manufactured from stainless steel and is used to hold the on/off top and on/off bottom in place. The notched end of the pin should be the last end in when reinstalling the on/off assembly.

On/Off Top: The on/off top is manufactured from a titanium coated aluminum and should be the first component (aside from two o-rings) inserted into the on/off cavity (flat side down).

On/Off Bottom: The on/off bottom is also manufactured from stainless steel and houses one Teflon and one urethane o-ring.

Pressure Regulator (*regulator valve, seal, piston, body, nut, spring pack*)



Pressure regulator

The regulator valve and spring are found inside the valve body and can be accessed by unscrewing the two halves of the **A.I.R.** (Advanced Integrated Regulator) valve. The regulator valve and spring can usually be pulled out together by hand. If the spring does not come out with the valve, use a bent-tip pick to pull the spring out, but be careful not to alter the spring shape. In the regulator body, you will find the regulator seal ("reg seat").

The regulator seal is a thick urethane washer that snaps into place *only one direction*. The regulator seal is wider on one end. That's the end that goes into the hole first. The reg. seal is probably the most important seal in the Automag and should be inspected, cleaned, and changed often. A dirty or bad regulator seal will cause your Automag to shoot "hot", or prevent the regulator from doing it's job...regulating the pressure in the valve.

The regulator piston (brass piece with o-ring) houses the non user-adjustable blow-off valve and is found in the regulator body. The regulator piston can be removed by unscrewing the regulator adjusting nut (the very rear of the gun) and pulling out the nut and spring pack. The regulator nut and spring pack should come out as a unit. To reassemble, place the piston in the back of the regulator body o-ring end first. Then install the spring pack and regulator adjusting nut and you're ready to go. The blow-off valve is a safety device that vents CO2 (or nitrogen) if the pressure in the valve exceeds safe levels.

Getting Started

This chapter is written for players that are already familiar with the Automag. If you just purchased your gun, watch the video and carefully read the manual supplied with the gun before using.

Always wear Paintball approved goggles before pressurizing your paintgun.



The 68 Automag operates on "gas" CO₂ only (or high pressure gasses such as nitrogen or compressed air). Liquid CO₂ that enters the valve will freeze your gun's o-rings and cause the gun to malfunction. Liquid CO₂ can actually damage your gun internals, so the first thing you'll want to do is learn how to keep liquid out of the gun. Also when you get liquid in the valve, at some point

it will boil back into gas and give you several dangerously "hot" shots.

Rule #1 - Never use a siphon tank with your Automag or Minimag.

Since your CO₂ tank almost always contains liquid in the bottom half, you never want to fire down at the ground. This will just pour liquid into the gun's valve and almost instantly freeze your power tube o-ring and cause your Automag to leak. The Crown Point and standard Automags come set up for back-bottle CO₂. *A standard CO₂ tank when placed in the horizontal position will always allow liquid CO₂ into the gun.* You need to do one or more of these things.

For the standard Automags, you can have an anti-siphon tube installed in your CO₂ tank valve. This tube, usually made from copper, screws into the bottom of your tank's pin valve and is positioned to prevent liquid CO₂ from being drawn into the valve. For the best performance, your anti-siphon tank should be set up specifically for your gun. (The tube must be properly aligned for your gun's CO₂ adapter or it will act as a siphon tank.) Another excellent option you have for preventing liquid from entering your gun's valve is to use a remote CO₂ set-up. A "remote" is a high-pressure hose that screws into your gun's CO₂ adapter and connects to your CO₂ tank that is placed in a harness or pouch on your back. The hose (usually about 40-inches) allows the liquid CO₂ from your bottle to expand into gas before entering your gun. The other more basic option you have is to have a vertical-bottle adapter installed on your gun. The vertical bottle adapter is installed onto your Automag's frame rail and is connected to the gun's regulator via a high-pressure hose. The bottle when kept in the vertical position is less likely to allow the liquid CO₂ in your tank to get into the gun

The Minimag comes set-up for vertical bottle CO2, so out of the box it is much less likely to have a liquid problem.

Rule #2 - Always let a trained airsmith make modifications to your paintgun.

Once you've figured out how to keep liquid CO2 out of your Automag, you're ready to actually use the gun. **Important:** *The Automag is cocked and ready to fire as soon as you install a CO2 tank to the gun. Unlike most semi-autos, the Automag does not need to be manually cocked to*



fire the first shot, so please be careful. The next step is to attach the elbow (included with the gun) to the Power Feed and feeder to the elbow. Screw your CO2 tank into the back-bottle adapter while holding the trigger down and install the barrel. At this point the gun is ready to fire, so make sure you and anyone around you are wearing Paintball approved goggles.

Your Automag is factory set at 280-290 feet per second (fps), but in hot weather your velocity can raise to dangerous levels. Always chronograph your gun several times per day. To alter your gun's velocity, simply turn the velocity adjusting nut clockwise to raise and counter-clockwise to lower your velocity. When you make a velocity adjustment, dry-fire the gun several times before re-chronographing. Also, the velocity adjuster on the Automag is sensitive, so start by turning only about an 1/8 of a turn at a time.

Cold Weather Performance

Cold weather performance with the stock Automag will be inconsistent at best. However, there are several methods of increasing the usability of the Automag in the cold weather. First, let's look at why your gun does not perform it's best in the cold.

Tank pressure: The 68 Automag is designed to operate at about 450 pounds per square inch (psi). When the temperature drops below 35 degrees (F), your tank pressure will fall below 450 psi and will not supply the gun with enough working pressure. That's it in a nutshell. The easiest way around this problem is to set your Automag up for high pressure gas (nitrogen or compressed air). Nitrogen and compressed air are virtually unaffected by temperature so supplying the gun with 450 psi is never a problem. High pressures systems are expensive but will give you much more consistent performance. For more on high pressure systems see "*Upgrading the Automag.*"

Another way to improve the consistency of your CO2 supply in the winter is by using a remote/expansion chamber. A remote hose gives the liquid CO2 coming out of the tank time to expand back into gas. In the winter, some players run the remote hose from the tank, under their shirt and into the gun. By running the hose under your shirt, your body heat helps warm the CO2 as it travels to the gun. While this may help a bit, don't expect this to be the end-all to your pressure problems.

Rapid firing your Automag (or any other gun) tends to chill your CO2 tank. As you rapid fire the gun, the liquid CO2 in your tank is changing to gas to replace the gas that is being used. In the cold weather this problem is magnified. So if you're playing in 30 degree temps, save your rapid firing for when you really need it. ***Tip:*** No matter what the weather is, using a twenty-ounce tank (as opposed to a seven, nine, or twelve-ounce) will give you better performance than a small tank. With a seven-ounce tank for instance, you will chill the tank much quicker when rapid firing than you would with a twenty-ounce. There just isn't much 'gas' CO2 in the tank, so freezing will happen much faster.

Paint: In the cold weather, paintballs are much more fragile than they are in warm weather. When the CO2 burst hits the fragile paintball, the odds of breaking a ball in the barrel or breach are greatly increased. When you break a ball in the cold, the fill tends to get thick and is difficult to clean. One method of improving this problem would be to use a venturi style bolt. The venturi bolt hits the paintball with a more evenly disbursed gas burst and will reduce the stress on the ball somewhat. Don't look for miracles though. If you are using a foamie-less bolt, you might want to also try a foamie bolt in the cold weather. The foamie tip is a bit more gentle than the newer all-stainless bolt.

When playing winter paintball, try to keep your equipment above freezing at all times, but be careful not to let your gun and tank get too warm. If you leave your equipment in your heated car at 75 degrees, then take it out to play where the temps are below freezing, you will have problems. Your velocity will be very inconsistent and possibly dangerously high at times. In addition, heating a CO2 tank will cause the pressure to rise higher than the tank is intended to handle. Be careful.

Maintenance

This chapter on maintenance is a basic overview of what it takes to keep your Automag functioning properly. Other chapters such as *"Trouble Shooting the Automag"* and *"The Automag's Basic Components"* will provide you with more technical maintenance tips as well.

The key to keeping your Automag shooting, is proper maintenance. A properly maintained Automag is the best shooting paintgun made, but a poorly maintained 'Mag will give you more trouble that you could possibly imagine.



Lubrication: To keep your internal components operating smoothly, place about four drops of oil in your gun's CO2 adapter (ASA) and dry fire (after removing the barrel) to spread the oil throughout the gun. Also, every few times out, place a drop of oil on your power tube o-ring. There are also two spots on the bottom of the regulator (you must remove the regulator to access them) that will need a drop of oil or two every few times out. If your power feed plug is difficult to turn, *lightly* lubricate the attached o-ring.

Tip: I've seen some players drill a hole in the base of the power feed plug so a key ring can be attached. This makes it easier to pull the plug out.

Cleaning: If you expect to get good performance from your Automag, you'll need to keep it clean internally and externally. The two external areas you need to be the most careful with are the barrel and the power feed/feed tube. If you break a ball in the barrel, you will lose most of your accuracy until you clean it completely. For a quick fix, remove the barrel and run a pull-through squeegee through the entire barrel. After each time out to the Paintball field, you'll want to clean the barrel with warm water and/or a barrel treatment (there are several available from the various Paintball suppliers) and squeegee it until it is dry. If you break a ball in the breach, you can run the same squeegee through the power feed after you remove the plug.



Frame rail

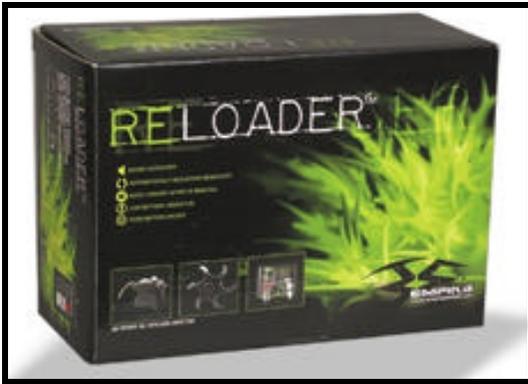
Internally, you should inspect the power tube o-ring, on-off o-rings, and regulator seal regularly. Keeping these clean is essential to good performance. A CO2 filter will help keep the dirt from the CO2 from getting into your gun. You can pick up a filter at most Paintball stores or through your distributor for about \$20.

Every couple of outings, disconnect the frame rail from the main body and clean the trigger assembly area carefully. Use a small paintbrush and warm water to remove the dirt from the hard to reach areas.

Upgrading the Stock Automag

Barrels: If you are using a standard Automag or Minimag with the stock barrel, you already have a very accurate paintgun. However, there are several barrels that will improve you gun's accuracy. There is a plethora of high quality aluminum, brass, hard chrome, and stainless steel barrels available for the Automag. In addition, you'll find muzzle breaks, drilled barrels and internally rifled barrels for the Automag/Minimag. drilled barrels). They are also gas efficient and will improve the accuracy of your Automag.

Performance Accessories



Empire's Reloader

awesome), Powerlyte, and J & J.

32 Degrees makes a nice rear velocity adjuster for the Automag as well as upgrade bolts, and other parts. On thing to keep in mind is that the 'Mag is a solid gun, almost right out of the box. I would not recommend doing any internal modifications to the 'Mag, since you run a high risk of messing up the gun's timing.

Probably the most important upgrade accessory you can get for your Automag is an upgraded feeder. Of course Airgun Designs makes their own "Warp Feed" which might actually be overkill for the 'Mag. Any of the aftermarket feeders (Halo, Revi, Reloader, Ricochet, etc.) Will do just fine for the Automag.

Another nice upgrade for the 'Mag would be an aftermarket barrel. Again, there are a plethora of barrel makers out there. Some of my favorites are Dye, Smart Parts, Empire (the new 7/11 kit is



32 Degrees foamie venturi bolt

High Pressure Systems



Crossfire systems have become really popular over the recent years, especially their pre-set output pressure, screw-in systems. These are amazingly easy to use. Screw it into the gun's ASA and you're ready to roll. Crossfire makes more than twenty systems, from 3000 psi, 47 cubic inch systems to 4500 psi, 88 cubic inch systems.

Crossfire's 88 cubic inch, 4500 psi system

Like Crossfire, Air America manufactures a huge line of HPA systems. Air America has been around since the first days of nitrogen and have been making great gear since. Some of Air America's popular systems are the Apocalypse, Raptor, Armageddon, and Me'lee systems. Most systems are available in several configurations from small tanks to larger capacities, and in 3000 and 4500 pounds per square inch.



Like Crossfire, Air America manufactures a huge line of HPA systems. Air America has been around since the first days of

ACI (Air Concepts makes a few nice systems under the Bulldog name — all available as screw in, ASA type units. Smart Parts' Max Flo regulators are as good as anyone's and can be installed on any of their tanks (45 to 114 cubic inch). DYE's Throttle titanium system looks great, but I've never personally used one.



These are just a few of the many systems that are out there.

High Pressure Accessories

Getting your high pressure system to the point of where you're comfortable with it usually takes buying some accessories. Some accessories are for performance, while others are strictly for show.



Tank covers: Tank covers not only make your gear look great, but they help protect the tank from getting dinged or worse. Tank covers are available for CO2 and high pressure air tanks from a number of manufacturers, and come in many colors and camo patterns. I would recommend the type that either zips open and closed or one that uses velcro. Other types make it difficult for stores/fields to check the tank's expiration date.

Cradles/Drop Forwards: Cradles and drop forwards essentially exist to help your high pressure system attach to your gun in such a way that is comfortable to your playing style. A properly fit system/gun combination will allow the user to shoot more comfortably and will be adjustable to bring the tank forward or backward depending on your size, arm length, playing style, etc. Drop forwards and cradles are manufactured by many companies including KAPP, 32 Degrees, Pro Team Products, Benchmark Manufacturing, and many others.

Gauges: Some high pressure systems have both tank pressure gauges and output pressure gauges. From time to time these gauges will get destroyed and will need to be changed. DYE, Pro Team Products, 32 Degrees, Bob Long, and other make replacement gauges that are more durable than some of those that come standard on HPA systems. You may also want to consider changing to a micro gauge, which is smaller, less likely to be hit/broken, and lighter.



Misc: Other accessories like gas-through stocks, butt plates, on/off valves, tank skins, and remotes will help you customize the look and feel of not only your high pressure system, but your paintgun as well.

Older Accessories

The Pro Series, Bob Long, and Fred Schultz high pressure system cradles are made to be used with the Air America Raptor system. The Paintball Mania Supply, Smart Parts, and Air America Apocalypse systems all come with mounting accessories.

The **Pro Series Cradle** from Pro Team Products mounts to the bottom of your Automag grip with two allen screws (provided). This two-piece cradle is manufactured from aircraft grade aluminum and weighs just over three ounces. The Pro Series Cradle positions your 114ci (cubic inch) tank in about the same position as a twenty-ounce CO2 tank. Another excellent feature of the Pro Series Cradle is that it can be mounted with the pressure gauge facing upward. The Pro Team Products Pro Series Cradle is available in right or left handed models.

The **Bob Long nitrogen cradle** is machined from aluminum and allows the tank regulator to slide into the unit. Two slots are cut into the cradle to accommodate the pressure gauge and fill adapter. Like the Pro Series Cradle, the Bob Long version also places the 114 ci. tank in about the same position as a twenty-ounce CO2 tank.

The **Fred Schultz Signature Series Cradle** works best with the 68 ci system since it mounts further back than the other two cradles. To comfortably use the Fred Schultz cradle, you probably will need a "Drop Forward" from Direct Connect. The Drop Forward allows you to mount the tank further forward than you could without it.

CM Support/Viewloader manufactures an aluminum butt plate that works great with the Air America 68 ci. tanks. The butt plate acts as a stock and provides stability to your shooting. Unique Sporting, Allen Paintball Products, and Indian Springs all manufacture butt packs that will hold any size nitrogen/compressed air tank systems. In addition, all three companies make accessories such as nitrogen tank covers, holders, etc.

Internal Upgrades

If you have a pre-1995 Automag, you may still have a foamie bolt in your gun. There are several foamie-less bolts available. *Airgun Designs* now has a bolt that does not require a rubber foamie. *Pro Team Products* sells the **Accurizer** venturi bolt for the Automag. TASSO also is marketing a venturi style bolt. A word of caution: While venturi foamie-less bolts work great in some guns, many players prefer the factory stock Automag foamie-less bolt. Give one a try if you don't mind taking the chance. In addition to bolt upgrades, *Exotic Sportz* (Michigan) is marketing an on/off upgrade that may give you more consistent performance. I have done some testing on the Cyclone on/off valve (on/off top) and have found it to reduce velocity drop-off during rapid firing. It also helps reduce short-stroking the trigger.

Pro Team Products sells their **Automag Spacer Kit**, that replaces the power tube spring permanently for older gun. The Spacer Kit also allows you to adjust your trigger pull slightly. As of early 1997, *Airgun Designs* is using spacers in their power tubes as standard items.

The Materials Used in Manufacturing the Automag

Some of the most commonly asked questions I've gotten over the years are regarding the materials used in manufacturing Paintball guns and equipment. If you take a look at the descriptions below, you'll be able to see why the manufacture of the 68 Automag and other paintguns requires several different materials.

Aluminum (barrel, frame rail, back-bottle adapter, vertical bottle adapter, bottom line, sight rail): Probably the best known quality of aluminum is its light weight. Aluminum is about one third the density of stainless steel. Even though aluminum is very lightweight it can be strengthened to compete with metals that are heavier and more expensive. Like stainless steel, aluminum is highly resistant to corrosion and can be machined, formed, or molded to tight specs. Aluminum can be polished or anodized in a variety of colors including "splash" finishes.

Stainless Steel (main body regulator, regulator adjusting screw): Stainless steel is an iron-based alloy that has a high resistance to rusting and corrosion and is very durable. Stainless steel can be shaped, formed and machined to precisely detailed specs. Stainless Steel can be polished, nickel-plated, or powder-coated to enhance its appearance.

Composite plastics (grip frame assembly): Over the last few years, the technology in plastics has increased tremendously. In the past, plastics were structurally weak, pliable, low in density and brittle. With the introduction of fillers or reinforced fibers, plastics can be as strong and durable as many heavier more expensive metals. Carbon fibers (and other synthetics) are used to produce extremely strong, lightweight materials.

Trouble Shooting the Automag

Air leaking out of the rear of the gun: Whenever air leaks out of the velocity adjusting nut, first check to see if your gun is shooting 'hot'. If it is, simply lower the velocity and recheck the gun. If your gun is shooting normally and you still have a leak out of the rear, clean the regulator seal (reg seat). If this does not work replace the regulator seal and check the gun for leaks.

Air leaking out of the barrel: If air is leaking out of the barrel first check, clean, or replace the power tube o-ring and/or spring. Sometimes even with a good power tube o-ring you may get an occasional air leak down the barrel. Make sure your gun is lubricated properly (a drop of oil on the power tube o-ring won't hurt either).

Air leaking out of the barrel can also be caused by liquid CO2 entering the gun. If this happens, you'll be able to see the liquid CO2 coming out of the barrel when you fire the gun. Liquid CO2 looks like what comes out of a fire extinguisher. When liquid gets into the Automag, stop firing the gun for a few seconds (try holding the trigger down) or disconnect your air source and "bleed" the CO2 from the gun. This should solve the problem if the liquid has not damaged the power tube o-ring.

First shot hot: If your gun is shooting hot on the first shot you almost certainly have a bad or dirty regulator seal. Your first shot will sound like a cannon and the rest will be fine. In general "reg seats" need to be changed at least three times per year. Install your regulator seal wide side in first.

Excessive ball breakage: In your Automag instruction manual it tells you that average ball breakage should be about three to four balls per thousand. Airgun Designs is being modest. If you're breaking more than **one ball per fifteen hundred**, something is wrong. First things first: Is your paint good? Check your paintballs for flat spots, color fading, etc. A fairly reliable way to see if your paintballs are good is to drop about twenty or so (one at a time) from a height of about six feet on a hard surface. If more than half of the balls break, you probably have a problem with your paint. Either way its probably best to try switching paint batches before you go crazy with everything else it could be.

Okay, so its not your paint. If you're using an Automag with a foamie bolt, is your foamie still in place? If you are not using a foamie bolt, check the front end of the bolt for scratches or burrs. What type of feeder are you using? We had a customer in our store that complained that he broke balls whenever he rapid fired. After talking to him for a while, we learned that he had a standard Automag without a motorized feeder and he was using a large bore paint. Bingo! If the ball is not feeding all the

way into the breech, the bolt will “cut” the ball every time. Finally, if your nubbin is not set up properly for the size ball you are using, that may be your problem. When adjusting your nubbin be sure to bend both sides evenly to maintain the “V” shape. The smaller the ball, the more the “V” should protrude into the barrel.

Low velocity: Low velocity can be caused by several variables. Is your tank near empty? Is your CO2 tank cold? Is your bolt sticking in the forward position? The first thing you might want to look at is trying another tank. There are many things that can prevent your tank from supplying a steady flow of CO2 or to your gun. After that, check your velocity adjuster. Is the nut too far out? If you are shooting high pressure, check everything in the system’s regulator as you would on the Automag’s regulator.

Inconsistent velocity: Once again check the regulator seal for dirt or wear and replace if necessary. Check and/or clean regulator piston. You’ll need to remove the spring pack and hook the piston out. The reg. piston opens and closes the valve so if dirt builds up on it, it won’t function properly. Check and replace the o-ring if necessary. Don’t wait to have a problem, check it about once every six times out. Your Automag will give you inconsistent velocity readings if your gun is not properly lubricated as well.

Bolt stick: Bolt stick can be caused by paint chips wedging between the bolt and the breech. Simply clean the gun, reassemble and give it a try. If that doesn’t do it try changing your power tube spring. A short spring can sometimes cause the bolt to stick in the forward position. A power tube spring that is too long or a bad power tube o-ring can also cause the bolt to get stuck in the forward position.

Double feeding: If your Automag is double feeding paintballs, its probably a result of your wire nubbin not being properly adjusted for the size paint you’re using. When adjusting the nubbin, remember to maintain the “V” shape.

Shooting full auto: The Automag will go into full auto mode if you are missing the Teflon o-ring or have a bad one in the on/off valve. Simply replace the o-ring and gas up the gun. While you’re at it, check to see that the on/off pin is not in backwards or broken. If none of these things fix the problem, you’re trigger sear is probably broken or worn so it won’t catch the bolt.

For high pressure users...

If you air up the gun with your high pressure system not regulated down enough, you will probably blow the regulator seat and/or the power tube o-

ring, so be careful. Make sure all of the maintenance precautions you take with the gun's regulator are repeated with the high pressure system's regulator.

Airgun Designs Automag R/T

The Automag R/T was introduced at the 1996 World Cup. The thinking behind the development of the Automag R/T was to make the best out of the box semi-auto in terms of looks and performance. If you already own an R/T, you know that those goals were achieved. Here are some of the new features.

High Pressure Air Only: The Automag R/T is designed to operate at a very specific air pressure (650-700 psi) only achievable using compressed air or nitrogen. This gives you improved consistent performance.

Reactive Trigger: The reactive trigger senses when the R/T is fired and will increase the internal trigger pressure, forcing the trigger forward after the trigger has been pulled. In simple terms the forward motion of the trigger is initiated (after the shot) before your brain can send the signal to your finger to let go of the trigger.

New Valve: The Automag R/T's valve recharges even faster than the 68 Automag's valve. This will virtually eliminate "shoot- down" (assuming your gun is set up correctly). This is accomplished by redirecting the air. Instead of having the incoming air go to the regulator piston and then to the air chamber, the R/T fills the air chamber first giving you full pressure recharge.

Stainless Steel Hardline: This eliminates the use of hoses, lessens the chance of leaking air, and makes breaking the gun down a breeze.

Dual Nubin Barrel: The R/T uses a dual nubin barrel to help prevent double feeding and ball breakage. Your single nubin 68 Automag barrels will work with the R/T though.

Coil Springs: The R/T replaces the 68 Automag's spring pack with a coil spring system that provides the user with a wider range of velocity adjustment.

In addition to the performance changes and enhancements, the R/T has been designed to look "cool." (a first for Airgun Designs). The R/T comes with a polished or black main body, custom machined look, vertical foregrip, machined rail, and has an all black and "chrome- look" finish.

[Click HERE to open the AGD R/T manual](#)

How the Automag R/T Works



RT Pro

The Airgun Designs Automag R/T is a blow forward (from an open bolt) semi-automatic paintgun. Air from your tank enters the R/T vertical-air adapter and travels inside the hardline, through the frame rail, into the field strip screw, and to the regulator seal area. The air then travels past the transfer port and forward to the on/off assembly area. When the trigger is released, the air will flow around the on/off pin and into the air chamber as well as rearward into the regulator piston. As the chamber reaches the desired pressure, the regulator piston moves back limiting the flow of air. At this point the valve closes and the air in the chamber is regulated.

When you pull the trigger, the firing sequence begins. As the trigger moves rearward, the sear lifts the on/off pin. This stops the air flow into the chamber. At this point the sear has not yet released the bolt, so the air chamber is isolated from the rest of the gun. As the trigger pull continues, the bolt is released firing the paintball.

Basic Components

The Automag R/T's barrel is manufactured from aircraft grade aluminum and is eleven inches in length. A polished (chrome look) muzzle break is mounted to the end of the barrel. On early models the muzzle break was removable. The R/T barrel uses two wire nubbin ball detents with o-rings used to hold them in place. Like the 68 Automag, the R/T barrel is a twist lock type.



RT main body

Main Body: The R/T's main body is manufactured from "300 series" stainless steel and is polished to an almost chrome look. On older versions as well as European versions, the main body has a "high rise" power feed. The intent with the high rise was to improve the sight line of the gun by placing the feeder out of the way of your sight picture. Most Automag R/T's in the

U.S. are now being manufactured with the standard power feed type--the high rise just never really caught on with the players here. The front of the R/T main body is machined to give it a "meaner" look. The main body houses all of the gun's internals excluding the trigger mechanism which is inside the grip frame. The main body cannot be removed without first removing the sight rail.

Frame Rail: The R/T frame rail is manufactured from aluminum and lies between the grip frame and the main body. The rear field strip screw goes through the grip frame and into the frame rail, threading into the regulator body. The front allen screw goes through the grip frame and into the frame rail as well. Like the 68 Automag, the bottom front end of the frame rail is "scored" to allow you to "punch" a hole for a vertical adapter, although there seems to be little need for a vertical-bottle adapter with the R/T. One of the major differences between the 68 Automag and the R/T is that air actually travels through the R/T's frame rail. Also, there are six "live" air ports machined into the R/T's rail that are "capped" off should you need them in the future.

Frame Rail Extension: The frame rail extension lies between the vertical-air adapter and the frame rail. Its only function is to hold the vertical-air adapter.

Sight Rail: The raised R/T sight rail is manufactured from aluminum and is machined to give it a unique look. The sight rail is attached to the frame rail using six stainless steel allen screws (three on each side of the gun). The sight rail can be removed to make the gun lighter and give you a smaller profile, without affecting the gun's performance.

Vertical-Air Adapter/Foregrip: The vertical-air adapter is manufactured from aluminum and is the base for the rubber molded foregrip. The bottom of the vertical-air adapter is threaded 1/8" NPT-- this is where the air from your compressed air system enters the gun. The top side of the vertical-air adapter is threaded--this is where the hardline connects the vertical-air adapter to the frame rail. There is a filter in the foregrip.

Composite Grip Frame: The composite grip frame used in the Automag R/T is the same one used for the 68 Automag. The bottom of the grip is machined to allow the user to easily attach a bottom-line adapter or high pressure cradle.

Power Feed Plug: The power feed plug is also manufactured from carbon fiber plastic that is very durable. This is a standard size plug that is interchangeable with any 7/8" power feed.

Rear Field Strip Screw: The rear field strip screw is manufactured from stainless steel and contains three o-rings. Be very careful not to damage the o-rings on the screw--they are a pain to replace.

Wire Nubins: There are two wire nubins that are fitted into the machined grooves in the R/T's barrel. The nubins protrude into the bore and prevent paintballs from double feeding. When adjusting the nubin always try to maintain the "V" shape.

Gas Hardline: The gas hardline runs from the vertical-air adapter to the frame rail and should really never cause problems or need adjusting.

Internals

Bolt: The bolt used in the R/T is one of the very few parts that are interchangeable with the original Automag.

Main Spring: The main spring is manufactured using high tensile strength flat "music wire." The flat edge of the spring allows the spring to collapse tighter than round wire.

Power Tube Tip: Like the 68 Automag, the R/T's power tube tip is manufactured from brass and contains one urethane o-ring. The power tube tip can be unscrewed using a coin (a nickel works best) so the power

tube spacer and o-ring can be accessed.

Power Tube Spacer: The brass power tube spacer is located inside the power tube just below the power tube tip. There is a size (measured in thousandths) engraved on the side of the power tube spacer. This may be important to know if your gun develops "bolt stick." We'll talk more about this in "Trouble Shooting."

Power Tube O-Ring: The power tube o-ring is the same 90 durometer urethane o-ring used in the 68 Automag. This is accessed by removing the power tube tip and spacer and can be removed using a bent tip pick (be careful not to cut the o-ring).

On/Off Valve Assembly: The on/off assembly is located on the under side of the valve body and can be removed by gently pulling on each side of the brass top--pull with even pressure from both sides. The on/off top unscrews from the on/off bottom. This exposes a very small urethane o-ring inside the on/off top. There is also an o-ring located in the on/off bottom and one in the on/off cavity. This is the o-ring you'll need to change if your R/T leaks down the barrel while holding the trigger. You'll also find the on/off pin in the cavity.

Valve Body: The Automag R/T valve body is manufactured from stainless steel and is held in place on the frame rail by the regulator body locking pin and the rear field strip screw. The valve body houses the valve assembly which consists of the valve pin, two-piece valve body, spring set and five o-rings. The valve assembly can be removed by pulling the pin straight out. From the bottom up you should see three o-rings grouped together and a brass piece, a spring set, the regulator seat and the brass top that contains one small o-ring.

Regulator Body: The regulator body is manufactured from aluminum and threads onto the valve body. The regulator body houses the regulator piston, non-user adjustable blow-off valve, and coil regulator spring set which is inside the stainless steel regulator nut. An o-ring has been added to help prevent the regulator nut from backing out.



Sear Assembly: The R/T's sear assembly is completely different from that of the 68 Automag--it has been improved dramatically. First, the sear "carbide tipped." Airgun Designs does this for two reasons--so you can't file the sear like many players did with the Automag and to prevent excess wear. Secondly, the roller bearing sear is held in place using a small allen screw.

Getting Started

Unlike the 68 Automag, the R/T does not come ready to fire out of the box. The R/T comes with a male quick disconnect fitting attached just below the foregrip. This is where you either attach your remote hose (not recommended) or run a hose down to your bottom-line adapter (not included) or high pressure tank cradle.

Never use CO2 with your Automag R/T

Automag R/T Chronographing Procedure: It is very important to know your high pressure system's output pressure (air going into the gun) before you try to use the Automag R/T. I have gotten the best results putting around 675 pounds per square inch (psi) into the R/T. The higher pressure you put into the R/T, the more reactive the trigger will be and the more velocity drop-off you'll experience during slow firing. Conversely, less pressure into the gun will give you very consistent chronograph readings, but will slow down the reactive trigger and cause some velocity drop-off during rapid firing. Experiment with your output pressure settings to find out what works best for you.

To find out your highest rapid fire velocity, fire a paintball and hold the trigger back. Release the trigger completely and immediately fire another paintball, again holding the trigger back--repeat as necessary. This simulates rapid firing (and saves you from wasting paintballs).

Cold Weather Performance

Cold weather performance with the Automag R/T will be pretty good since the R/T runs on compressed air/nitrogen only. As you probably already know, compressed air runs much more consistently than CO2.

The advantages of high pressure: Nitrogen and compressed air have virtually the same characteristics. Compressed air is the air that you breath every day that is compressed into a higher pressure than its normal state. Compressed air is around 78 percent nitrogen and 21 percent oxygen. Under normal conditions, nitrogen and compressed air are unaffected by temperature changes and fluctuations. Unlike CO2 which boils at about 89 degrees Fahrenheit, nitrogen boils at the very high temperature of 196 degrees Celsius. So for Paintball, no matter how hot or cold it gets or no matter how many shots you fire off rapidly, your gun will be supplied with consistent pressure from the regulated tank (assuming your equipment is working properly). This means that your velocity will stay much more consistent than you've come to expect using CO2. That fact alone makes high pressure more appealing to Paintball players than CO2. Another advantage with high pressure is that you do not have to wait for your tank to warm before you use it and you don't

have to chill the tank to fill it. To get a complete fill however, you need to fill to 3000 psi, wait a few minutes for the tank pressure to stabilize, and top off with 300 - 400 psi. There are many more smaller advantages to using high pressure. High pressure systems allow you to play all year, whereas CO2 does not really work well in any gun in the extreme cold. What happens if you burst a hose or damage your system using high pressure is actually less dangerous than the more volatile CO2.

The disadvantages of high pressure: High pressure systems are much more expensive than CO2, mostly because of the pressure regulator. In addition, the aluminum/fiberglass wrapped bottles (also known as composite bottles) are a bit expensive. Not all pro shops and fields fill high pressure currently. High pressure is a bit harder to carry as well. A 114 cubic-inch high pressure tank is much larger than a twenty-ounce CO2 tank and yields about the same number of shots. That

statement is sort of generic, but pretty close to accurate with most guns. From a performance point of view I can't think of one disadvantage with nitrogen compared to CO2.

A word about fittings...

The fittings used for Paintball are almost always 1/8" NPT (National pipe thread). This has become the standard for the Paintball industry. As I stated earlier, you shouldn't have to change your gun's fittings to use high pressure. The one exception to this is if you are using fittings between the high pressure tank and the regulator. There is one important thing to think about however; brass does not have the impact resistance of stainless steel or nickel. As you know a Paintball gun takes a pretty fair amount of abuse and steel filings may just prevent your gun from going down in a game.

When installing fittings of any type remember they do not need to be super tight. In fact, over tightening your fittings will actually shorten the life of the fittings. Here's how fittings are designed; Pipe threads (which all fittings have) are designed to taper outward. As you tighten the fittings the widest part of the threads wedges into the female side. This is what makes a seal. Teflon tape (pipe dope) is used as a secondary seal and as a lubricant for the threads. If you use the same male fittings over and over, they will thread further and farther into the female fitting. At some point, the fittings will become unusable and will begin to leak.

Paint: In the cold weather, paintballs are much more fragile than they are in warm weather. When the CO2 burst hits the fragile paintball, the odds of breaking a ball in the barrel or breach are greatly increased. When you break a ball in the cold, the fill tends to get thick and is difficult to clean.

One method of improving this problem would be to use a venturi style bolt. The venturi bolt hits the paintball with a more evenly disbursed gas burst and will reduce the stress on the ball somewhat. Don't look for miracles though. If you are using a foamie- less bolt, you might want to also try a foamie bolt in the cold weather. The foamie tip is a bit more gentle than the newer all-stainless bolt.

When playing winter paintball, try to keep your equipment above freezing at all times, but be careful not to let your gun and tank get too warm. If you leave your equipment in your heated car at 75 degrees, then take it out to play where the temps are below freezing, you will have problems. Your velocity will be very inconsistent and possibly dangerously high at times. In addition, heating a CO2 tank will cause the pressure to rise higher than the tank is intended to handle. Be careful.

Maintenance

This chapter on maintenance is a basic overview of what it takes to keep your Automag R/T functioning properly. Other chapters such as "Trouble Shooting the R/T" and "Basic Components" will provide you with more technical maintenance tips as well.

The key to keeping your Automag R/T shooting is proper maintenance. A properly maintained R/T is one of the best shooting paintguns made, but a poorly maintained 'Mag will give you more trouble than you could possibly imagine.

Lubrication: To keep your internal components operating smoothly, place about four drops of oil in your gun's quick disconnect and dry fire (after removing the barrel) to spread the oil throughout the gun. Also every few times out, place a drop of oil on your power tube o-ring. There are also two spots on the bottom of the regulator (you must remove the regulator to access them) that will need a drop of oil or two every few times out. If your power feed plug is difficult to turn, lightly lubricate the attached o-ring.

Tip: *I've seen some players drill a hole in the base of the power feed plug so a key ring can be attached. This makes it easier to pull the plug out.*

Cleaning: If you expect to get good performance from your R/T, you'll need to keep it clean internally and externally. The two external areas you need to be the most careful with are the barrel and the power feed/feed tube. If you break a ball in the barrel, you will lose most of your accuracy until you clean it completely. For a quick fix, remove the barrel and run a pull-through squeegee through the entire barrel. After each time out to the paintball field, you'll want to clean the barrel with warm water and/or a barrel treatment (there are several available from the various paintball suppliers) and squeegee it until it is dry. If you break a ball in the breach, you can run the same squeegee through the power feed after you remove the plug.

Internally, you should inspect the field strip screw o-rings, the power tube o-ring, and on/off o-rings. Keeping these clean is essential to good performance.

Every couple of outings, disconnect the frame rail from the main body and clean the trigger assembly area carefully. Use a small paintbrush and warm water to remove the dirt from the hard to reach areas

Upgrading the Automag R/T

Barrels: If you are using the Automag R/T with a stock barrel, you already have a very accurate paintgun. However, there are several barrels that will improve you gun's accuracy. There are many high quality aluminum, brass, hard chrome, ceramic coated, and stainless steel barrels available for the Automag R/T. In addition, you'll find muzzle breaks, drilled barrels and internally rifled barrels for the Automag R/T.

The Armson Rifled Barrel is manufactured in South Africa and distributed by Pro Team Products of Flagler Beach, Florida. The Armson barrel is the only internal twist-rifled barrel available for the Automag or any other paintgun. The Armson barrel is available in eight, ten, thirteen and sixteen-inch lengths. All Armson barrels are manufactured from 60-61 aircraft grade aluminum. The Armson barrel is super accurate, but is loud compared to some other add-on barrels. In cold or damp weather, the Armson barrel is one of the best available.

The Smart Parts "Original" drilled barrel is available in twelve and sixteen-inch lengths and comes anodized in black, green, red, "splash" blue, camo, green, purple, red, and silver. Smart Parts' barrels are spiral drilled and are the quietest barrels you'll find anywhere. Like the Armson barrel, all Smart Parts barrels are manufactured from aircraft grade aluminum and are beautifully finished. The Smart Parts Original barrel is by far the most used aftermarket barrel on the tournament circuit. It's accurate, quiet and is probably the best warm weather barrel available. The Smart Parts original barrels are among the most accurate barrels available.

J & J Performance Barrels and Accessories manufactures several excellent barrels for the Automag/Minimag. J & J's hard chrome and brass Automag barrels are available with straight rifling, ports, spiral drilling, etc. The hard chrome coating reduces friction between the paintball and the barrel interior which helps stabilize the ball as it travels through the barrel. J & J's barrels are easy to squeegee clean (with the exception of the drilled barrels). They are also gas efficient and will improve the accuracy of your Automag.

DYE Barrels: DYE barrels are available in both aluminum and stainless steel. Like the Armson and Smart Parts barrels, the DYE barrel is very accurate. The only down-side to the stainless steel barrel is that it is very heavy.

Since the R/T comes with almost everything you'll ever need there are not too many upgrades available for it. Diamond Lab made a very nice 45-grip frame for the R/T bac in the day. They also manufactured a 45-grip frame with a double finger trigger that has an enclosed trigger guard. Pro Team Products also manufactures high quality 45-grip frames for the R/T.

Smart Parts sells a full line of "splash" anodized Automag R/T parts as well as R/T packages with Smart Parts' barrels.

Custom Finishes for Your Automag R/T

Anodizing: Anodizing is an electronic finishing process that can be done only to aluminum. This would include the rail, barrel, vertical bottle adapter, some grip frames, and sight rail. The Automag R/T's main body is not manufactured from aluminum and cannot be anodized. There are several companies that offer custom anodizing as well as "stock" anodized parts for the Automag R/T. Smart Parts, Inc., offers a huge variety of "splash" and solid color anodized parts for the Automag R/T. Smart Parts will also anodize you existing parts at a fair price. Pro Team Products/Gun f/x also offer a variety of custom anodized parts for the Automag R/T including their Armson internally rifled barrel. TASO, Sumo Marketing, Bad Boyz Toyz, Bob Long, and Airgun Designs also offer a selection of fancy anodized replacement parts and accessories for the Automag R/T.

Powder Coating: Powder Coating is commonly used in the automotive industry due to it's tough finish. Powder Coating is a finish that is actually baked onto the surface and is available in hundreds of colors.

Chrome Plating: Chrome plating the Automag R/T is a fairly expensive process that can be done to give your stainless steel parts (main body) a bright shiny finish. Chrome plating is a metal that is actually deposited on the surface of another metal.

In addition to changing the finish of your Automag R/T , there are several companies that will machine your gun to give it a unique look. Predator Marketing machines several holes in the standard main body as well as machining the frame rail.

Materials Used in Manufacturing the Automag R/T

Some of the most commonly asked questions we get at PCRI on a daily basis are regarding the materials used in manufacturing paintball guns and equipment. If you take a look at the descriptions below, you'll be able to see why the manufacture of the Automag R/T and other paintguns require several different materials.

Aluminum (barrel, frame rail, frame rail extension, sight rail, vertical-air adapter): Probably the best known quality of aluminum is its light weight. Aluminum is about one-third the density of stainless steel. Even though aluminum is very lightweight it can be strengthened to compete with metals that are heavier and more expensive. Like stainless steel, aluminum is highly resistant to corrosion and can be machined, formed, or molded to tight specs. Aluminum can be polished or anodized in a variety of colors including "splash" finishes.

Stainless Steel (main body, valve body, regulator adjusting screw): Stainless steel is an iron-based alloy that has a high resistance to rusting and corrosion and is very durable. Stainless steel can be shaped, formed and machined to precisely detailed specs. Stainless steel can be polished, nickel-plated, or powder-coated to enhance its appearance.

Composite plastics (grip frame assembly): Over the last few years, the technology in plastics has increased tremendously. In the past, plastics were structurally weak, pliable, low in density and brittle. With the introduction of fillers or reinforced fibers, plastics can be as strong and durable as many heavier more expensive metals. Carbon fibers (and other synthetics) are used to produce extremely strong, lightweight materials.

Trouble Shooting the Automag R/T

Air Leaking out of the rear of the gun: The most likely reason your Automag R/T would leak from the rear of the gun is that your velocity is set too high. Simply lower the velocity and re-chronograph the gun. It is always best to start off too low and work your way up. Remember to dry fire the gun a few times before you chronograph the gun. The next likely cause of the leak is that the chamber is over pressurized. This is caused by a bad regulator seat. It is also possible that the regulator piston is malfunctioning. This is not a user-serviceable part: Call Airgun Designs for a replacement part.

Air Leaking down the barrel: Air leaking down the barrel is usually caused by a bad or dirty power tube o-ring. To change this o-ring, remove the power tube tip, spacer, and pull the o-ring out using a bent tip pick. This can be checked before replacing by pulling and holding the trigger back. Using a wooden dowel rod (down the barrel), push lightly on the power tube. If the leak changes pitch it is your power tube o-ring. If not, change the on/off bottom o-rings or try a shorter power tube spacer.

Air Leaking from power feed: If you hear the "lawn sprinkler" sound you probably need to change the o-rings on the valve stem. This is a very rare problem, but you should know what to do if it does happen.

Excessive ball breakage: In the Automag instruction manual it tells you that average ball breakage should be about three to four balls per thousand. Airgun Designs is being modest. If you're breaking more than one ball per fifteen hundred, something is wrong. First things first, is your paint good? Check your paintballs for flat spots, color fading, etc. A fairly reliable way to see if your paintballs are good is to drop about twenty or so (one at a time) from a height of about six feet on a hard surface. If more than half of the balls break, you probably have a problem with your paint. Either way it's probably best to try switching paint batches before you go crazy with whatever else it could be.

Okay, so its not your paint. Check the front end of the bolt for scratches or burrs. Is your velocity set too high?

What type of feeder are you using? We had a customer in our store that complained he broke balls whenever he rapid fired. After talking to him for a while, we learned that he had a standard Automag without a motorized feeder and he was using a large bore paint. Bingo! If the ball is not feeding all the way into the breech, the bolt will "cut" the ball every time.

Finally if your nubins are not set up properly for the size ball you are using, that may be your problem. When adjusting your nubbin be sure to bend both sides evenly to maintain the "V" shape. The smaller the ball, the more the "V" should protrude into the barrel.

Inconsistent velocity: Inconsistent velocity can be caused by many things. But using the Automag R/T, the most likely culprit is your input pressure coming from your high pressure system. Make sure that your pressure is set somewhere between 650-700 psi. Check the regulator seat in both the gun and your high pressure system as well.

If your pressure is set properly and the regulator seat is okay, check the inside of your barrel. Is it super clean? If not it should be. It is unlikely, but your regulator piston or regulator piston o-ring may be causing the problem.

Low velocity: Is your velocity adjusting nut all the way out ()? If your high pressure system does not have an output pressure gauge it's possible that your pressure is adjusted too low.

Velocity spikes: Velocity spikes are caused by over pressurizing the air chamber. This is almost always caused by a damaged regulator seat.

Bolt stick: Bolt stick can be caused by paint chips getting wedged between the bolt and the breech. If a good cleaning doesn't fix the problem, your power tube spacer is probably too long.

Double feeding: There's only two things that can cause double feeding--missing barrel nubin, or you're using 50 caliber paintballs.

Commonly Asked Questions

Is the R/T a better cold weather paintgun than the 68 Automag? The R/T is a better cold weather gun simply because it is a compressed air only gun. Compressed air gives you much better cold weather performance than CO2.

Do I need a secondary regulator with the Automag R/T? Your secondary regulator is actually the one on the gun when you're using high pressure--so the answer is you don't need another regulator besides the one on the hps system and the R/T's stock pressure regulator.

Do you recommend the high rise or the standard power feed system for the Automag R/T? I'm not a big fan of the high rise, although it does allow you to get a better sight picture down the barrel. With the high rise the feeder is placed further back which gives the gun a whole different feel. It's really a matter of personal preference.

What is the best barrel for the R/T? I'll quote Tom Kaye for this answer. "If there was a best anything, everyone would be using it." There are a number of excellent barrels available for the R/T. I really like the Smart Parts "Original", the DYE stainless steel, and the Armson short barrel for the R/T.

Is there a difference between nitrogen and compressed air? No, at least not as far as paintball applications are concerned. The two gasses share the same practical makeup in terms of how they affect paintball guns. Both nitrogen and compressed air can be used in the same tanks using the same regulators. The gasses are completely interchangeable for paintball purposes.

How would I go about filling my nitrogen tank? During the last year or so, many commercial paintball fields and stores have made the switch from CO2 only to filling nitrogen and compressed air as well. If the field or store near you doesn't fill high pressure systems, try your local dive shop. Most dive shops can fill your high pressure tank with compressed air.

I've heard that high pressure systems are not filled by weight like CO2. How is that done? High pressure systems like nitrogen and compressed air are filled not by weight, but by pressure. Typically high pressure systems are filled to 4500 psi maximum.

WDP LED (original) Angel



Dynasty sporting custom Angels

In This Chapter of The Airsmith Survival Guide

[Introduction](#) - Various models and versions of the Angel

[Downloads & Web Links](#) - Clickable links to download Angel manuals and instructions, manufacturers' websites, accessory company websites, reviews sites, and more

[Basic Components](#) - All you need to know about the receiver, grip frame, regulator, bolt, and the rest of the Angel's components

[Complete Disassembly](#) - Breakdown instructions

[Angel Maintenance](#) - Learn how to do basic maintenance on your Angel

[Tools](#) - A list and description of tools you'll need to work on your Angel.

[Upgrading](#) - Some suggestions on upgrading your Angel.

[Troubleshooting](#) - Instructions on how to troubleshoot and fix your Angel.

Which Angel to Use



WDP's IR3

There are a several variations of the Angel going around these days. WDP manufacturers three versions of the Angel. The LCD, IR-3, and Angel Speed. including the Dark Angel from Warped Sports, the Eclipse Angel from Planet Paintball (UK), the LCD from WDP, the Adrenalin Series (Adrenalin Paintball), and others. There are low pressure Angels, custom anodized Angels, tricked Angels, etc. So where do you start?

Like any other paintgun, you'll want to think about the upgrade path before you purchase the gun. You'll want to do this because it may save you time and money down the road. For instance, if you know you want a custom anodized low pressure Angel eventually, you may find that Dark Angel or Eclipse Angel worth waiting for, rather than starting with a standard Angel and upgrading to the finished gun. Do some research to find out which versions come with what upgrades and decide on the Angel that will suit you best. We're not going to cover each of the different versions in detail because they'll be more guns coming out of the woodwork on a regular basis.

Low pressure or not? This is one of the questions I get asked all of the time. First there's the "low pressure equals a flatter trajectory" theory. I'm not going to tell you this is one hundred percent wrong, but I will tell you that no company or individual that I know of has proven this theory correct. There are opinions, but to my knowledge there is no factual data to lead me to believe this is true. In theory, using low pressure with your Angel (or other paintgun) will allow you to use a more fragile paint and have less ball breakage in the cold weather due to the lighter gas burst hitting the paintball. You should also experience slightly less air efficiency since lower pressure means that you'll need a larger volume of gas/air to fire the paintball at an equal velocity. Remember this-- low pressure/more volume, high pressure/less volume. It holds true every time.

You'll probably at some point hear someone say, "I get more shots out of my tank since I went to a low pressure set-up." There are only two possibilities here. Either the person in question is flat-out wrong or something else in the gun, barrel, or paint has changed as well. If you are shooting a stock Angel with a twenty-inch barrel and you change to a low pressure gun with a twelve-inch barrel, you may get better air efficiency. With all things being equal you will always get better air efficiency with higher pressure.

A Couple of Quick Notes

Older Angels came with a Mini Reg that contained an on/off valve. Newer Mini Regs do not come with on/off's.

All new Angels have vertical feed tubes that can be removed simply by unscrewing the tube. Older model guns have permanent feed tubes.

As of April 1999 all Angels now come with Select Fire circuit boards.

Helpful Information Regarding the WDP Angel

[WDP's online tech e-mail address--jonrice@wdp-paintball.co.uk](mailto:jonrice@wdp-paintball.co.uk)

[WDP's web address--http://www.wdp-paintball.co.uk/](http://www.wdp-paintball.co.uk/)

About This Chapter



Ed Poorman sporting an Angel

When reading this manual you'll notice in the "Basic Components" section and the "Disassembly" section, many things are repeated. This is done so when you are working on a gun you can simply flip to the disassembly section and break down the gun. However, I thought that in describing each component of the Angel, it was important to tell you how the pieces go together. This way if you are working on just one section of the gun, you will not have to dig through the entire disassembly instructions to find the information you needed.

I should give full credit to WDP for allowing me to use their drawings and photos at my discretion. There are also times in this manual when I have used WDP's wordage from their original manual. If I can't say it better, why try. Thanks John Rice. Also a quick thanks to Todd Peverill, Allen Curtis, Brenda Seefeldt, and Pat Eckert, for editing this guide both for content and misspellings.

Angel Basics

In case you haven't noticed, the Angel is not a simple paintgun. It is very advanced in many ways. This has its good and not so good points. The not so good points are mostly to do with the fear factor of an electronic gun. There are 270-plus components to this gun, but most of them you will never see or touch. The term 14-way valve is enough to scare anyone and if that doesn't do it, skip down to "General Maintenance" and remove the grip frame--pretty scary. Let me tell you that this gun looks a lot more intimidating than it actually is. The Angel is very well thought out and problems can be isolated easily which helps troubleshooting greatly.

Once you play with the gun for a while I can almost guarantee that most or all of your fears will disappear, especially once you fire the thing. The Angel is capable of firing at a rate above any other gun on the market to this point. After playing with the Angel for an extended period of time you will probably agree that it is a relatively maintenance free gun when compared to others in its class. Here's a basic overview of how the Angel works.

The Angel is an electro-pneumatic paintball gun. This means that some of the components work electrically, and some work pneumatically. No brainer I guess. Compressed air/nitrogen is supplied to the Mini Reg at 850 pounds per square inch (psi). The regulator takes that pressure down to around 500-550 psi. The air flows through the regulator and into the flash tank feed tube (the tube between the regulator and grip frame) where it makes a ninety-degree upward turn and runs through the 14-way valve and through the main body to the air chamber. The hammer is held back by air pressure--no springs are used here. Pulling the trigger activates the timed shot cycle.

The workings of the 14-way valve are best described by John Rice of WDP. "The 14-way valve is operated by two solenoids connected to the trigger. These solenoids act like magnets and shuttle the 14-way valve back and forth directing the 90 psi air into the front and rear of the RAM, forcing the RAM forward to strike the valve, and backwards to re-cock the gun."

Tools You Will Need

To work on your Angel effectively there are a number of tools you'll need. There are the basic tools and tools for those that really want to get inside the gun as far as we can go.

Basic tools:

- C Set of metric allen wrenches
- C Variety of picks (bent tip, straight, etc.)
- C Jeweler's screwdrivers (flat-head and phillips)
- C Rubber mallet and wooden dowel
- C Loctite #271 (red)
- C LPR piston removal tool (or 3 M machine screw)
- C RAM removal tool or circlip pliers
- C Teflon tape
- C Lithium grease
- C Paintgun oil.
- C Angel parts kit

For the very experienced.....

- C Soldering iron
- C Solder
- C Vice with protective rubber grips

The Angel's Basic Components

Infinity Series Barrel (older models): The Angel's standard barrel is manufactured from hard anodized aluminum and is fourteen-inches in length. The barrel screws into the body (six and one-half turns) and no o-rings are required. The barrel is a smooth bore type and has five rows of drilled ports that help quiet the barrel down when firing.

Main Body: The Angel's main body is also manufactured from hard anodized, polished aluminum (black) and contains a ball detent, Rotabreech, and vertical feed tube. A sight rail is machined into the rear of the main body, but is relatively useless since your vision will be blocked by the vertical feed tube and hopper. The .45 grip-frame is attached to the main body with two allen screws. (Use your 3 mm allen wrench to remove the screws.) The Mini Reg is also attached to the main body via the vertical-bottle adapter (with one allen screw) and is connected to the grip-frame via the air tube.

Rotabreech: The Rotabreech is manufactured from aluminum and is machined to hold the bolt. Opening the Rotabreech is a snap (see "Removing the Bolt" in the "General Maintenance" section of this guide) and is extremely helpful in quick-cleaning the bolt and breech on the field.

Regulator: The Mini Reg regulator that is standard on the Angel is manufactured from the same materials as the body, grip frame, and barrel, and has a matching anodized finish. A Micro-Line adapter is supplied with the regulator. Older versions of the Mini Reg have a push button on/off (red/green). New versions have no on/off valve. It is left to the user to have a bleed valve and on/off somewhere in the system. Most high pressure systems have on/off valves these days, but unless you want to shoot the hose and gun empty of air, you'll need a bleed as well.

To remove the regulator and vertical-bottle adapter from the gun you'll first need to remove the two grip-frame allen screws (3 mm allen wrench). Next unscrew the regulator body from the vertical-bottle adapter. (At first glance you might think the regulator is one piece that is attached to the main body. In fact the regulator simply screws into the vertical-bottle adapter.) You can do this simply by turning the regulator body counterclockwise. Inside the top portion of the vertical-bottle adapter you will find one allen screw (4 mm head) that holds the adapter onto the main body. The air tube is held onto the grip-frame with one black rubber o-ring. Be careful not to lose the small rubber o-ring that rests between the vertical-bottle adapter and the bottom of the main body.

.45 Grip Frame: The aluminum .45 grip-frame houses the trigger assembly and attaches to the main body with two allen screws. The air tube connects the regulator to the grip-frame. The bottom of the trigger guard

has a hole machined into it to allow you to use a t-handle allen wrench to loosen the frontmost allen screw. The on/off for the electronics is also mounted in outside of the grip-frame (rear slide switch).

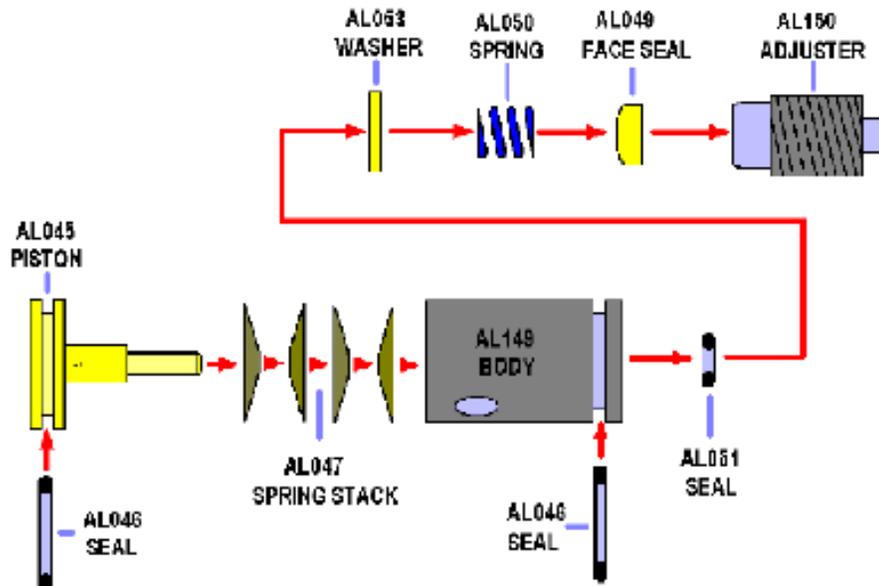
A quick look at the inside of the grip frame will reveal the Angel's brains--the circuit board. To get to the circuit board you'll need to remove the four allen screws that hold the rubber grips on the grip frame. Use your 2.5 mm allen wrench to remove the four screws. With the gun facing forward you'll see the adjustable electronics on the left side of the grip frame--the right side is the back of the board. There are two adjustable switches or screws--the top one is always the rate of fire switch, and the bottom one is the dwell switch (more on these later). These are adjustable using a small flat-head screwdriver.

A note on older boards--these are known to have "heat stroke" problems which will cause very low velocity problems or your gun to shut down completely. If you've experienced these problems you can exchange your board or replace the bad capacitor by going to an Angel service center.

Disconnecting the circuit board: Once the rubber grips are removed, disconnecting the board is simple, but you need to be extremely careful not to damage the board. The easiest way I have found to remove the board is by using a very small flat-head screwdriver and pushing upward a little at a time on each end. Push upward towards the bottom of the main body.

Ball detent: The Angel's ball detent is manufactured from aluminum externally and contains a nylon ball bearing which faces inward. Be careful not to over-tighten the detent as it will protrude too far into the breech where it will be hit by the bolt.

Internals

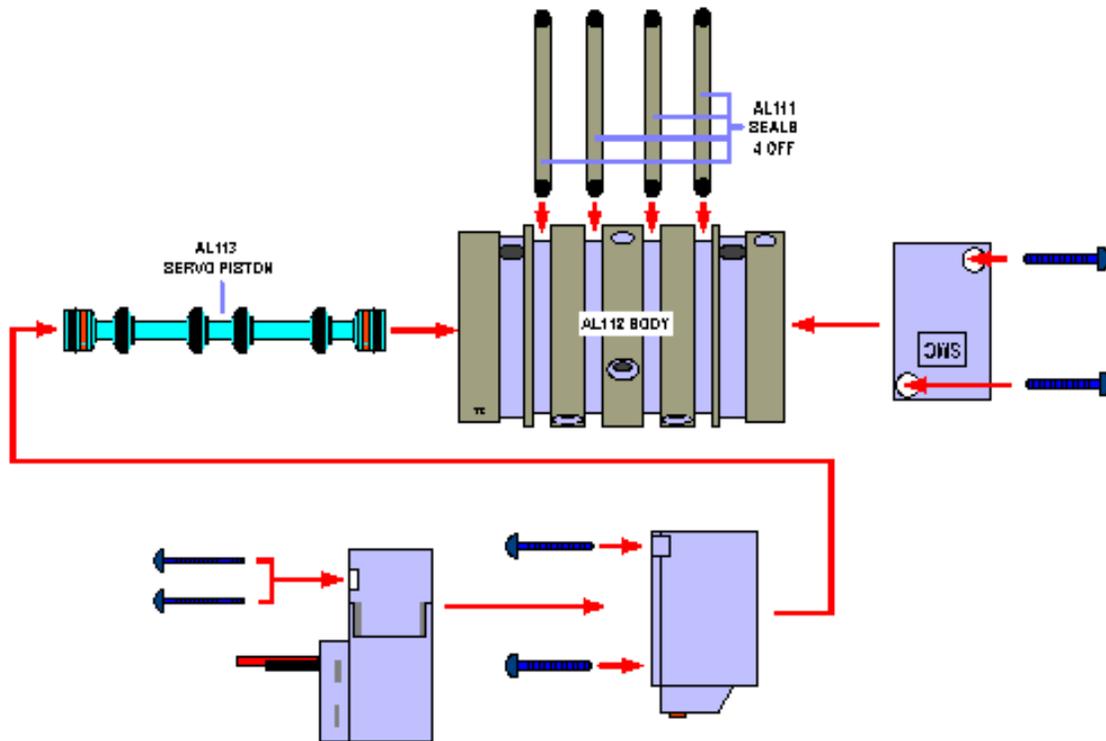


LPR ASSEMBLY © MPF Ltd 1999

Low pressure regulator (LPR) chamber: The LPR is located in the front left chamber behind the LPR piston assembly. The LPR is manufactured from black anodized aluminum and contains one black rubber o-ring. A round wire spring connects the LPR to the LPR stainless steel cup seal.

To remove the LPR, first remove the front left end cap. What you will see at this point (in the front left chamber) is the front end of the LPR piston which is a brass piece that looks like a funnel with a flat edge. The hole in the center is threaded (M3 screw thread). Thread the M3 screw (or specially designed LPR piston removal tool) into the hole and pull the piston out. Do this with the gun facing down so the shims stay on the piston shaft. There will be several shims there that can easily fall out, so please be careful.

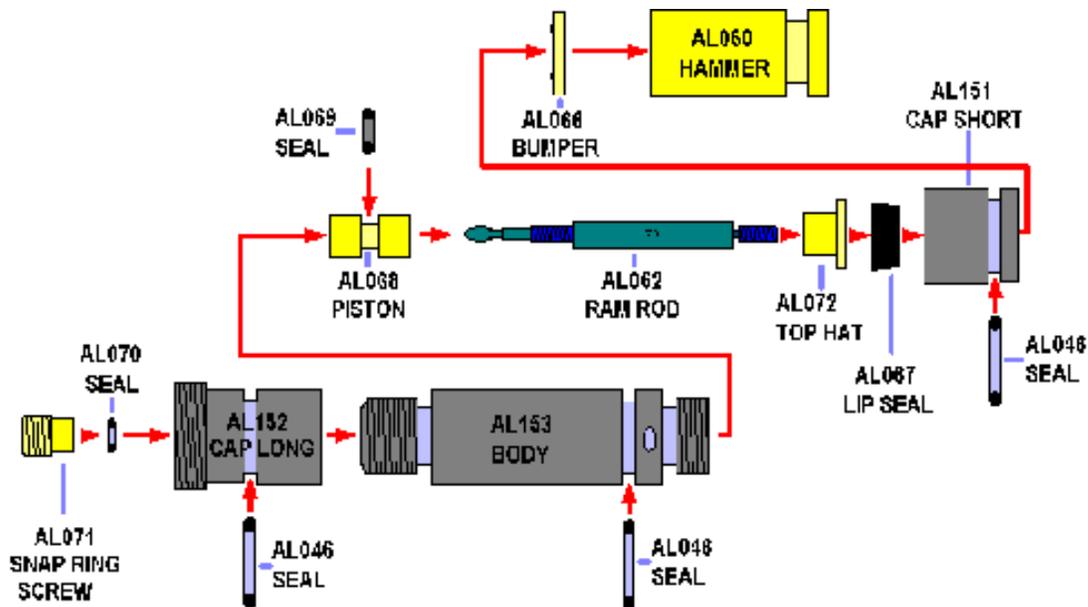
Pull the pin out of the bottom of the main body and with a little convincing, the LPR should come out. Behind (or attached) the LPR is a spring and the exhaust valve (a.k.a cup seal). Next moving inward is the exhaust valve main body which contains one o-ring and a seal at the front end. The exhaust valve main body is also held in place with a pin on the underside of the main body.



14 WAY VALVE © NPI Ltd 1999

14-way valve: The 14-way valve is located in the back upper chamber of the Angel. To get to the 14-way valve you'll need to carefully remove the back plate (be careful it is under spring pressure) and breech block release knob (unscrews) and disconnect the two small screws connected to the solenoid. Open the breech block and push the valve out the rear of the gun. You may have to carefully tap the 14-way valve out using a wooden dowel and mallet. Use extreme care when working in this area. You can easily damage the wiring harness, 14-way o-rings, or even worse, the inside of the Angel body which will cause un-repairable leaking. Use some lithium grease on the 14-way valve when reinstalling so that you don't cut the o-rings.

The 14-way valve is manufactured from aluminum and contains four rubber o-rings. There are two white plastic electrical components on the 14-way valve.



RAM ASSEMBLY © WDP 3rd 2004

RAM: The RAM is located in the rear right chamber of the Angel. To access the RAM you will need to remove the breech block knob, spring, and pin. Remove the back plate (two screws) carefully--it is attached to the wiring harness. I've seen some people that like to remove the entire wiring harness when working on the RAM or 14-way valve. I don't recommend that simply because you've got a greater chance of damaging the harness removing it than you do working carefully around it. Removing the RAM is tricky--you'll either need WDP's RAM removal tool or a circlip pliers. Insert the RAM removal tool teeth in the two holes and turn counterclockwise to remove. The RAM is manufactured from aluminum and contains three rubber o-rings. The hammer is attached (threaded) to the RAM and is separated by a rubber bumper.

Bolt: The bolt is a concave venturi head style bolt and is manufactured from a plastic/carbon fiber material. There is a stainless steel pin in the bolt as well. The bolt is very simple--just keep it clean and it should be fine for a very long time.

Rate of fire adjustment: (see "General Maintenance")

Complete Angel Disassembly

Make sure your air source is disconnected and that you are wearing Paintball approved safety goggles at all times.

Disassembling the Angel can be difficult and does require care and time. Complete disassembly is not for the novice or faint of heart. We recommend that only very experienced airmen disassemble the Angel completely.

- C To remove the barrel simply turn the barrel counterclockwise approximately six and one-half turns.
- C Pull back on the "breech block release knob" and rotate 90 degrees counterclockwise. Now you can swing the breech block open and slide the bolt out.
- C Unscrew the regulator from the vertical-bottle adapter and remove the allen screw inside the adapter.
- C Remove the two allen screws holding the grip-frame to the main body. Gently pull the vertical-bottle adapter apart from the grip frame to separate the adapter from the grip-frame. The air tube should remain connected to the vertical-bottle adapter.
- C Remove the four allen screws from the rubber hand grips. The easiest way I have found to remove the circuit board is by using a very small flat-head screwdriver and pushing upward a little at a time on each end. Push upward towards the bottom of the main body and the wired harness should separate from the board. Remove the one allen screw holding the board in place.
- C To remove the micro-switch from the inside top of the grip frame, push the two pins out of the frame. This is done from the outside of the grip-frame. Now you can carefully pull the micro-switch (with wire attached) up toward the top of the grip-frame. Reinstalling the micro-switch is a bit of a pain, so only remove it if you really need to.
- C To remove the back plate, unscrew the two allen screws holding the plate in place (be careful not to lose the spring). Remove the breech block release knob, lock pin, and spring.
- C Remove the two screws that connect the 14-way valve to the wiring harness.
- C Remove the two screws holding the isolator switch to the main body.

- C You can now very carefully fish the wiring harness through the bottom of the main body and out of the back end of the gun. The wiring harness is now completely out of the Angel.
- C Remove the allen screw from the top outside of the Angel's main body (located in the sight rail).
- C Tap the 14-way valve out from the breech using a wooden dowel and rubber mallet.
- C Unscrew (counterclockwise) the RAM located in the right rear lower chamber of the Angel. You will need the RAM removal tool or circlip pliers to do this. The hammer will come off with the RAM. The hammer can be unscrewed from the RAM shaft.
- C To get to the low pressure regulator which controls the pneumatic cycle of the gun, remove the left most end cap looking at the gun from the front end. With your LPR removal tool, pull out the piston.

Use extreme caution when working inside the low pressure area chamber. The smallest of scratches in this area will permanently damage the Angel's main body, causing a leak that cannot be repaired.

- C Remove the spring and cup seal.
- C Remove the pin located on the bottom of the main body (the pin located nearest the front end of the gun). Carefully remove the low pressure regulator.
- C Remove the second pin from the bottom of the Angel and the exhaust valve main body can be accessed or removed.

At this point you will have the Angel disassembled almost completely. The only things left are the battery pack and trigger.

Getting Started

This chapter is written for players that are already familiar with the Angel, and has a basic knowledge of paintguns in general.

Always wear paintball approved goggles before pressurizing your paintgun.

The first thing you'll need to do if you've purchased a standard stock Angel is figure out how to attach your high pressure system (hps) to the gun. The Angel's grip-frame is machined to accept a bottom-line adapter or hps cradle so this is the place to start. The easiest most common way to get started is by using a drop forward along with your cradle and hps system. Then simply run your Microline hose from the tank to the Mini Reg or replacement regulator. Never use CO2 with your Angel, no matter what type of configuration you choose.

Always treat your Angel as if it were loaded and ready to fire.

If you have an older Angel, the Mini Reg might have a red push button on/off valve which means your air is "off." Pushing that button in will supply air to the gun, assuming your hps tank's on/off valve is "on." On newer Angels there is no on/off in the regulator. You will need an on/off bleed valve on your high pressure system. Note: I have seen many cases where air was left in the system after the on/off valve was shut off. The Angel will still be able to fire as many as three to four shots with the air supply shut off.

At this point all that remains is to switch the rear isolator slide switch to the "on" position and the Angel is ready to fire. A green LED located in the rear end of the main body will illuminate when the slide switch is in the "on" position.

The next step is to attach your feeder to the gun. Again, please make sure you and everyone around you is wearing Paintball approved safety goggles. Although WDP sets the velocity fairly low from the factory, it is imperative that you chronograph your Angel before you play with it.

You should now be ready to use your WDP Angel. If you encounter any problems getting started, see other chapters such as "Trouble Shooting the Angel" and "Commonly Asked Questions."

Charging the Battery

Before you use your Angel for the first time, you will need to charge the battery pack for a period of at least fourteen hours. Batteries of this type (Nicad) have a "memory" and will not function properly if this is not done correctly. Subsequent charges take only three hours.

The Angel can be charged using a cigarette lighter socket found in motor vehicles (13.8v). Simply insert the female end into the socket located on the back end of the Angel. The isolator switch must be in the "off" position. Connect the male cigarette adapter end into the lighter socket and you're ready to charge the gun. You can also buy a charger for your angel at Radio Shack® type stores. Multiple socket chargers are also available which is great for teams charging their guns at night between playing days.

Battery life: WDP states that you will get 20,000 shots if your battery is fully charged and damage is not done to the battery's memory. Using the VL-2001 will shorten that number to around 5,000 shots. A good rule to follow is charge the battery the day or night before you are planning on playing Paintball.

LED on the charger: The LED on the charger will indicate the status of the charging cycle. Here's how it works:

No LED: This means power is not getting to the charger. (Is your switch in the "off" position?)

Dim red: Isolator switch is on--switch to forward position.

Bright red flashing: Battery is charging and was completely dead.

Bright Red: Rapid charging.

Green LED: The manual calls this "trickle charging." Battery is only charging to 30 percent.

Maintenance

Considering there are 271 components in or on the Angel, it is a relatively maintenance free paintgun, especially when compared to other guns on the market. Having said that I will tell you that there are a few things that need to be done on a regular basis, and great care is required in some areas such as the low pressure regulator area and around the wiring harness.

General Maintenance

Removing the bolt: The Angel's Rotabreech makes removing the venturi bolt a breeze. Simply pull the "breech block release knob" out and rotate 90 degrees counterclockwise. Now you can swing the breech block open and slide the bolt out. Make sure the bolt is clean and not lubricated.

Velocity adjustment: All velocity adjusting of the Angel is done in the regulator, whether you are using the standard Mini Reg or another aftermarket product. With the Mini Reg, turn the velocity adjusting screw counterclockwise to increase velocity, and clockwise to decrease velocity. Use your 3 mm allen screw to adjust the velocity. Always dry fire the gun several times and chronograph the gun to ensure you are playing at a safe velocity (under 300 feet per second). It is important to recheck your velocity using a chronograph several times during a day's play.

Rate of fire adjustment: Remove the rubber grips by unscrewing the four allen screws. You should be able to see the circuit board. Using a small flat-head screwdriver, you can adjust the rate of fire (ROF) upward (from 6- 16 balls per second) by carefully turning the ROF pot to the right (clockwise). It's important to note that ball breakage will occur if you set the ROF faster than your hopper will feed. You'll need to experiment to find the setting that works best for you and your equipment.

Dwell setting: The valve dwell controls how long the valve stays open. If the valve stays open too long your efficiency will be down. If the valve does not stay open long enough your gun will not have sufficient air to fire the ball at a decent velocity.

The valve dwell is set at the WDP factory and probably shouldn't be changed unless you've changed the working pressure (LPR) on your Angel. To reset your dwell time first make sure the gun is shooting at a good velocity (280-300 feet per second). Turn the dwell pot as far as it will go counterclockwise. This is the gun's least air-efficient setting. Slowly turn the pot clockwise while firing the gun over a chronograph. Listen for a decrease in the volume or noise signature of the gun. When the chronograph reading starts to decrease you're almost there. At this point turn the pot counterclockwise approximately 1/16" and your gun should be

at its most air efficient setting. If your dwell is too high the gun will be loud and your efficiency will be poor. You may need to experiment with your dwell setting if you've made pressure changes to your Angel.

Low pressure regulator adjustment: The low pressure regulator (commonly known as the LPR) controls the pneumatic cycle of the Angel. The LPR is found in the left chamber (looking at the gun from the front end) in the front of the gun. The LPR runs at a pressure of 80-90 pounds per square inch (psi) and can be adjusted by adding or removing 3.5 psi shims.

The LPR pressure can also be adjusted up by turning the allen screw counterclockwise or down by turning the screw clockwise. Remove the spring to get to the allen screw adjustment.

Adjusting the trigger: You can shorten or lengthen the trigger stroke of the Angel by turning the trigger tensioning screw (item # 110 in the WDP manual) clockwise to shorten or counterclockwise to lengthen. You will have to Loctite™ "red" #271 the screw when you've got it adjusted where you want it. To remove the rearward "play" in the trigger, a qualified airsmith familiar with the Angel can tap and thread a screw in the top of the trigger that is adjustable.

Removing the low pressure regulator: To remove the LPR, first remove the front left end cap. What you will see at this point (in the front left chamber) is the front end of the LPR piston which is a brass piece that looks like a funnel with a flat edge. The hole in the center is threaded (M3 screw thread). Thread the M3 screw (or specially designed LPR piston removal tool) into the hole and pull the piston out. Do this with the gun facing down so the shims stay on the piston shaft. There will be several shims there that can easily fall out, so please be careful. Pull the pin out of the bottom of the main body and with a little convincing, the LPR should come out with the spring attached.

Exhaust valve removal: The exhaust valve body is also held in place with a pin on the underside of the main body. Remove the pin and the exhaust valve should slide right out.

RAM stroke adjustment: Remove the rear plate (items 1-5 in the original Angel manual) as described in the "Angel's Internal Components--RAM" section of this guide. Rotate the RAM/hammer clockwise until resistance occurs in opening the breech. Rotating the RAM too far will result in the breech not opening. If this happens, rotate the RAM counterclockwise and repeat the instructions.

RAM snap ring adjustment: John Rice says it best, "To access the snap ring, first remove the back plate (item 160), you will see item 071, which is screwed into the Ram body (item 153). To set the snap ring you will

need the appropriate allen key, which is included in your spares kit. Firstly make sure the gun is gassed, then turn item 071 anti-clockwise a few turns to loosen it. It is very important that while item 071 is being turned, item 153 does not move. Once you have loosened the snap ring start to tighten it again (turn clockwise) while dry-firing the gun, you will hear the gun's noise signature change as the snap ring tightens and eventually the gun will stop firing and you will hear a 'clicking' noise. When you hear this 'clicking', turn the snap ring one 1/3 to 1/2 turn anti-clockwise. Your ram snap ring is now in the correct position and your problem will have been deleted. It is far easier to complete this task with a RAM adjuster tool. This tool holds the ram body in place while you adjust the snap ring. It also makes removing the Ram a lot easier. If you wish to purchase one of these tools drop me a line, and I will arrange to send you one."

Removing the 14-way valve: To get to the 14-way valve you'll need to carefully remove the back plate (be careful it is under spring pressure) and breech block release knob (unscrews) and disconnect the two small screws connected to the solenoid. Open the breech block and push the 14-way valve out the rear of the gun. You may have to carefully tap the 14-way valve out using a wooden dowel and mallet. Use extreme care working in this area. You can easily damage the wiring harness, 14-way o-rings, or even worse, the inside of the Angel body which will cause un-repairable leaking. Use some lithium grease on the 14-way valve when reinstalling so that you don't cut the o-rings.

Testing pneumatics and electronics: With the Angel's electronics switched to the "on" position and the gun aired-up, remove the two screws that hold the cover plate in place. Carefully remove the cover plate. Using a sharp object, hold the orange button down. This will start the pneumatics in motion, bypassing the electronics. When the orange button is released the pneumatics will reset if they have functioned properly. Check that the rear panel green light is illuminated. Pull the trigger. If the red LED illuminates this indicates that the electronics are working properly.

Cleaning

Barrel/Breech area: If you break a ball in the barrel or breech you'll need to clean it if you plan on hitting anything you shoot at. The standard barrel on the Angel is a smooth bore type which makes it easy to squeegee. However you'll want to get the paint out of the drilled holes. Keep the bolt cleaned, but do not oil it. The Angel bolt was designed to run "dry."

Oiling the Angel is simple. Disconnect your hose from your air-source and place three drops of paintgun oil into the air line. Reconnect your air source and remove the barrel. Dry fire twenty-five rounds or so to circulate the oil in the gun and reinstall the barrel.

Angel Upgrades

Select fire board: The Select Fire Circuit Board for the Angel retails for around \$70. There are four firing modes on the Select Fire Board. Mode one is your standard semi-automatic mode with an adjustable rate of fire of six to sixteen balls per second. Mode two is a three shot burst mode that is also adjustable (rate of fire). Mode three is an eight-shot burst mode with a non-adjustable rate of fire. Lastly, mode four is a fully automatic mode that is adjustable from six to sixteen balls per second.

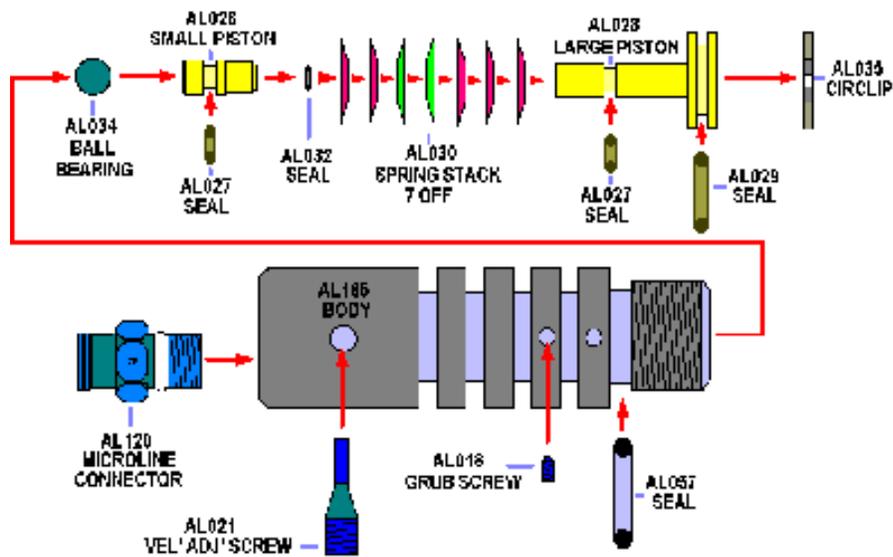
Barrels: There are a ton of aftermarket barrels available for the Angel.

Planet Paintball (UK) offers a product called the Barrel Exchanger that allows you to use Worr Game Products barrels on your Angel.

Viewloader Revolution Upgrade (VL 2001 Intellifeed): The Revolution Upgrade Kit for the Angel is available at most Angel dealers or WDP directly. This upgrade will allow you to run your Viewloader hopper off of the Angel's battery, meaning you'll no longer have to throw 9-volt batteries into your hopper. The upgrade will allow your Viewloader to activate whenever your Angel is shooting in excess of two balls per second. (This would be most of the time with this gun.) The loader paddles will stop turning approximately two seconds after you stop firing.

Double Finger Trigger: Most Angel dealers can fit a double finger trigger on your Angel. This will shorten your trigger pull giving you the ability to fire even faster than with the stock trigger.

Standard Front Bottle Mount: Planet Paintball, AKALMP (Leads Metal Products Inc.), and other companies make a replacement front bottle mount that uses standard (non-metric) threads. This allows the user to replace the Mini-Reg with a Unireg or other brand regulator. Installation is fairly simple. First insert the small end of the air tube into the grip frame. Next place a drop of oil on the tube o-ring and slide it into the vertical



MINI REGULATOR

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adapter. Align the screw hole and tighten the screw. Now you're ready to use a standard non-metric regulator with your Angel. Note: The standard thread adapter is not intended to be used for installing a CO2 tank. It is used to install a standard thread regulator.

Low Pressure Internals: Low pressure internals are available from a variety of sources

including Planet Paintball (UK), Warped Sports, Pev's Paintball, AKA Performance Paintball and others. Upgrading to low pressure involves opening up the valve chamber to allow a larger volume of air flow. Planet Paintball also modifies the valve guide and valve body.

Miscellaneous: WDP sells a variety of replacement parts for the Angel including, stainless steel screws, shim kits, tool kits, and valve kits. Replacement grips are readily available for the Angel's .45 grip-frame.

Non-Angel Specific Upgrades

The first thing you're going to need for your Angel is a quality high pressure system-- there are many to choose from. Many people have asked me over the years what the difference between nitrogen and compressed air is. Here it is.

Trouble Shooting the WDP Angel

The Angel does not fire: Is your high pressure system properly attached to the gun, and is the on/off valve on the hps set to the "on" position? Is the electronics switch in the "on" (rearward) position? Check for a green LED light on the rear plate of the gun. Is the on/off on your Mini Reg or other regulator in the "on" position?

If you've checked these basic things and you still get no response, you'll need to do a pneumatics/electrical test as described in the "General Maintenance" section of this guide. If you still can't get the gun to fire, try the following:

Check to see if the wiring harness is properly attached to the circuit board. This should not be a problem unless you've disconnected it at some point. Remove the circuit board plug by carefully pushing upward on the white plug in equal measure on each side. Once you have the circuit board plug removed, reinstall it. This will reseal the plug in case it was not already seated properly.

Carefully remove the regulator, vertical-bottle adapter, and two allen screws from the grip. Check to see that the micro-switch wires are still in place.

Is the bolt stuck in the forward position? Is the bolt area clean. Sometime a piece of paint shell will wedge between the bolt and bolt cavity causing the bolt to stick forward.

Check your snap ring adjustment--it may be too tight. See "General Maintenance" to reset your snap ring.

Erratic velocity: Inconsistent velocity with the Angel can be caused by many things. Some of these things may have nothing to do with the Angel itself. We'll start off with the non-Angel related things except for the age old question, is your gun and barrel clean? If so lets move on. Take a look at your paintballs. Do they look okay? No broken paint? All one brand? You may not realize that if you mix brands or even batches, you'll get erratic velocity readings over the chronograph because the balls may be sized or weighted differently. Is your barrel clean? Oh I guess I asked you that already. If you are using an Air America nitrogen system check your regulator seal and replace if necessary. Check your output pressure, it should be as close to 850 psi as possible. Try changing high pressure systems as a test if necessary. Check your LPR pressure--it should be 85-90 psi. This can be fixed by adding or removing shims. Each shim is worth around 3.5 psi.

Check the air pressure from your tank. It should be in the 800-850 psi range.

Check your valve dwell setting as per "General Maintenance."

Check your RAM stroke adjustment as per "General Maintenance."

Check your RAM snap ring adjustment as per "General Maintenance."

In rare cases a bad or damaged exhaust valve can cause erratic velocity. Replace if necessary.

Ball breakage in the gun: Like the erratic velocity problems discussed earlier, ball breakage is usually caused by a gun that is not properly cleaned/lubricated, or by something not associated with the gun itself. Check your paintballs for flat spots, dimples, etc. Try changing paint batches before you drive yourself crazy with everything else that could be wrong. Make sure your barrel is clean as well. If none of these things fix your problem, try the following:

Check your ball detent--is it still there?

Is your velocity too high?

Check the front end of the bolt. Is it damaged?

Check and/or set your rate of fire to what is appropriate for your hopper and your playing style. If your rate of fire is set for seven balls per second and you're trying to fire nine balls per second, you will chop balls.

If you are using an Eclipse double finger trigger and if your trigger pull is too short, you may get trigger bounce which will cause ball breakage in the gun. What happens here is you get more than one electrical charge from the trigger and the gun will double or triple fire causing ball breakage.

Air Leaks: Like any other paintgun, the Angel has o-rings and seals that can get damaged during use causing air leaks. Also any of your air fittings such as elbows, quick disconnects, etc., can leak.

Leaking from the top of the regulator: Check that the o-ring is still in place by removing the Mini Reg and the vertical-bottle adapter. Replace if necessary. Loctite the vertical adapter screw. Leaking from the flash tank air tube: Make sure that both ends of the tube are seated correctly in the grip frame (held in place with an o-ring) and the regulator (threaded or held in place by an o-ring depending on which type you have). Make sure o-rings are not damaged.

Leaking from the underside of the main body: There is a LPR vent hole located under the main body near the flash tank. A damaged low pressure regulator body o-ring can cause a small leak from this area. Refer to "General Maintenance" for instructions on how to remove the LPR. Make sure to slightly grease or oil the new o-ring after installation. This will help prevent damage when reinstalling the LPR.

Air leak from the top of the gun: There are two vent holes in the top of the Angel's main body (in the sight rail). Leaking here can be caused by a damaged RAM o-ring or occasional damaged 14-way o-ring. See "General Maintenance" for information on removing the RAM or 14-way valve.

Air leaking from the Mini Reg: Older Mini Regs used inferior o-rings in the on/off area. It is very common for these to develop an air leak. Contact WDP for the new more durable seals. A common thing people are doing now is inserting an Automag power tube space between the red and green on/off buttons which keeps the valve in the "on" position. There is an o-ring between the vertical-bottle adapter and the main body that can get damaged causing a leak here as well.

Loss of accuracy: Once again check your paintballs for flat spots and/or dimpling. Try different brands and different batches of paint. Make sure your barrel is clean. If your Angel is new and its accuracy is inconsistent, check the bolt for grease. WDP uses lithium grease when installing several of the Angel's components and sometimes it will get on the front end of the bolt, causing the ball to stick to the bolt for a millisecond during firing. Simply clean the bolt area and you'll be okay.

Loss of accuracy can also be caused by the following:

- C Inconsistent velocity.
- C Paint wedged in the bolt or breech.
- C Dirty barrel/oil residue on paintballs..

Gun shuts down: In cold weather the Angel can completely shut down if you've got too much lithium grease on the internals. This one can throw you because the gun will work for a while then just shut down. Simply remove some of the grease and put your gun back together.

Commonly Asked Angel Questions

Can you explain the reason for the vertical feed on the Angel? Sure. The vertical feed stacks balls on top of each other, and the weight of the balls helps prevent the air blowback from pushing paintballs back into the hopper, which would cause ball breakage. WDP states that a vacuum occurs during the firing sequence which also helps prevent the paintballs from blowing back into the hopper.

Check out what WDP's John Rice has to say about the Angel's feed system, "The Angel's bolt is electronically timed on it's return stroke, hence the bolt will not retract until the ball and gas have left the barrel, this leaves a slight negative pressure in the barrel (a vacuum) which sucks air in through the feed tube when the bolt is retracted. You can test this by placing a piece of tissue paper over the feed port and firing the gun, you should see the tissue getting pulled into the breech by the negative pressure in the barrel. The amount of negative pressure created is controlled by the valve dwell pot, and this is where your particular problem lies. If the valve dwell is set too high then the valve will remain open for longer, the bolt could retract when there is still some gas being released. This would create blow back. You need to decrease your valve dwell time, this will solve your immediate problem, it will also make your gun more efficient and a great deal quieter."

Is the Angel a good all weather gun? It is now. Early models of the Angel, (pre #1750 serial numbers) had some hot weather problems with regards to the circuit board overheating. This problem has since been corrected. If you have an early serial number Angel contact WDP to get it replaced with the upgrade.

What is the best pressure to run my Eclipse low pressure Angel at? You should run your Eclipse at 800-900, just as you would run a stock Angel.

What paint works best in the Angel? Which ever one shoots straightest and breaks least in the gun . Seriously, different weather conditions, barrels, internals, etc., are all a factor in which brand or color paint shoots best. My best advice is to experiment with a variety of paint brands.

Is the Angel an open bolt gun? Tricky question! Yes it fires from an open bolt, BUT when the ball leaves the barrel the bolt is actually closed.

Angel Tips

1. When installing or reinstalling the RAM or 14-way valve, use lithium grease around the o-rings to prevent them from being cut or damaged.
2. Reinstall the RAM slowly to avoid cutting the o-rings.
3. Do not oil the Angel's venturi bolt. It was designed to run dry.
4. Radio Shack sells a multi charger that will allow you to charge several Angels simultaneously.
5. Over-tightening the ball detent will cause the ball bearing to protrude too far into the main body, causing excessive ball breakage.
6. Never use a sharp object such as a pick inside the Angel's main body, especially in the LPR area. Any scratches inside the main body will cause a permanent air leak which will require buying a new main body (a \$400+ expense).
7. One of the most common reasons Angels come back into the shop is for damaged wire harnesses (also referred to as wire looms). You can buy any piece of the harness separately, the harness is only available as a complete unit. Be careful working around the harness.
8. Many players will run their output pressure at 1000 psi if they are using an Air America Apocalypse system. However, you won't be able to use a Microline hose at this pressure.
9. If you break a ball on the field, your Angel might just shut down. Simply remove the barrel and push the bolt back and you should be ready to go.
10. Always carry a parts kit with you to the field. You'll find most fields do not carry Angel parts yet.
11. If you want to be different and have your rear power light red instead of green, simply switch the wires going to the light.

Angel select board settings:

Mode

semi-auto
full-auto
3-shot
8-shot

Settings

down two down
up two up
left two up, one down right
two down left, one up right

The Worr Game Products Autococker



In This Chapter of the Airmith Survival Guide

[Introduction](#) - Various Autococker models

[Downloads & Web Links](#) - Clickable links to download 'Cocker manuals and instructions, manufacturers' websites, accessory company websites, reviews sites, and more.

[Basic Components](#) - All you need to know about the receiver, grip frame, regulator, bolt, 3-way, Ram, and the rest of the gun's components

[Cold Weather 'Cocker](#) - What to do

['Cocker Maintenance](#) - Learn how to do basic maintenance on your Autococker

[Tools](#) - A list and description of tools you'll need to work on your Autococker

[Upgrading](#) - Some suggestions on upgrading your 'Cocker

[Troubleshooting](#) - Instructions on how to troubleshoot and fix your Autococker

[Click HERE to open Worr Games website](#)

The Worr Game Products Autococker

The Worr Games Products Autococker is one of the most widely used paintguns on the tournament circuit. There are many reasons for this. It is probably the most upgradable paintgun on the market, it out-performs most other guns, and it's design is intriguing. If you like to tinker, play with, and nurture your paintgun, the Autococker is probably for you.

How the Autococker Works

Description #1: The Autococker is a closed bolt auto-cocking paintgun. It is not a semi-auto, but it's rate of fire is comparable to the best semis on the market. When the trigger is pulled, the three-way valve is activated allowing the gas to enter the ram (cocking cylinder). This pushes the cocking block, bolt, and cocking rod back approximately one inch. This opens the bolt, allowing a paintball to drop into the breach (chamber). The hammer sear latches at the same time. The cocking block stays in the rearward position until the trigger is released. At that time, the three-way enables the gas to vent from the front of the piston, pulling the block forward to close the bolt. The gun is now ready to fire. Pulling the trigger fires the paintball and begins the cycle again.

Description #2: When you air-up the gun, the gas enters the lower chamber. At the same time the gas flows through the regulator, into the three-way, and then to the ram. At this point the trigger is in the forward position and the CO2 is in the back part of the ram. This keeps the back block forward (flush with the gun body). When the trigger is pulled the CO2 in the three-way to ram hose is vented (short front hose on the three-way). At the same time the front three-way to ram hose is charged, forcing the bolt/block assembly back which cocks the gun. The gun is now ready to fire.

Which Autococker to Use



VF Tactical 'Cocker

That's a good question. You've got the older Autocockers ('97 and '99 'Cockers), Minicocker, Evolution Autococker, Express 'Cocker, Bob Long Signature Series Autococker, Gun f/x 'Cocker, Danny Love Autococker, P & P Autococker, Eclipse 'Cocker and many more. Most of these are still seen on the playing fields. These were all pretty good markers. More recently WGP has introduced the 2000 'Cocker, STO, the Black Magic Cocker, the Vertical Feed 'Cocker, the Outkast, the Sidefeed, the VF Tactical, the Orracle and others.

The first three, the '97 and '99 'Cockers and the Minicocker were all manufactured by Worr Games Products (WGP) in southern California. These were the basic guns that all of the other guys modify. The STO, Black Magic, Vertical Feed, Outkast, Orracle etc. are still manufactured in southern California and are selling as well as ever. Even now in 2003, people are still buying main bodies directly from WGP and customizing them for resale.

Companies like Planet Paintball, Cole Cockers, DYE, Shocktech, and Warped Sports are making some great guns.



Bud with the Orracle E-Class

The Autococker's Basic Components

Barrel: The Autococker's barrel is manufactured from aluminum and varies in length depending on when you purchased your gun and what model you purchased. The stock barrel (on the Sniper) is a smooth bore type, meaning there is no rifling, drilling, etc., done to the barrel. The barrel threads into the main body with about seven turns. The shroud slides over the barrel and the front end of the main body.



VF Tactical drilled barrel

Other models like the Outkast and Black Magic come with drilled, more custom type barrels.



Chipley 'Cocker main body

Main Body: The Autococker's main body is manufactured from aircraft grade aluminum and has two machined-in chambers. The upper chamber houses the bolt. The lower chamber houses the velocity adjuster, cocking rod, exhaust valve, valve spring, hammer, and main spring.

Vertical-bottle adapter: The

Autococker's vertical-bottle adapter is also manufactured from aluminum and is mounted to the bottom front of the main body just in front of the trigger guard. The vertical-bottle adapter is machined to allow the trigger actuating rod to run through it where it hooks into the trigger.



Vertical adapter



Chiplew aluminum grip frame

Composite grip-frame (on all post 1994 Sniper guns):

The Autococker's grip-frame is manufactured from a very durable carbon fiber material. The hand-grips are not interchangeable with the Airgun Designs grips, but are very similar. The bottom of the grip is machined out or threaded to allow the user to attach a bottom-line adapter. The grip is mounted to the main body with two allen screws. Use an 1/8" allen wrench to remove these screws. The front screw is a bit awkward to remove--the trigger shoe gets in the way. Pull the trigger back as you unscrew the allen screw. The trigger and sear are manufactured from stainless steel and are found in the grip frame (remove the grips using a 3/32"

allen wrench to access the internals of the grip-frame). The under sear spring is positioned vertically, guess where? That's right, under the sear. To remove it simply pull down on the spring. WGP has used several different springs over the years. The latest spring (1.113" length) is about 0.200 (thousandths of an inch) smaller than the original. It's also much lighter. Be careful not to lose the sear retaining pin when working on or cleaning inside your grip frame. You'll also find the trigger return spring in the grip-frame. It measures around 0.7930 in length and is positioned horizontally behind the trigger. It takes a bit of a knack to install this spring. Lastly, the trigger safety is located in the grip-frame and is used secondarily to hold the trigger in place.

Later Autococker models (Outkast, E-Orracle, etc.) Have aluminum grip frames.

Hand grips: The original WGP hand grips are the non-molded types that mount to the grip frame via the two allen screws (one on each side). On the '97 Autococker, the grips used are the molded plastic/rubber type. These are interchangeable with Automag grips.



KAPP back block

Back block: The back block is manufactured from aluminum. The cocking rod threads into the block which is also machined to allow the user to access the velocity adjuster. The rear of the bolt attaches to the block via the stainless steel bolt retaining pin that runs horizontally through the bolt.

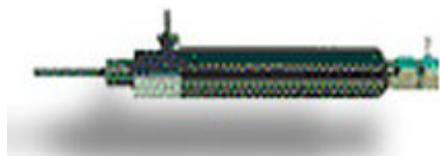
Sledgehammer (or other self-adjusting) regulator: The Sledgehammer regulator (on most stock Autocockers from 1996 to 1999) is located under the shroud. It is the black enclosed unit and is connected to the three-way valve with one short low pressure hose. The Sledgehammer is self-adjusting. This basically means that the unit regulates the pressure in the system, and when it is over-pressurized, it will limit or shut down the flow until normal pressures are restored. On older models there was a user-adjustable regulator which was a real annoyance. You had to go through a series of adjustments just to air-up the gun. Still some players prefer a modified adjustable regulator since the Sledgehammer will occasionally malfunction when a lot of liquid enters the system.



MAKO mini reg

To remove the Sledgehammer (or user adjustable regulator), just disconnect the single low pressure hose and carefully unscrew the unit from the mounting block. Do not try to get inside the Sledgehammer. If it needs repair, send it to Worr Games Products.

Cocking cylinder (ram): Also located under the shroud, the ram is mounted closest to the barrel and connects to the three-way valve with two small low pressure hoses. The ram is manufactured from brass and has two seals within the unit. It also has a threaded rod that attaches to the pump rod. *Important note:*

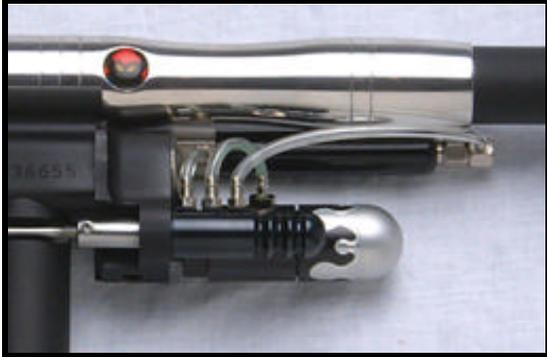


Shocktech RAM

Do not attempt to disassemble the ram--The end cap is "loctited" and the soft brass housing will bend if you put it in a vise. My advice is to buy a "Clippard," Shocktech, 32 Degrees, etc. ram if you're looking for a slightly

smoother performance. It's lighter and smoother than the stock ram.

Three-way valve: This is sometimes referred to as a four-way valve, since it is kind of a four way valve in reality (one input, two outputs, and an exhaust). The "three-way" is manufactured from brass and is three separate pieces (not including the o-rings). There is the three-way housing or shell, the three-way stem, and for lack of what else to call it, an end cap. The stem has two o-rings (same size) and the end cap has one. A "c-clip" holds the stem in place. To remove the c-clip, simply hook the end of the clip with a bent tip hook (be careful, the clip has a tendency to "fly" out) and pull it out. Once you've done that you can push the stem and end cap out



Three way valve

from the threaded end using an allen wrench. The three-way valve screws to the mounting block where the three-way valve coupling joins the three-way valve stem. The coupling attaches to the trigger actuating rod on the other end (two 1/16" allen set screws hold the stem and actuating rod). The three-way has one low pressure line *in* (one from the Sledgehammer), and two lines *out*.

Pump rod: The pump rod is manufactured from steel (stainless steel on some guns or with most aftermarket rods). The pump rod connects to the back block on the rear end of the gun and the ram piston rod on the front end of the gun. The ram piston rod screws into the pump rod and the pump rod screws into the back block. Both of these adjustments are important to your gun's timing.

Timing rod (also known as the trigger actuating rod): The timing rod hooks into the trigger on the back end and slides into the valve coupling where it attaches to the three-way valve. This is another area that is critical to a properly timed Autococker. The stock timing rod/coupler is not adjustable, so if you want to radically improve your trigger pull, you'll need to get one that is adjustable.



Cocking rod: The cocking rod is located in the rear of the gun and is inserted into the lower chamber of the main body. The cocking rod contains three pieces: the rod, knob, and bumper. To adjust the velocity on your older stock 'Cocker you'll need to remove the cocking rod (use a 3/16" allen wrench on older 'Cockers) from the main body.

Internals

Valve spring: The round wire valve spring measures between 3/4"-1" depending on when you bought your Autococker. It is the component located furthest into the lower chamber of the 'Cocker's main-body. The valve spring sits on the back end of the valve stem.

Valve assembly: This includes the valve stem and valve (two separate pieces). Both are machined from brass. The valve stem holds the valve spring. The valve contains one black rubber o-ring. The valve is installed o-ring end in first. To remove the valve you'll need a "valve tool" to unscrew the retaining nut. The wrench does not come with the gun, but you can purchase one from most distributors of Paintball products.



RAT valve



32 Degrees hammer kit

Hammer assembly/spring kit: This includes the two-piece hammer and main spring. The back end of the hammer assembly is where you will find the velocity adjuster on the stock hammer assembly. Turn the allen screw clockwise to increase the pressure on the main spring, which will increase your velocity. Turn counter-clockwise to decrease your velocity.

Bolt: The bolt is manufactured from aluminum and contains three black rubber o-rings (Some aftermarket bolts have less than three o-rings). It is knurled on the back end to provide a better grip. To remove the bolt, just pull the bolt retaining pin out and slide the bolt out the back end of the gun.

Tools You'll Need

To work on or adjust your Autococker you'll need some tools. Here's a basic list of what you'll need to keep your gun operational:

- 1/8" allen wrench (grip-frame screws)
- 3/32" allen wrench (hand grips)
- 3/16" allen wrench (velocity adjuster)
- bent-tip pick (remove o-rings, c-clips)
- 1/4 socket (vertical-bottle adapter)
- 0.05 allen wrench (trigger shoe)
- Autococker valve tool

You'll also need at least an adjustable wrench, Teflon tape, Q-Tips, alcohol, paintgun oil, etc.

Getting Started

This chapter is written for players that have some experience with the Autococker. If you have not read the instruction manual that came with your gun, you should do that now. If you have and are somewhat familiar with the gun, read on.

Always wear Paintball approved goggles before pressurizing your Autococker.

The WGP Autococker works best on "gas" CO₂ or high pressure gasses such as nitrogen and compressed air. Never use a siphon tank on your Autococker. Siphon tanks are designed to draw liquid CO₂ into your gun. For Autocockers, liquid CO₂ can be a nightmare even in small quantities. If you feed liquid directly into your Autococker, you don't stand a chance of having a working gun. Liquid CO₂ that enters your gun in large quantities will freeze your gun's o-rings, your regulator, and possibly blow a hose.

Rule #1 - Never use a siphon tank with your Autococker

What you'll probably want to do is use an anti-siphon tank mounted in the bottom-line position or set your 'Cocker up for remote CO₂. An anti-siphon tank has an anti-siphon tube installed inside the tank. The tube, usually made from copper, screws into the bottom of the tank's pin valve and is positioned to prevent liquid CO₂ from being drawn into the gun. The anti-siphon tank must be set up specifically to your tank. The tube inside the tank must be aligned to your gun's air source adapter.



WGP sponsored pro team, Naughty Dogs

The stock 'Cocker comes set up for vertical-bottle CO₂. That's a decent way to prevent liquid from entering the gun, but it's still going to be a problem occasionally. If you can deal with an occasional problem, the vertical set-up may be all you need.

Rule #2 - Always let a trained airsmith make modifications to your Autococker or Minicocker.

Okay, once you've figured out how to keep your Autococker shooting gas CO₂, you're ready to actually fire the gun.

The next step is to attach the feeder elbow to your gun and the feeder to the elbow. Screw the tank into the adapter and the gun is ready to fire. Please make sure you and everyone around you is wearing Paintball approved goggles. If you have any questions regarding goggle safety, please check out www.paintballsafety.com.

From the WGP factory, most Autocockers shoot in the 280 feet per second range, but sometimes much higher. You'll need to chronograph your gun before you use it. An important rule to follow is to always chronograph your gun before your use it, and chronograph it several times during the day. Weather/temperature affects your gun's velocity, as does overfilling your CO₂ tank, and other things. To change your Autococker's velocity, remove the cocking rod and insert the 3/16" allen wrench until it engages the screw. Turn the wrench clockwise to increase the velocity, and counter-clockwise to decrease the velocity. Be careful, one full turn can increase the velocity by as much as 70 feet per second. Always verify your velocity before using the gun.

At this point the gun should be ready to use.

Cold Weather Performance

Cold weather performance with the stock Autococker will be inconsistent at best. There are however, several methods of improving the usability of the Autococker in the cold. First, let's look at why your 'Cocker does not perform it's best in the cold.

Tank pressure: The Autococker is designed to operate at about 500 pounds per square inch (psi) or more. When the temperature drops below 35 degrees (F), your CO2 tank pressure will fall below 475 psi and will not supply the gun with enough working pressure. That's it in a nutshell. The easiest way around this problem is to set your Autococker up for high pressure gas (nitrogen or compressed air). Nitrogen and compressed air are virtually unaffected by temperature so supplying the gun with 500 psi is never a problem. High pressure systems are expensive but will give you much more consistent performance. For more on high pressure systems see "Upgrading the Autococker", "High Pressure Systems."

There are ways to improve the consistency of your CO2 supply in the winter by using a remote/expansion chamber. A remote hose gives the liquid CO2 coming out of the tank time to expand back into gas. In the winter, some players run the remote hose from the tank under their shirt and into the gun. By running the hose under your shirt, your body heat helps warm the CO2 as it travels to the gun. While this may help some, don't expect this to be the end-all to your pressure problems.

Although a regulator won't fix your cold weather problems by itself, using one in conjunction with an expansion chamber is a good cold weather combination. You do get some expansion with a regulator, but not enough on it's own.

Rapid firing your Autococker (or any other gun) tends to chill your CO2 tank quickly. As you rapid fire the gun, the liquid CO2 in your tank is changing to gas to replace the gas that is being used. In the cold weather this problem is magnified. So if you're playing in 30 degree temps, save your rapid firing for when you really need it. **Tip:** No matter what the weather is, using a twenty-ounce tank (as opposed to a seven, nine, or twelve-ounce) will give you better performance than a small tank. With a seven-ounce tank for instance, you will chill the tank much quicker when rapid firing than you would with a twenty-ounce. There just isn't much "gas" CO2 in the tank, so freezing will happen much faster.

Paint: In the cold weather, paintballs are much more fragile than they are in warm weather. When the CO2 burst hits the fragile paintball, the odds of breaking a ball in the barrel or breach are greatly increased. When you break a ball in the cold, the fill tends to get thick and is difficult to clean. One method of improving this problem would be to use a venturi style bolt. The venturi bolt hits the paintball with a more evenly disbursed gas burst and will reduce the stress on the ball somewhat. Don't look for miracles though.



When playing winter paintball, try to keep your equipment above freezing at all times, but be careful not to let your gun and tank get too warm. If you leave your equipment in your heated car at 75 degrees and then take it out to play where the temps are below freezing, you will have problems. Your velocity will be very inconsistent and possibly dangerously high at times. In addition, heating a CO2 tank will cause the pressure to rise higher

than the tank is intended to handle. Be careful.

Maintenance

This chapter on maintenance is a basic overview of what it takes to keep your Autococker functioning properly. Other chapters such as "Trouble Shooting the Autococker" and "The Autococker's Basic Components" will provide you with more technical maintenance tips as well.

The key to keeping your Autococker shooting is proper maintenance. A properly maintained Autococker is one of the best shooting paintguns made. A poorly maintained 'Cocker will give you more trouble than you could possibly imagine.



Lubrication: To keep your internal components operating smoothly, place about four drops of oil in your gun's CO2 adapter (ASA) and dry fire (after removing the barrel) to spread the oil throughout the gun. Use oil that is designed specifically for paintguns unless you know more about this subject than I do. The Autococker's instruction manual states that you should lubricate the threads and all moving parts with Vaseline. I would recommend lubricating the threads with Vaseline but not all of the moving parts. Use paintgun oil for that.

Cleaning: If you expect to get good performance from your Autococker, you'll need to keep it clean internally and externally. The two external areas you need to be the most careful with are the barrel and the power feed tube. If you break a ball in the barrel, you will lose most of your accuracy until you clean it completely. For a quick fix, remove the rear pull pin and run a pull-through squeegee through the entire body and barrel. After each time out to the Paintball field, you'll want to clean the barrel with warm water and/or a barrel treatment (there are several available from the various Paintball suppliers) and squeegee the barrel until it is dry. If you break a ball in the breach, you can probably run the same squeegee through the feed port and out the barrel.



Timing is everything

Timing maintenance: Almost every problem related to a malfunctioning Autococker stems from a mis-timed gun. To start, manually cock your gun without your air attached and look in the feed tube. Can you see the bolt tip? It's okay if you do. Now air-up the gun, squeeze the trigger and hold it in the rearward position. Look into the feed tube again and now the bolt tip should be gone, but not too far. If the bolt is too far back, your cocking rod is

probably out of adjustment. To adjust your cocking rod length, first unscrew it from the gun. Remove the knob and bumper from the rod (it may be Loctited). Put a few drops of Loctite on the rod threads. Screw the knob onto the rod, put the bumper in place and insert the rod in the gun. Pull back on the cocking rod until the gun cocks. Pull back on the block until it touches the bumper. The bolt should now clear the feed tube (it may be sticking out slightly). If it does not, unscrew the knob only until it does. Now let the Loctite dry.

Next check to see if your gun fires during the first part of the trigger pull. To do this, pull the trigger slowly--watch and listen. The cocking lug (also known as the sear lug) is critical to the gun's timing. The adjustment of the cocking lug determines when the hammer is released. The shorter the length of the lug, the earlier the hammer will be released on your trigger pull. Conversely the farther out the lug is, the later the hammer will be released. Experiment here to find the setting that releases the hammer before the gun is cocked. This will ensure that the bolt is in the fully closed position, which is important to velocity consistency--there will be less CO2 blowback if this is done correctly.

Your Autococker's timing is also affected by the timing rod (also known as trigger actuating rod). If you have the stock timing rod you shouldn't have a problem here, but you have limited adjustability. The one problem to look for is to see if the set-screws have loosened. If they have, slide the coupler forward and tighten them down.

If you have an adjustable timing rod it could be out of adjustment. If the rod is adjusted too "short", your three-way stem will be pulled out--which is what happens when you pull the trigger. This may cause your block/bolt assembly to be pulled back to the cocked position. If the rod is adjusted too long it will force the trigger into the rearward position.

Upgrading the Stock Autococker

Although the stock Autococker is far better now than it was a few years ago, there are still many things you can do to make it look, feel, and perform better. You can make your 'Cocker faster, lighter, more accurate, more reliable, and more colorful, and you can do it part by part over any length of time.

Barrels: Even with just the stock Autococker barrel you have a pretty accurate paintgun. The closed-bolt design and excellent workmanship done by Worr Games Products gives the 'Cocker a big jump in the accuracy race. Yet there are some excellent barrels that will improve your Autococker's accuracy a bit.

External Performance Upgrades

Where do you start? There are so many excellent accessories for the 'Cocker, you could fill a book with just the names. Lets start with external upgrades for the 'Cocker.



Halo Feeder

Motorized/Belt driven feeders: If you want to get the most out of your 'Cocker, you'll need an aftermarket feeder. There are a ton of great aftermarket feeders available. Feeders like the eVLution, Halo, Ricochet, etc. Generally the way these work are when no paintballs are in the feed tube, the fan turns on (or belt) forcing a ball into the chamber. When the gun feeds properly, the fan turns off. A must have. The Warp Feed from Airgun Designs has become another popular feeder as well.

Power feed (for older 'Cockers that do not have vertical feed tubes):

The Autococker does not come with a Power Feed system like the Automag. From a performance standpoint you may not need one. The closed bolt design of the Autococker does not create the massive amount of CO2 blowback like some of the blowback style semi-autos. One thing that a Power Feed does for your Autococker is put the loader over the center of your gun rather than off to the side. This comes in handy when you're trying to come out from behind your tree to shoot. Your loader is much less of a target. It's also a bit easier to squeegee a ball break with a power feed. You just shut off the flow of paint to the breach, pull the bolt out and run the squeegee through the gun body and barrel. You won't have to turn the gun upside down to stop the flow of balls to the breach.

To my knowledge, Pro Team Products is the only manufacturer of bolt-on Autococker Power Feed systems.

Feed Adapter: This is an extended feed tube that fits over the stock feed port. It allows more paintballs to stack, preventing the balls from "blowing" back into the hopper. Again, this is for older Autocockers.

Lightened back block: There are many companies that make lightened or "cut" back blocks for the Autococker. The lightened weight will improve the cycle rate of the gun if used with a lightened bolt. There are also some companies that sell a combination cut block/beaver tail (see beaver tail). If you've got an old rectangular back block, it's probably one of the old ones--time to upgrade.



KAPP P-block

less expensive aluminum pins, take a look at the Q-Pin from Bud-U-Like in the U.K. This one does not use ball bearings. Instead it uses a stiff spring detent to hold it in place. It simply pulls out and pushes in. If you have an older stock bolt pin, at least replace it with a "stainless" one.

45-grip frame: Have you seen Bob Long's new 45-grip frame? This one has a machined in "drop forward" and machined-in molded grip. Pro Team Products, Proline, and others make the 45-grip frames that may give your Autococker a better feel. If you know someone that has a 'Cocker with a 45-grip frame, try it before you invest the \$60+ yourself. When you install a new grip-frame expect to have to make some timing adjustments.

Bolt retaining pins: There are a ton of replacement bolt retaining pins available for the Autococker. In addition to the stainless steel and

Beaver tails: A beaver tail is a bolt-on accessory that prevents the user from "slamming" the back block to increase the velocity to "illegal" speeds. There's a ton of them out there and they basically all do the same thing.



There are combination cut block/beaver tails that may give you two upgrades for the price of one. Bob Long sells one of these. The '97 Autococker does come standard with a beaver tail now.

In-line regulator: There are many in-line regulators available that work well with the Autococker. Worr Games Products makes a nice in-line regulator that screws into the vertical-bottle adapter, then runs

to a bottom-line set-up. Air America manufactures the Unireg which is probably the most widely used regulator among 'Cocker owners. Those are the two I would recommend first.

Micro-line hose kit: The Micro-line hose kit is a super-small hose (plastic) kit that includes quick disconnect elbows/fittings. They reduce the overall weight of the gun and allow you to disconnect your hoses without tools (on both ends).

Fittings & quick disconnects: Standard fittings used in the Paintball industry are known as 1/8 N.P.T. (National Pipe Thread). When you change the configuration of your Autococker, you may need to add hoses/fittings, etc. Brass fittings will work okay, but I would recommend stainless steel or nickel plated fittings for all applications. Brass is softer and does not have the impact resistance of steel or nickel. Playing Paintball can be rough on the gun, so think about spending an extra few dollars on better quality fittings. When you do install new fittings, don't over tighten them and use "pipe dope." This lubricates the fittings and will keep them lasting longer.

High Pressure Systems

There are a ton of great air systems available for the Autococker and virtually every other gun on the market. Crossfire, Air America, 32 Degrees, and WDP all make outstanding systems.

Internal Upgrades

There are a gizzillion internal Autococker upgrades, many of them are excellent. What I'll do here is list the internal upgrades and their benefits in the order in which I would recommend upgrading. In other words, I'll put them in order of importance. I'm going to take the liberty of assuming that your Autococker is regulated and that you've added a good feeder, barrel and regulator.

Trigger work: Most Autococker users will tell you that the stock Autococker's trigger has too much "play" and the pull is too stiff and long. You may be able to do some trigger work yourself, but it's tricky. Unless you really know what you're doing, leave it to an airsmith. Danny Love of Bad Boyz Toyz does excellent trigger work on Autocockers as do many others. A good trigger job on the Autococker entails changing the two main springs in the grip frame, polishing the trigger, and shortening the stroke by adding a trigger stop. This will make your trigger-pull lighter, shorter, and make your gun shoot faster. An important point here is that the more you polish and adjust the trigger, the more you'll need to adjust/modify your three-actuating way rod. The short pull will affect your gun's timing. You'll also need an adjustable coupling. See "Autococker Tips" for more on lightening and shortening your 'Cocker's trigger-pull. A good trigger job should also include a vertically mounted screw in the bottom of the trigger guard. This will take out the unnecessary vertical movement in the trigger.

One of the things that many people don't realize about the Autococker's trigger pull is that many things other than the trigger affect it. For instance, the timing rod regulates the portion of the trigger pull when the gun cocks. The timing rod connects the trigger to the three way valve and easily becomes mis-timed if the allen screws loosen. A threaded, adjustable timing rod will help keep your gun timed correctly, especially after modifying your trigger. This is a "must have." Another "must have" is an adjustable cocking or sear lug. This is done by drilling a hole from the top of the gun's main body so that you can access the lug without removing the grip frame. There's much more to it than just drilling a hole though. The sear screw is faced upward so you can adjust it from the top rather than the bottom, which is the way it comes from the factory. Again, this is critical to the gun's trigger-pull and timing. Some players are drilling the side of the 'Cocker's main body so a side set-screw can be accessed. This will help prevent the cocking lug from moving up or down.

There are other trigger related things that can be done to improve the Autocockers rate of fire and comfort. There are several companies that will install a double finger trigger on your Autococker. This requires cutting the trigger guard, which actually makes it easier to access the front grip-frame screw. The double finger trigger allows the user to use two fingers to pull the trigger. This comes in handy after you've shot 500 rounds or so during a game. Also a 45-grip frame give your gun a different feel and in some cases may cause less fatigue to your hands. At least that's what some people have told me. Finally, take a look at some replacement grips for your 'Cocker. The molded ones are super comfortable.

Okay let's summarize: To really shorten and soften your trigger you'll need to change the two springs, add an adjustable timing rod and coupler,

install trigger stops (probably two), polish the trigger and add an adjustable cocking lug. To really maximize your shooting speed you will also need to modify your three-way, your timing rod, and modify your ram. Finally, you should know that the more you shorten or modify your trigger pull, the more likely your gun will need regular maintenance and adjusting.

Bolt: Where do we start? There are a few key things to look for in deciding on which aftermarket bolt to purchase. First you want to buy a lighter bolt than the stock one. This will increase the cycle rate of the gun. There are bolts made from delrin, nylatron, lightened aluminum, titanium, etc. There are venturi bolts, o-ring-less bolts, and pull-pin-less bolts. You name it.



Omega bolt

Omega Products Y2K Bolt
Shocktech SupaFly Bolt
P & P Venturi Bolt
DYE Bolt/Block Combo
TKO 'Cocker Bolt

Here are a few replacement bolts available for the Autococker:
A-n-S Quick Pull venturi bolt

Also check with Pro Team Products/Gun f/x, National Paintball Supply, I & I Sports, Smart Parts, etc. New Autococker bolts come out almost every day.

Spring Kits and Hammer Kits: The Nelson spring kit for the Autococker is one of the most popular because the springs are a wider diameter than most others available. It works the pneumatics less and gets better results than the stock springs. Also look at the Pro Team Products "Pro Shot Kit" and the Smart Parts hammer/spring kits as well. I've found both of these to do a good job. If you have older (smaller diameter) springs in your 'Cocker, they have a tendency to kink when cocked. This problem is fixed with the wider diameter spring kits.



ANS Three-Way

Three way valve: A good three-way valve should be polished and/or manufactured from stainless steel to reduce friction and the amount of force required for it to perform. This is pretty important to your trigger-pull and/or any trigger work you have had done on your gun. You'll see some three-way valves that are polished externally--that's only for show. The part that is polished or honed for

performance is the inner housing. This allows the o-rings on the stem to move smoother. The possible problem here is over-polishing. This can cause the three-way to leak.

Ram: If you are going to upgrade your ram, take a look at the Clippard ram. This one is by far the most used aftermarket ram you'll find anywhere. The Clippard ram is much smaller, lighter, and produces less drag inside the unit than the stock ram. A good quality ram piston rod moves more smoothly creating a less choppy cycle.



Shocktech RAM

Custom Finishes for Your Autococker



Shocktech anodized 'Cocker

Anodizing: Anodizing is an electronic finishing process that can be done only to aluminum. This would include the main body, back block, vertical-bottle adapter, beaver tail, shroud, barrel, older grip-frames, front mounting block, and bolt. Anodizing is a process in which the surface of aluminum is converted into a colored or clear coating by electrolytic oxidation. Unlike most other metal finishing, anodizing is not a coating that is deposited on the surface of metal. It actually grows inward from the surface.

Polishing: Polishing is generally done only to stainless steel since it has a hard durable surface. Although polishing can be done to aluminum, it will usually take on a grey look rather than a gloss silver look like stainless steel.

Powder Coating: Powder Coating is commonly used in the automotive industry due to its tough finish. Powder Coating is a finish that is actually baked onto the surface and is available in hundreds of colors.

Chrome Plating: Chrome plating is a metal that is actually deposited on the surface of another metal. It works best with stainless steel and can be done on your timing rod, trigger, cocking arm, etc.

In addition to changing the finish of your Autococker, there are several companies that will machine your gun to give it a unique look. Predator Marketing, Bad Boyz Toyz, Smart Parts, Bob Long, and others will cut grooves, drill holes, and do other creative things to make your Autococker stand out.

Trouble Shooting the Autococker

Gun sounds weak--paintball barely makes it out the end of the barrel:

First check your bolt. Is the forward hole facing down? If not turn it over and try again. Is the bolt hanging up or binding during the cocking portion of the trigger pull? Check the o-rings on the bolt. They may be damaged from liquid CO2 or "drag." Replace if necessary. Some of the plastic bolts will "swell" if you're shooting CO2, especially if liquid is present in the system. Put the original bolt in the gun and try it again. If that doesn't do it, check your CO2 tank. Is it full and warm? You know the drill--fill the tank and let it warm.

Much less likely is the possibility that your CO2 tank is screwed onto the gun too tightly. Unscrew the tank a half turn or so and try again.

Another thing that will make your Autococker cycle but with almost no power is if the under sear spring slipped out from under the sear. Remove the hand grip screw and give it a quick look, it just might solve your problem.

Autococker makes a burping sound: I'll let Danny Love answer this one.

"During normal wear and tear of your Autococker, the cocking lug may vibrate inward causing it to skip over the sear. You'll need to adjust it to the proper depth. Also check the sear for wear. It may no longer be catching the lug. If you have an adjustable front regulator it may not be turned up enough."

Gun stops firing for no apparent reason: If your gun won't cycle and you know there's air in your tank, you may have broken a ball. There's probably a large chunk of shell wedged between the bolt and the upper chamber of the main body. The ram does not push the bolt back with great force, so you'll need to clean out the main body. Just pull the bolt out and run a squeegee through the body.

Loss of accuracy: The first thing to check here is if you've broken a ball in the breach or barrel. Pull the bolt out and run your pull through squeegee through the body and barrel. Also clean the feed port and dry fire the gun a few times. If there's no ball break it could be that your barrel is older and is starting to wear inside. After a year or so of steady play, some barrels, particularly aluminum barrels, tend to wear and your accuracy suffers. Take the barrel off and take a look inside.

If your barrel is okay, you may want to try a different batch of paintballs. Paintballs have a relatively short shelf life and will quickly get "out-of-round," or the pigment in the paint will settle on one side of the ball. This will kill your gun's accuracy. Also, your "Rock" (or any other adjustable) regulator may be set too high. Try lowering it a bit. Finally if you've done

all of the above things and you still can't hit anything, check your velocity (You really should have done that without my telling you.) If your velocity is above 300 feet per second your accuracy will be poor.

Back block is jerking back and forth during cycling: Check your adjustable regulator, you're pressure is probably too high. You are probably in danger of blowing one of your hoses as well.

Excessive ball breakage: You should not break more than about one ball per 1500 with a properly working Autococker (and user). If you are, something is wrong. Check your paint for flat spots, color fading, etc. Try switching paint brands/batches before you drive yourself crazy figuring out what else it could be. Once you've checked your paint it's time to move on. Check the back block/bolt adjustment. You may need to lengthen the pump rod or cocking adjustment. Check everything that has to do with the gun's timing. If your adjustable regulator is set too high you could be chopping balls as well. Do you have a ball detent? If not you should.

Bolt and block stuck open: You probably have a ball that got pinched by the bolt. Pull and hold the trigger and shake the gun. The ball should fall into the breach and your bolt should come forward. Also check your actuating rod adjustment.

Inconsistent velocity (using CO2): Are you using the right kind of tank-- anti-siphon for bottom-line users, regular tank for vertical-bottle or remote users. Do you have a regulator and/or expansion chamber on your gun? You really can't expect to get consistent velocity using CO2 without either. If you have a user adjustable regulator on your gun, is it cold from liquid CO2. Most velocity inconsistencies are caused by your CO2 changing from liquid to gas and visa versa.

I've heard that the nut in the lower chamber of the main body can come loose causing the velocity to be all over the place. This is the nut that holds the valve in place. This will screw up the path of the hammer and mess up the whole deal.

Inconsistent velocity (high pressure): Put a gauge on the output side of your hps regulator. It may be too high or too low. Also if it is an Air America high pressure system, check the regulator seal inside the regulator. It's probably worn or damaged. Also for best results you should have a second regulator on your Autococker. Set it to about 550-600 psi.

Low velocity: Spring problem--I guarantee it. If you've had your 'Cocker for a while, the spring has probably lost some of it's stiffness. If it's not a spring problem, is your bolt binding?

Velocity drop off: If your velocity drops off during rapid firing, it is probably because your timing is out of adjustment. The hammer is being pulled back before it solidly strikes the valve. Therefore the valve does not release enough CO2 to fire the paintball at the desired velocity.

The hammer will not engage the sear: This is usually caused by a worn out sear. Take a look at the sear, it probably has a flat polished spot where the hammer catches onto it. Change out the sear and you should be ready to go. If that doesn't work, try replacing the under sear spring with a heavier one so the sear "snaps" up quicker on the pull.

Air leaking from the three-way valve: First check the timing rod coupler to see if the set-screws have loosened. If they have, slide the coupler forward and re-tighten. You'll have to play around with it until the timing is right. If that's not the problem, the three-way stem's o-rings may be damaged. If the leak starts off in the rear of the three-way and changes to the front during the trigger pull, your ram o-ring may be leaking. Leave this one to a trained technician or the factory.

Air leaking from the CO2 adapter: This one is probably just a worn or damaged tank o-ring. Replace it and your problems should be gone. If you have an older Autococker, there may be an adjustable pin depressor in your constant air adapter. Take a look--it's adjustable with an allen wrench. You'll have to experiment a bit to get it to the proper depth of your CO2 tank's pin valve.

Note: If there is ever a leak between the tank's neck and the valve, this means that your tank valve is coming off from the valve as you unscrew the tank. Be extremely careful here. This is a dangerous situation. Bleed the air out of the tank and unscrew the tank from the gun at the valve. Do not reinstall the tank on your gun. Bring it to a qualified airsmith to be repaired.

Bob Long's Intimidator



Oakland Assassins

[Introduction](#) -

Various models and versions of the Intimidator

[Downloads & Web Links](#) - Clickable links to download Intimidator manuals and instructions, manufacturers' websites, accessory company websites, reviews sites, and more

[Basic Components](#) - All you need to know about the receiver, grip frame, regulator, bolt, and the rest of the Impulse's components

[Complete Disassembly](#) - Breakdown instructions

[Intimidator Maintenance](#) - Learn how to do basic maintenance on your Timmy

[Tools](#) - A list and description of tools you'll need to work on your Intimidator

[Upgrading](#) - Some suggestions on upgrading your Timmy

[Troubleshooting](#) - Instructions on how to troubleshoot and fix your gun.

[Click HERE to open Bob Long's website](#)

About the Intimidator

Bob Long is a paintball legend. While his friendly humility may prevent him from stating so himself, his successful teams, successful sponsors and successful products have turned his name into a common household phrase within paintball's ranks. From a successful line of Autocockers and accessories, and even one of the first widely distributed compressed air systems ever during the early days of



professional paintball, to BobLong.com and an amazing high performance electronic paintball gun called the Intimidator, players of all skill levels are able to directly benefit from Bob Long's experience in the game and sport of paintball. Along the path to paintball gun success, Bob stopped off at Spyder bodies, custom parts and his first electronic tournament paintball gun called the Defiant in the late 1990's. The Defiant, an upgraded and



ECX Factory Team

altered Bushmaster 2000, enjoyed some success and helped Bob Long and his team win trophies, but a new and more innovative concept quickly appeared on the horizons of Bob Long's drawing board. This concept, which became reality as the twenty-first century dawned, was the Intimidator. A futuristic design and revolutionary features turned heads of players and industry leaders alike as Bob Long's Ironmen began winning using Intimidators. Before long (or after Long) National Paintball Supply, the exclusive

distributor of the Intimidator, was sending them out the door before they hit the warehouse floors, and Bob Long's Intimidator became his latest, greatest success story.

Intimidator Models

2001/Classic Intimidator



Classic Timmy

The original Intimidator, now referred to as the 2001 or Classic model, was so revolutionary in design and radical in shape that many players were taken aback by it. Its vertical feed and lightweight body was milled to reduce weight and threaded for Autococker barrels. Dual rubber ball detents held each ball squarely in the center of the breech and two horizontally mounted regulators (one high pressure and one low pressure) ensured consistent

low-pressure operation. The aluminum bolt field strips easily with no tools via a quick-pull connecting pin and the ray-gun looking grip frame is equipped with both a standard double trigger and drop forward configuration. The trigger frame also contains the LCD screen and buttons that control the paintball gun's settings, including perhaps the most important feature of the Intimidator, its anti-chop eye. The eye, which activates automatically when the Intimidator is switched on, prevents the "Timmy" as it quickly became known, from firing until a paintball completely feeds into the breech. All this, in addition to low-pressure operation, crated one of the most highly accessorized stock tournament paintball guns ever produced. While eyed with suspicion at first due to a few initial teething problems, by the end of its initial run, the 2001/Classic Intimidator had become the beloved paintball gun of choice for many great teams and players worldwide, including Bob Long's Ironmen, Justice, the New England Hurricanes, Kapp Factory, Todd Adamson and Ritchie Maliszweski of Aftershock, and thousand of other players.

Bob Long Ripper

Not long after the release of the 2001 Intimidator, Bob Long and his team were seen playing with a highly customized, wildly milled version known as the Ripper. While in most ways identical to the 2001, the Ripper's body was cut and carved to the maximum for unique looks and minimum weight, and some were equipped with the new SOB circuit board that enabled users to reach remarkable rates of fire. While originally a Bob Long's Ironmen team paintball gun, the Ripper was eventually made available to the public at premium prices.

Ground Zero (GZ) Intimidator



GZ Intimidator

After parting ways with Adrenalin, who sponsored them with Adrenalin Angels during their 2001 season, the Ground Zero family of professional paintball teams, Black and Gold, picked up Intimidators and began to tinker with them when not being impressed by them on the field. Emerging from their tests and examinations was a new Intimidator model, aptly named the GZ, or Ground Zero Intimidator.

The Ground Zero improved and changed the 2001 Intimidator in many ways. The high-pressure regulator was moved from a horizontal position below the barrel with the low-pressure regulator to a more orthodox and familiar vertical mount, more useful as a fore grip. The futuristic drop forward grip frame was removed and replaced with a simply .45 grip frame, and the LCD screen was done away with altogether, in favor of a simpler, fool-proof on/off switch and LED light.

A low-rise vertical feed neck ensured that hoppers would not fall off. A new, milled body and Delrin self-lubricating bolt rounded out what became the paintball gun that won the 2002 Mardi Gras Open, Aruba and Skyball's five-man professional divisions handily, and took fourth place at Atlantic City in the hands of Ground Zero Gold.

2002 Intimidator

After releasing a plethora of upgrades and aftermarket accessories for the 2001 Intimidator, Bob Long responded to requests and comments and released a new model for 2002, aptly named the 2002 Intimidator. The 2002 Intimidator, while relatively identical internally to earlier Intimidator models, is vastly different in form. The twin horizontal regulators of the 2001/Classic were removed in favor of a more orthodox and accepted single horizontal regulator, the low-pressure model. The high-pressure regulator, now a mass-produced Bob Long Torpedo model, threads into a vertical air source adapter beneath the LPR. Gone also is the custom-grip frame and drop forward, replaced by a more familiar .45 design, allowing for greater versatility and lowering the overall profile of the Intimidator approximately one-inch (with a hopper installed). The trigger housed within the new grip frame is lighter, shorter, faster and thinner in design. The .45 frame is also designed to split in two for easier maintenance, construction and dismantling. Plates bolted to both sides of the grip frame, constructed of aluminum and machined to a unique tribal pattern, give each 2002 a custom look.

The aluminum bolt of the 2001, while quality, required care and maintenance; it possessed o-rings critical to efficient and trouble-free performance and required regular greasing. For 2002 a white Delrin self-lubricating model replaced this bolt. Feeding the new bolt was a new, lower-vertical hopper adapter possessing much thicker threads into the receiver for increased durability and upgradability. Most 2002's were shipped with SOB boards early-on, but some later models were shipped with a newer, improved board from Wicked Air Sports, referred to as the "WAS" Equalizer board.

Overall, the 2002 Intimidator is a remarkable piece of tournament paintball equipment that has few, if any equals on the playing field. Compared to its 2001 predecessor, the 2002 is a lighter, smaller, faster, more reliable, more user-friendly paintball gun more than worth its increased price.

Dragon Intimidator

The Intimidator model that has caused the greatest amount of stir in the public compared to the actual amount of pieces sold is the Dragon Intimidator. The Dragon is a mythically milled, incredibly fast limited edition factory custom 2002

Intimidator model. The difference between other Intimidators and the Dragon is the amazingly milled body, cut to resemble a scaly, roaring dragon, right down to the red eye inserts on either side of the receiver behind the barrel and below the low, milled hopper adapter. A .45 frame is standard on the Dragon, as is a Delrin bolt, metal eye covers and spiked trigger guard. Most Dragons also possessed rare, luscious polished two-color fade anodizing patterns.



Dragon Timmy

Lasoya Intimidator



Miami Effect

With Chris Lasoya, one of the best known players in the professional ranks, leaving Avalanche at the end of the 2002 season and creating a Draxxus-sponsored X-Ball franchise team known as Miami Effect, he began shooting an Intimidator. Shortly thereafter, his own Intimidator model based on the 2002 was released. Standard with a clamping low-rise, new trigger guard and standard blade trigger, an Empire two-piece barrel, Tribal eye covers, custom body milling and newly redesigned low pressure regulator, this paintball gun is certain to be one of the best Intimidator models ever.

Intimidator Online Tips and Manuals

<http://www.boblong.com> - Bob Long's Home page

Reviews

www.pbreview.com/products/reviews/350/

www.pbreview.com/products/reviews/1375/

www.pbreview.com/products/reviews/1473/

<http://www.paintballguru.com/reviews/equipment/guns/timmy.htm>

Tech

<http://www.warpig.com/forums/tech/tim/>

<http://pbnation.com/forumdisplay.php?s=abc2cc25606db43832fa0d8e651bd034&forumid=146>

Intimidator Parts and Accessories

<http://www.888paintball.com/browse.asp?plid=PARTS&csid=97392596729806846252281714952554583300796152911261&icid=INTIMIDATOR>

<http://www.800paintball.com/browse.asp?plid=PARTS&csid=77875467750010974873166544579871018962695799166352&icid=INTIMIDATOR>

Basic Components

Receiver



The Intimidator's receiver has changed very little from the 2001/Classic Intimidator through the most recent models. While they vary a great deal in looks, in function they are all extremely similar. The tube at the top of the receiver houses the bolt and is threaded at the front for Autococker barrels. At the top is a threaded opening for a vertical hopper adapter, and small holes are cut in

the upper tube in the breech area for the anti-chop eyes and ball detents. The lower tube contains the ram, within a ram sleeve, and the vertical adapter block that holds the LPR horizontally below the barrel, and the vertical high-pressure regulator. The grip frame bolts onto the bottom of the receiver.

High Pressure Regulator

The high-pressure regulator of the Intimidator takes air from the compressed air tank used to power the marker and regulates that air down to a pressure more manageable, between 200 and 300 psi. The high-pressure regulator provides air to the valve for firing each paintball and to the LPR for actuating the solenoid. The high-pressure regulator of older model Intimidators was placed in a horizontal configuration above the low-pressure regulator and below the barrel. While in later models, a Bob Long Torpedo regulator has become the standard HPR of every Intimidator and is configured vertically for use as a fore grip. Velocity of the Intimidator is also adjusted via the high-pressure regulator.

Low Pressure Regulator

The low-pressure regulator of the Intimidator functions at between 75 and 90 psi, and provides air to the solenoid that is used for re-cocking the marker. It is constructed of aluminum and is housed in a vertical configuration at the front of the receiver, below the barrel.



Grip Frame

The grip frame of the Intimidator is (on Classic/2001 models) a futuristic design, incorporating finger grooves and a small drop forward into its construction, but this grip frame helped make the early Intimidators taller than necessary. The 2002 and GZ Intimidators both incorporated more conventional .45 grip frames into their construction. All of the models (but the GZ Intimidators) have a grip frame house with LCD readout and buttons for operating the paintball gun. The GZ possesses only an LED light. All Intimidators' grip frames house the solenoid, hoses, circuit board and on/off and micro switches that operate and fire the paintball gun. All Intimidators are standard with a double trigger. The grip frame bolts onto the Intimidator's receiver with two screws, one at the rear of the grip frame and one at the front, just in front of the trigger guard. 2002 Intimidator grip frames possess aluminum plates bolted onto either side that have been milled into a "tribal" pattern.

Bolt

The bolt of the Intimidator is one of several models made from either aluminum in early Classic/2001 models or Teflon-impregnated, self-lubricating Delrin in all later models. All stock models possess several o-rings to prevent blowback. The Intimidator's bolt is connected to the ram by a pull pin for easy removal.

Complete Disassembly

Tools Required

Few tools are necessary in order to perform regular maintenance on the entire line of Bob Long Intimidators.

- Ⓒ Dow Corning (Shocker) grease is necessary for lubricating the o-rings on early model bolts, the ram and the o-rings within the high and low pressure regulators
- Ⓒ a complete set of standard Allen keys for velocity adjustment and removal of the grip frame and eye covers
- Ⓒ a set of needle-nosed pliers for removing regulator pistons
- Ⓒ several paper towels or a clean rag.



Maintenance of the Classic Intimidator



Dragon o-ring kit

There are two regulators on the Classic Intimidator. Remove the high-pressure regulator, the top regulator closest to the barrel. It is best to dismantle and work on one regulator at a time so that no parts are confused or reversed. Once the high-pressure regulator is removed from the marker, remove the piston with needle nose pliers; the spring and washer may fall out as well.

When the piston is removed, wipe it clean with a rag or paper towel, and then examine the o-ring on the piston to ensure there are no nicks or burs in the ring itself. If there are no visible imperfections in the ring, apply a small dab of grease and smear it around the o-ring. First reinsert the washer, then the spring, and then the piston with the smaller post inward toward the center of the marker. Screw the regulator back onto the Classic Intimidator. Cleaning and maintenance on the high-pressure regulator is now complete. For the low-pressure regulator follow the same steps.

Once the regulators are complete, move on to the ram and bolt assembly. Start by removing the bolt by pulling the bolt-retaining pin straight up. The bolt should then slide out the back of the marker. Then remove the ram sleeve cap (the silver thumb screw located on the back of the gun). Next, remove the ram. Firmly tap the backside of the marker and the ram should fall out into your hand. Once the ram and bolt assembly are removed, wipe the ram clean with a paper towel and examine the ram bumper, located at the rear of the ram, to make sure that it is not compacted. If the bumper is compacted, replace it with a new one. To replace the bumper, completely remove the old bumper. Sometimes the bumper will break off inside the ram, use a dental pick to clear the remaining pieces. Insert the new bumper; there is no need for any adhesive to secure the bumper to the ram. Once the ram is repaired, apply a small amount of grease to the two o-rings and smear grease to cover the entire o-rings. Reinstall the ram and ram sleeve cap and move on to the bolt. Wipe the residue off the bolt with a cloth or paper towel and apply a small amount of grease to the three o-rings and smear the grease in order to cover the o-rings. Now reinsert the bolt and maintenance of the bolt and ram is completed.

Periodically, to properly maintain the Classic Intimidator and keep it functioning flawlessly, replace the nine-volt battery with a fresh one and clean the marker's anti-chop eyes. In order to change the battery remove the right grip panel with a 1/16 Allen wrench and remove the old battery and replace it with the new battery. To clean the eyes remove both of the eye covers with a 5/64 Allen wrench, carefully so as not to lose the small rubber ball detents, clean the eye covers and set them aside. Carefully remove the anti-chop eyes from both sides of the Intimidator and gently wipe them clean. Before reinstalling the eyes make sure that the small o-rings are still on each of the eyes and install each eye on its respective side. When reinstalling the eyes line up the wires with the pre-cut grooves on each side of the marker and replace the covers with the ball detents already installed in the eye covers.

Maintenance of the 2002 and Later Intimidators

On the 2002 Intimidators there are still two regulators, however they are configured differently than on the Classic Intimidator. Instead of an over/under design, the high-pressure regulator has been relocated to the vertical fore grip position. Remove the high-pressure regulator. Once the regulator is off the marker, remove the piston with needle nose pliers; the spring and washer may fall out as well. When the piston is removed, wipe it clean with a rag or paper towel, and then examine the o-ring on the piston to make sure there are no nicks or burrs on the ring itself. If there are no visible imperfections on the ring, apply a small dab of grease and smear it around the o-ring with a finger. First reinsert the washer, then the spring, and then the piston with the smaller post up toward the center of the marker. Screw the regulator back onto the Intimidator and the high-pressure regulator service is complete.

For the low-pressure regulator follow the same steps as your high-pressure regulator. However, the regulator dismantles differently. Instead of removing the regulator from the marker, remove the regulator end cap. Remove the washer and spring, and then remove the piston using a needle-nose pliers. Once the piston and o-ring are examined and greased, reinstall the regulator internals and replace the end cap.

Once the regulators are complete, move on to the ram and bolt assembly. Start by removing the bolt by pulling the bolt-retaining pin straight up. The bolt should then slide out the back of the marker. Then remove the ram sleeve cap (the silver thumb screw located on the back of the gun). Next, remove the ram. Firmly tap the backside of the marker, and the ram should fall out. Once the ram and bolt are removed, wipe the ram clean with a clean towel and examine the ram bumper, located at the rear of the ram, to make sure that it is not compacted. If the bumper is compacted, replace it with a new one. To replace the bumper, completely remove the old bumper. Sometimes the bumper will break off inside the ram. Use a

dental pick to clear the remaining pieces. Then insert the new bumper. There is no need for any adhesive to secure the bumper to the ram.

Once the ram is repaired, apply a small amount of grease to the two o-rings and smear grease to cover the entire o-ring. Reinstall the ram and ram sleeve cap and move on to the bolt. For the bolt, wipe any residue off the bolt and apply a small amount of grease to the three o-rings and smear the grease to cover the o-rings. Reinsert the bolt and maintenance on the bolt and ram are complete.

Occasionally, to ensure proper operation of a 2002 or Ground Zero Intimidator, the nine-volt battery should be replaced and the anti-chop eyes should be cleaned. In order to change the battery remove the rubber grips, then remove the left side of the clamshell frame. Loosening, (not removing) the main grip frame screws may be necessary to easily remove the clamshell grip. The battery is located in the bottom of the grip. Replace it and reassemble the grip frame.

To clean the anti-chop eyes, remove both of the eye covers with a 5/64 Allen wrench carefully so as not to lose the ball detents, wipe the covers off and set them aside. Carefully remove the anti-chop eyes from both sides of the receiver and wipe them clean. Before reinstalling the eyes ensure that the small o-rings are still on each of the eyes and install each eye on its respective side. When you install the eyes, line up the wires with the pre-cut grooves on each side of the marker and replace the covers with the ball detents already installed in the eye covers.

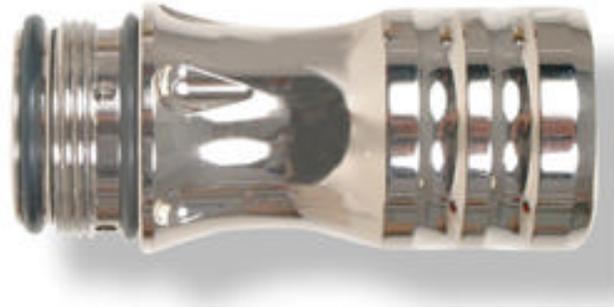
While the Intimidators are fairly reliable markers, there are a few problems that may occur occasionally. One of the noticeable problems with Intimidators is a pressure spike. However if the above maintenance of the Intimidator is complete, the problem should be solved. It is also a good recommendation to have a low pressure gauge, between 0-300 psi, on your low-pressure regulator. This will help an owner notice any problems with spikes in the regulators. The low pressure gauge should read between 70-90 psi. The low-pressure regulator should never exceed 110 psi, if the pressure goes over 100 psi immediately shut off the air source and refer to the regulator maintenance section of this article. Pressures of more than 150 psi could potentially ruin the solenoid. If re-greasing the regulator does not correct the problem of spikes, replace the o-ring on the piston with a new one.

Upgrading

.45 Grip Frame for Classic/2001

Many players find the unorthodox grip frame of the Classic Intimidator either uncomfortable or un-cool. Bob Long has responded by creating and releasing a clamshell .45 grip frame for the 2001/Classic Intimidator. This replacement grip frame, identical to that standard on the 2002 and later Intimidators, splits in two halves for battery replacement, and all the Classic's electronics, LCD display and trigger drop into it with relative ease. The frame is delivered with a stylish trigger guard and "tribal" aluminum grip panels. This frame lowers the overall profile of a Classic/2001 Intimidator by over an inch, and is very comfortable, well contoured to a shooter's hand. See www.boblong.com.

Low Pressure Chamber/Volumizer for Classic/2001



Hybrid Volumizer

While the 2001 Intimidator functions at relatively low pressure out of the box, its performance and overall ergonomics can be improved with the addition of a volumizer/low pressure chamber. This large volumizer replaces the horizontal high-pressure regulator beneath the barrel and above the horizontal low-pressure regulator, lowering the overall pressure of the Classic/2001 by approximately 10 to 15 psi, and provides a greater amount of pre-regulated air to the paintball gun, increasing efficiency and eliminating any shoot down. This upgrade should only be undertaken in conjunction with the purchase of a replacement high-pressure regulator such as a Bob Long Torpedo or Palmer Stabilizer to ensure proper function. The aftermarket high-pressure regulator threads vertically into the air source adapter in front of the trigger guard and will also function as a fore grip. See www.boblong.com.

Metal Eye Covers

While some of the latest models of the Intimidator are delivered standard with aluminum anti-chop eye covers, early 2002 and all 2001/Classic Intimidators were standard with plastic eye covers that were extremely susceptible to cracking or breaking due either to heavy use or repeated removal and replacement for cleaning. Numerous types of aluminum eye covers are available and should be purchased without delay by the owner of any Intimidator still possessing plastic eye covers. Basic models, black

or polished models and tribal or tomahawk designs are available from Bob Long and National Paintball Supply, and are easily installed in minutes by removing the old covers, placing the ball detents in the slots of the new covers, sliding the eye cover screws through the new covers, placing the covers against the side of the receiver carefully to avoid pinching the anti-chop eye wires, and tightening the screws into the receiver. See www.boblong.com

Clamping Rises

The stock rises of all early Intimidator models are relatively basic pieces into which hoppers simply pressed. While they all work, they neither hold on to or let go of any hopper very well, requiring the use of electrical tape, adapters or worse in order to obtain a secure fit. To remedy this, Bob Long has released clamping rises, in black or polished aluminum, for every Intimidator model. These thread into or onto an Intimidator's receiver depending on the model and possess a knurled sleeve that threads onto and tightens or loosens the clamping inner-rise piece to securely hold onto any hopper, from Revolutions to HALO's to eVLution 2's. Available everywhere and relatively inexpensive, this piece greatly increases the user friendliness of any Intimidator and eliminates hopper fall-offs or spinning hoppers that could send a player to the dead box early. See www.boblong.com.

Bolts

While the bolts in the various Intimidator models are now all manufactured from self-lubricating, Teflon-impregnated Delrin, most still possess o-rings that require care and maintenance. Some aftermarket models from Bob Long or Next Level do away with o-rings, seal just as well, and increase velocity and overall efficiency. See www.boblong.com.

Troubleshooting The Intimidator

Chopping Paintballs: Every Intimidator is equipped with anti-chop eyes and should never chop paintballs in the breech, as long as the anti-chop eyes are actually turned on. With older Intimidators, always turn the air on first in order to cock the bolt, switch the marker on, then put paintballs into the Intimidator, to ensure that the anti-chop eyes are not bypassed when the marker is switched on.

Intimidators may encounter paint-related problems when the anti-chop eyes are dirty. Remove the eye covers, carefully pull the eyes out of the receiver and wipe them clean with a rag. Clean the breech, the eye covers and the holes in the receiver that house the eyes, then ensure that the small o-rings are still present on each eye so that they are properly spaced into the breech, then replace the eyes, the eye covers and shoot the marker again.

Ensure that both ball detents are in good working order and are present when shooting any Intimidator. Remove the eye covers and check to be sure that a small rubber ball detent is present in each one. If either are dirty, missing or worn out, clean or replace them, clean the breech and the eye covers and shoot the marker again.

The Intimidator is a high performance paintball gun, requiring a high performance loader and the best quality paintballs in order to perform at its best. Only high quality, fresh paintballs should ever be used with the Intimidator, and no less than a Viewloader 12-volt Revolution with an X-Board should be used to ensure a steady flow of paintballs into the breech for firing.

With some Intimidators, using a HALO or HALO B hopper has led to chopped paintballs because the HALO hoppers have been known to force more than one paintball into the breech at a time. If a HALO hopper is used with an Intimidator, try shooting the marker with some other type of hopper, such as a Viewloader Revolution. If this stops the paint breakage problem, consult a local pro-shop or Boblong.com for improved ball detents enabling Intimidators to function best with HALO hoppers, or switch to a different brand of motorized hopper.

Velocity Spikes: On rare occasions, the Intimidator's regulators may spike and cause velocity related problems. Refer to the maintenance section of this guide for proper regulator care and servicing to ensure the proper function of the high and low-pressure regulators.

Inconsistent Operation: A nearly dead nine-volt battery can lead to many problems with the Intimidator, including inconsistent velocity, failure to re-cock and a non-functional LCD screen. Always ensure that a fresh

nine-volt battery is installed in the Intimidator after approximately ten thousand shots (five cases of paintballs) to ensure consistent operation.

Marker Fires Seconds After Trigger Pull: Dry firing the Intimidator without paintballs can cause some new users to believe their marker is somehow broken, because the Intimidator will not fire when the trigger is pulled, but a short time afterwards. This is because the anti-chop eyes are functioning properly and not reading a ball in the breech, and delaying the bolt from coming forward. If this is happening on the field with paintballs loaded, ensure that the batteries in the hopper are fresh and that a paintball is loading into the breech fully before firing. Check the paintballs for freshness and ensure that the breech, ball detents, feed neck and anti-chop eyes are as clean as possible.

Budget Electronic Blowbacks

By Josh Silverman



In This Chapter of the Airsmith Survival Guide

[Introduction](#) - Various budget semiautomatic models and makes

[Downloads & Web Links](#) - Clickable links to download gun manuals and instructions, manufacturers' websites, accessory company websites, reviews sites, and more.

[Basic Components](#) - All you need to know about the receiver, grip frame, regulator, bolt, and the rest of the gun's components

[Complete Disassembly](#) - Breakdown instructions

[Maintenance](#) - Learn how to do basic maintenance on your Budget Electronic paintgun

[Tools](#) - A list and description of tools you'll need to work on your electronic blowback

[Upgrading](#) - Some suggestions on upgrading your gun

[Troubleshooting](#) - Instructions on how to troubleshoot and fix your electronic blowback

Budget Electronic Blowbacks



One of the newest segments of the high tech paintball gun marketplace is that of the budget priced electronic blowback paintball gun. Nearly every company that manufactures a blowback semiautomatic paintball gun also produces an electronic version of their better models. In contrast to the high priced, high tech electro pneumatic paintball guns like the Angel and Intimidator, with their regulators, rams and fourteen-way valves, the budget electronic paintball guns are electromechanical, simple blowback semiautomatics equipped with electronic grip frames that trip a sear, allowing a hammer to move forward and strike a valve to fire the paintball down the barrel. While capable of extremely high rates of fire, these paintball guns are simple in design, function and performance, and can be cheaply manufactured for sale at as little as ninety-nine dollars.

These low priced, high performance paintball guns bring tournament level performance and high rates of fire to the budget minded masses that finance the entire paintball industry.

Makes and Models



Numerous companies from Taiwan to Alabama manufacture and distribute low priced electronic blowback paintball guns. Dozens of models are sold under many names but most function identically with only minor variances from company to company. Kingman International, the company that first brought semiautomatic paintball guns to the masses with their affordable Spyder, have again taken the lead in a new market and produce and distribute more budget electronic paintball guns than any other company, with no fewer than six models. These range from the one hundred dollar Esprit to the AMG LCD, used by professional paintball team Bad Company. Kingman's electronic paintball guns differ from all others in their class by their use of 9.6-volt rechargeable batteries. Only Kingman's batteries should be used in electronic Spyder models, as regular nine-volt batteries will be unable to provide enough power to keep the paintball gun functioning for extended periods. Kingman budget electronic paintball gun models include the Esprit, Imagine, E-99, Flash, Flash LCD, AMG Classic and AMG LCD.

Kingman also distributes a bolt-on electronic grip frame that can turn any of their standard Spyder blowback semiautomatic paintball guns into electronic paintball guns, called the ESP. While well built and inexpensive, many of Kingman's ESP frames are made of plastic and are therefore extremely susceptible to breaking and cracking during play or if grip frame screws are over tightened.

In response to Kingman's dominance of the budget electronic paintball gun

market, many other companies have begun to manufacture their own budget electronic paintball guns. These include many outstanding models from PMI, called the Piranha E-Force. These excellent paintball guns are well equipped, simple to maintain and are very durable. Worr Game Products, makers of the Autococker, produced the electronic E-Ranger, as their first electronic paintball gun ever. The E-Ranger, one of the best budget electronic paintball guns on the market, is stacked with standard features. M3, a new company to the paintball industry, produces a solid line of budget electronic paintball guns called the Black Dragun that is distributed by all the major companies in the industry, including National Paintball Supply and Paintball Inc.

Even a company so foreign to the paintball gun market as apparel manufacturer JT USA has gotten in on the budget electronic marketplace, with two successful models, the Excellerator 5.0 and 6.0. Both function well and are equipped with a myriad of features that make them very user friendly.

National Paintball Supply also produces a successful line of budget electronic paintball guns, with their line of electronic Rebels. From the electronic vertical Rebel to the electronic Rebel BTB, National's electronic Rebels shoot fast and perform well. National also produces a quality electronic grip frame that bolts onto any Rebel, creating an affordable electronic paintball gun.



Tippmann Response Trigger

Budget Electronic Blowback Downloads

Kingman Schematics Downloads

http://www.kingmanusa.com/section/support/diagram/pdf/spyder_em1.pdf
- Spyder EM-1

http://www.kingmanusa.com/section/support/diagram/pdf/spyder_flash.pdf
- Spyder Flash

http://www.kingmanusa.com/section/support/diagram/pdf/spyder_flash_lcd.pdf - Spyder Flash LCD

http://www.kingmanusa.com/section/support/diagram/pdf/spyder_amg.pdf
- Spyder AMG

http://www.kingmanusa.com/section/support/diagram/pdf/spyder_amg_lcd.pdf - Spyder AMG LCD

http://www.kingmanusa.com/section/support/diagram/pdf/spyder_e99.pdf
- Spyder E99

http://www.kingmanusa.com/section/support/diagram/pdf/spyder_imagine.pdf - Spyder Imagine

http://www.kingmanusa.com/section/support/diagram/pdf/spyder_esprit.pdf - Spyder Espirit

http://www.kingmanusa.com/section/support/diagram/pdf/spyder_electra.pdf - Spyder Electra

http://www.kingmanusa.com/section/support/diagram/pdf/spyder_electra_dx.pdf - Spyder Electra DX

Tech Support Page

<http://www.kingmanusa.com/section/support/maintenance/index.html> - Kingman

<http://worr.com/dl.html> - Worr Game Products

Worr Game Products Manuals

http://www.worr.com/images/Ranger_manual.pdf - Worr Game Products E-Ranger Manual

Tippmann Pneumatics Manuals

<http://www.tippmann.com/support/manual/98eboltmanual.pdf> - E-Bolt Manual

<http://www.tippmann.com/support/manual/a5egripmanual.pdf> - E-Grip Manual

Air Concepts Industries Manuals

<http://www.jam-products.com/sonic.pdf> - Sonic Conversion Manual

Related Websites

<http://www.spyderea.net/> - Spyder Enthusiasts of America

<http://www.spyderzone.net/> - The Spyder Zone

<http://pmipog.hypermart.net/> - Piranha Owner's Group

Manufacturer's Websites

<http://www.32degrees.com> - Rebel Series

<http://www.kingmanusa.com> - Spyder Series

<http://www.pminetwork.com> - Piranha Series

<http://www.worr.com> - Ranger Series

<http://www.jtusa.com> - Excellerator Series

Budget Electronic Blowback Reviews

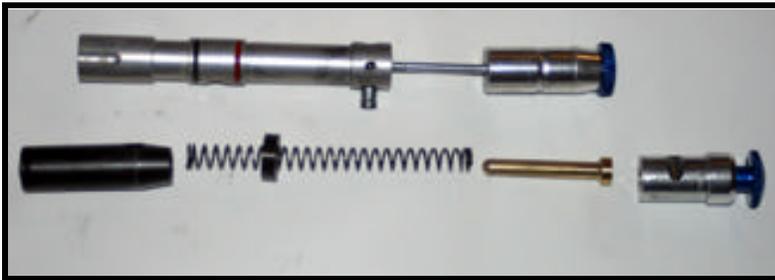
<http://pbreview.com/products/reviews/376/> - Spyder EM-1

<http://pbreview.com/products/reviews/1376/> - Rebel BTB Electronic

Basic Components

Bolt-The bolt in a budget electronic paintball gun is the same as a bolt used in a blowback semiautomatic. Most often made of metal, the bolt possesses two or three o-rings that seal against the inside of the paintball gun's body and help direct air from the valve into the bolt and down the barrel. The bolt and bolt chamber into which paintballs fall should always be kept as clean as possible, as any dirt, broken paintballs or paint in this chamber area can cause the bolt to stick, rendering the paintball gun inoperable. The bolt should be lubricated with paintball gun oil regularly as should the o-rings present on the bolt, to lessen friction as much as possible, lessening the amount of wear on the o-rings. The bolt is connected to the hammer by a connecting pin.

Hammer/Striker



Blowback internals

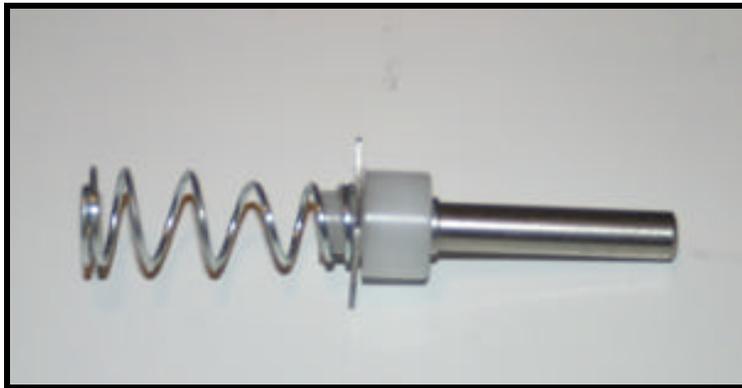
held in place by the sear by a notch at its bottom. At the front of the hammer/striker is the most critical component in any semiautomatic blowback paintball gun, the striker o-ring. This o-ring creates the seal that allows the paintball gun to re-cock after firing. Any damage to this o-ring, or even a lack of lubrication on the o-ring or the hammer/striker itself, will cause problems, including "machine gunning" or a complete failure to re-cock at all. The hammer/striker should be removed, cleaned and oiled after every day of play, and the striker o-ring should be oiled and examined for wear before and after every day of paintball for optimum paintball gun performance, especially considering the amount of wear the increased rate of fire the electronic grip frame exerts on these critical components. Also, the point at the back of the

The hammer or striker is the part of a blowback paintball gun that actually moves forward when the trigger is pulled and impacts the valve, firing the paintball down the barrel. It is connected to the bolt at the top by a connecting pin, and contacts and is



hammer/striker where it is caught and held by the sear during re-cock should be watched closely, as it will begin to round off as the paintball gun is used. Eventually this area will round off to the point where the sear cannot catch it any longer, and the paintball gun will "machine gun" and fail to re-cock. At this point a new hammer/striker will be required for the paintball gun to function properly.

Cup Seal and Valve



Spring and cup seal

A common problem with nearly all blowback paintball guns and another problem compounded by the increased rate of fire blowback paintball guns are able to reach with an electronic grip frame is an air leak down the barrel. A damaged or worn cup seal almost always causes this leak. The cup seal is a small plastic piece found at the tip of the valve stem, that contacts and seals

against the paintball gun's valve, until the hammer/striker impacts the valve stem, opening the valve and firing the paintball gun. The valve spring then pushes the cup seal against the valve, closing it until the paintball gun is fired again. When a cup seal becomes worn or damaged by wear and tear, it may not completely seal against the valve, allowing air to leak around it, up into the chamber and down the barrel. A clean cup seal that is in good repair will prevent such leaks and keep the paintball gun operating at peak efficiency.

Main Spring, Spring Guide and Rear Velocity Adjuster



Main spring, bumper, spring guide, velocity adjuster

The main spring of a blowback electronic paintball gun provides the power that pushes the hammer/striker forward when the trigger is pulled. This spring, held in place by a guide, sits behind the hammer/striker and can also be used to adjust the paintball gun's velocity, in conjunction with a rear

velocity adjuster, present on nearly all blowback electronic paintball guns. Whether adjusted by Allen key or thumb adjuster, turning the adjuster clockwise will put more pressure on the spring, causing it to push the hammer/striker against the valve harder, increasing the paintball gun's velocity. Backing the adjuster out by turning it clockwise will, conversely, lower the velocity of the paintball gun.

When a player uses CO2 as a power source, or in hot summer months, often players will be unable to lower their velocity below the safety limit of three hundred feet per second. To solve this problem, a player should either carry a spring kit containing a lighter, replacement spring, or in extreme conditions, a player can remove the main spring, clip a coil from it, and then replace it. This will lower a blowback paintball gun's velocity up to twenty feet per second per coil clipped. A worn or previously clipped main spring can cause a blowback paintball gun to fail to reach competitive velocities, and may require replacement.

Electronic Grip Frame and Sear



Electronic frame disassembled

The key difference between a regular blowback semiautomatic paintball gun and an electronic blowback paintball gun is the electronic grip frame. The electronic grip frame of an electronic blowback paintball gun contains all the electronics, micro switch, circuit boards and battery that operate the paintball gun. In all cases, the on/off switch that turns the paintball gun on and off also acts as the safety device, in lieu of a mechanical, trigger-block type of safety found on most non-electronic paintball guns. Whether or not the on/off switch is used as a safety, an approved barrel bag or other barrel plug should always be used whenever the paintball gun is being handled.

Removing a grip panel with either a screwdriver or Allen key opens the frame, and allows a user to install or replace the battery. A fresh battery should be installed before each day of play to ensure optimum performance of the paintball gun. While most budget electronic paintball guns utilize a

standard nine volt battery as a power source, Kingman's paintball guns and electronic grip frames require a nine volt-like 9.6-volt rechargeable battery that is delivered with every paintball gun and grip frame sold by Kingman. It is highly recommended that only Kingman's batteries be used

with Kingman's paintball guns and grip frames.

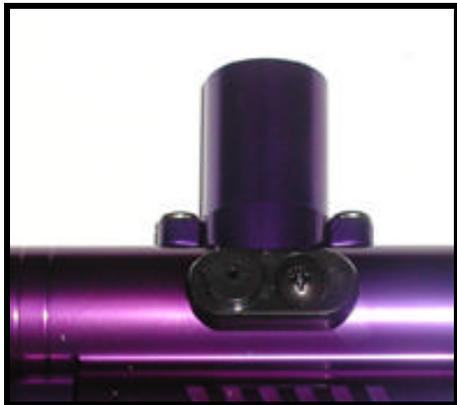


Dip switches

The sear, the piece of hard, edged metal protruding from the top of every electronic grip frame, is the piece that catches the hammer of the paintball gun and holds it until the trigger is pulled. When the trigger is pulled, it activates a micro switch that tells the grip frame to lower the sear, allowing the hammer to slide forward and fire the paintball gun. After firing, the sear raises and catches the hammer when it returns. All this metal-on-metal wear can quickly take the edge off of the sear, rounding it off. A rounded or worn

sear will not always catch the hammer as it returns, causing "machine gunning." Should this be the case, the sear must be replaced.

Ball Detent



Ball Detent

The type of ball detents installed on the numerous models of electronic blowback paintball guns on the market differs. Some, like the M3 and ERanger, possess a spring-loaded ball bearing type of detent, while the Kingman models possess a rubber nubbin detent. Both types perform the same job; holding the chambered paintball in place until it is fired, preventing more than one paintball from feeding at a time. The Autococker style of detents perform well, at least until dirt or paint clog them or cause their springs to rust or become stuck. These types of detents should be removed and cleaned, then oiled after each day of play to

ensure consistent, proper performance and a user should at least consider replacing this type of detent with a new one on a regular basis, two to three times per year.

The rubber nubbin detents used by Kingman and some other manufacturers, while simpler and less susceptible to paint damage, can also wear or fall out after prolonged use. These detents should be cleaned regularly and replaced once every few months to prevent worn detents from allowing double feeding and/or chopped paintballs. These

types of detents are held in place by a cover that, in some cases may be manufactured from plastic. If possible, replacing plastic ball detent covers with metal ones is advisable as plastic detent covers are very prone to cracking if the screw holding them against the paintball gun's body is over tightened.

Tools Required

C Metric and standard Allen key sets - some budget electronic paintball guns, like the Spyder series from Kingman and the M3 Black Dragun are manufactured in Taiwan or elsewhere overseas, and are held together with metric screws, while others are made in the United States, like the PMI Piranha, and require standard Allen key sizes.



C Phillips and flathead screwdrivers - some grip plate and/or other screws are Philips head screws, while most valve retaining screws require a flathead screwdriver to remove

C Dental Pick - for removing o-rings

C Rubber mallet and small punch - for removing body and sear pins

C Paintball gun oil - for lubricating the bolt, hammer/striker, and various o-rings within every budget electronic paintball gun

C Spray bottle of water, squeegee and paper towels - for cleaning the barrel, feed neck, ball detents, bolt, and hammer/striker and body tubes

Complete Disassembly of a Blowback Electronic Paintball Gun

C Ensure that all air sources and hopper are removed and that the chamber is clear of paintballs before beginning work on any paintball gun

C Remove barrel

C Remove body pin (carefully as internals are under spring pressure)



Disassembled "front end"

C Remove end caps and/or velocity adjusting nut

C Slide bolt, main spring, spring guide, bumper and hammer/striker out of main body

C Remove front and rear grip frame screws and disconnect hose from vertical air source adapter, then remove grip frame

C Remove front screw and slide the front air assembly forward and away from the receiver

C Remove cup seal spring, cup seal and valve stem

C Unscrew valve-retaining screw and remove valve

General Maintenance

All budget blowback electronic paintball guns will function well as long as they are kept spotlessly clean, well oiled and o-rings, the hammer/striker, sear and cup seal are replaced regularly. O-rings should be examined for wear after each day of play and replaced if found to be worn or damaged. The hammer/striker and sear, while harder wearing, will also eventually require replacement.

Cleaning



After each day of play, the paintball gun should be completely dismantled. The barrel should be cleaned with warm water and squeegeed dry. The vertical adapter should be cleaned with a spray bottle and dried. The internals should be removed and the bolt o-rings and the striker o-ring should be checked for damage. The bolt and striker should be sprayed clean with water, wiped dry, and oiled.

The grip frame should be removed and the sear should be carefully examined for wear, as it is extremely susceptible to rounding. The battery should be disconnected to ensure longer life, or replaced if it is a standard nine-volt. If the battery is a 9.6-volt Kingman rechargeable, it should be recharged.

The paintball gun should never be stored in the cocked position, as this can compress and weaken the main spring.

The ball detent should be removed and cleaned, and oiled if it is an Autococker type of ball detent.

An o-ring and spring kit should be kept with every budget electronic paintball gun at all times, as these are the most common wear items within them all. All users should also at least consider purchasing several replacement hammer/strikers and sears, because the high rates of fire common to this type of paintball gun places excess wear and tear on these components. These products are available from each paintball gun's respective manufacturer, for nominal fees.

Upgrading



As the budget priced electronic blowback paintball gun market is one of the most highly competitive in paintball, most of the models on the market are very well appointed out of the box. However, nearly all users should consider an aftermarket barrel from such companies as Smart Parts, J&J, Powerlyte, JT, Dye or Lapco, as these are manufactured to much

higher standards of quality than any stock barrel and will therefore increase accuracy a great deal.

Due to the phenomenal rates of fire of which all the budget electronic paintball guns are capable, every user should immediately purchase a motorized hopper, such as a Viewloader Revolution with X-Board, as a standard gravity fed hopper will be completely unable to feed these paintball guns without a great deal of jams, misfires and chopped paintballs in the breech. Along a similar vein, CO2 will likely be unable to keep up with the demands these incredibly fast, often unregulated paintball guns place upon it. Compressed air, though sure to be almost as expensive as the paintball gun itself, is highly recommended to prevent freeze-ups, frozen bottles and valves, and shoot-down (a rapid drop in velocity) during rapid fire.

Troubleshooting

While relatively simple to maintain and operate, budget electronic blowback paintball guns are still capable of breaking down or experiencing problems, most of which are simple to repair.



Check the cup seal for damages

Air Leak Down Barrel: Remove and examine the cup seal. Is it worn out, grooved or shredded? If so, it is allowing air past it as it attempts to seal against the valve, allowing that air to leak out down the barrel. Replace the cup seal with a new one.

Chopping Paintballs: Is the paintball gun being used with a motorized hopper? If not, get one and use it. Budget electronic paintball guns fire so fast that a

motorized hopper is absolutely necessary to avoid chopping paintballs.

Check the ball detent. Is it there at all? If not, replace it. If so, is it clean and well maintained? On some Spyder models, the ball detent is held in place by a plastic cover that can crack or break if the screw holding it in place is over tightened, causing the detent to fail. If the detent cover is cracked, replace it with a metal one if possible.

Are the bolt o-rings intact and well oiled? If not replace them and oil them. Dry or damaged bolt o-rings cause the bolt to drag as it moves, sometimes causing chopped paintballs, low velocity and a lack of efficiency.



Is your tank full?

Is the paintball gun "machine gunning" when the trigger is pulled? If so, check to be sure the air tank is full. If it is empty, fill it. If it is a full CO2 tank, make sure the tank is warm, as a cold CO2 tank will not be able to provide a high enough pressure to re cock the paintball gun consistently, leading to chopped paintballs. If compressed air is used, check the tank's output pressure. A blowback paintball gun requires a minimum of 750psi to re

cock with compressed air. Any lower output pressure will cause "machine gunning" and chopped paintballs.

Check the hammer/striker knob. Is it well lubricated? If not, oil it. A dry hammer/striker will drag and cause re-cocking problems, leading to chopped paintballs. If the hammer/striker is well lubricated, examine the underside where it catches against the sear. Is it sharp and edged, or rounded off? A rounded hammer/striker may not always catch on the sear, leading to "machine gunning" and chopped paintballs. If it is rounded, replace it. If the hammer/striker is in good repair, carefully examine the striker o-ring. Is it there at all? If not, replace it. Often a damaged striker o-ring can disappear altogether, creating an inability to seal and re-cock, leading to chopped paintballs. A dry or otherwise damaged striker



o-ring can cause the same problems. If the striker o-ring is damaged or dry, replace it or oil it.

Check the barrel for a good paint to barrel match. Paint that is too big for the barrel can often be chopped in the breech. If the paint is too tight in the barrel, go to a smaller size paintball or larger size barrel.

Is the paint fresh? The bolt can chop old or brittle paintballs easily. If the paint is old or brittle, get fresh, better paintballs.

Is the battery a new nine-volt or, if the battery is a rechargeable type, is the battery fully charged? If not, replace or recharge the battery.

Low Velocity: Is the air tank full and if CO2 is used, is the CO2 tank warm? A cold or empty CO2 tank may not provide enough pressure to propel paintballs at high velocities. Fill the CO2 tank and allow it to warm up before use. Better yet, get rid of CO2 altogether and use compressed air.

Is the compressed air tank full and set to at least 750psi output pressure? If not, fill the compressed air tank and ensure that its output pressure is at a minimum of 750psi. An empty compressed air tank, or one with a low output pressure, may not be able to propel paintballs at high velocities.

Check the bolt. Is the bolt and bolt o-rings clean and well lubricated? Dry or damaged bolt o-rings can cause drag that lead to low velocity. A non-lubricated bolt can also drag and lead to low velocity. Oil the bolt and bolt o-rings.

Is the barrel clean of water or broken paint? Any obstructions in the barrel can lead to drag on fired paintballs that may cause them to be fired at low

velocities. If the barrel is dirty, squeegee it.

Is the main spring new and strong, or old and worn out? An old, worn out main spring, or one that has been previously clipped to lower the velocity, may not be able to push the hammer/striker against the valve hard enough to obtain high enough velocities. If the main spring is old, worn or clipped, replace it with a new, stronger main spring.

Check the paint to barrel match. Paintballs that are too tight for the barrel may drag down the barrel when fired, leaving the barrel at low velocities. If this is the case, try a different brand of paintballs or different barrel.

High Velocity: If compressed air is used, what is the compressed air tank's output pressure? If it is above 900psi, too much air pressure may be pushing paintballs down the barrel, leading to high velocity. Check the compressed air tank's output pressure and lower it if necessary.

If CO2 is used, could the CO2 tank be allowing liquid CO2 to enter the paintball gun's valve and supercharge it? Is a large cloud of white "snow" coming out of the barrel with each shot? If so, remove the CO2 tank, replace it, and fire the paintball gun up in the air to allow only gaseous CO2 to enter the valve, then chronograph the paintball gun again. If this problem persists, an anti-siphon tube must be installed in the CO2 tank's valve to ensure only gaseous CO2 enters the paintball gun.

Is the velocity adjuster backed out as far as it will go? If so, remove the main spring and clip one coil off of it with a wire cutter. The shorter main spring will lower the paintball gun's velocity. A better, more permanent solution is to purchase a spring kit, and try a lighter spring to lower the velocity.

Failure to Re-Cock (Machine Gunning): Check the CO2 tank. Is it full and warm? An empty or cold CO2 tank cannot provide enough pressure to the paintball gun to consistently re-cock it. Fill the CO2 tank and allow it to warm up.

Check the compressed air tank. Is it full and set to at least 750psi output pressure? As previously mentioned, an empty tank or low output pressure can keep the paintball gun from consistently re-cocking. Fill the compressed air tank and check its output pressure.

Check the hammer/striker. Is the o-ring intact, clean and lubricated? A dry or damaged striker o-ring can prevent the paintball gun from consistently re-cocking. Replace or oil it. Is the hammer/striker well oiled? If not, oil it. Is the bottom of the hammer where it contacts the sear worn out? If so, replace the hammer/striker.

Examine the sear. Is it rounded off at the top? A rounded sear cannot always catch the hammer/striker as it returns from firing the paintball gun, and this can lead to "machine gunning." If the sear is worn, replace it.

Indian Creek Designs Bushmaster Series



In This Chapter of the Airmith Survival Guide

[Introduction](#) - Various models and versions of the Bushmaster

[Downloads & Web Links](#) - Clickable links to download Bushmaster manuals and instructions, manufacturers' websites, accessory company websites, reviews sites, and more

[Basic Components](#) - All you need to know about the receiver, grip frame, regulator, bolt, and the rest of the Bushmaster components

[Complete Disassembly](#) - Breakdown instructions

[B'Master Maintenance](#) - Learn how to do basic maintenance on your Bushmaster

[Tools](#) - A list and description of tools you'll need to work on your Bushmaster

[Upgrading](#) - Some suggestions on upgrading your gun.

[Troubleshooting](#) - Instructions on how to troubleshoot and fix your Bushmaster

Indian Creek Designs Bushmaster Series



Indian Creek Designs of Nampa, Idaho, has been quietly building one of the mainstays of the mid-level electropneumatic paintball gun market since the late 1990's when they revived a name from their past and released the Bushmaster 2000. This simple yet well-constructed paintball gun has soldiered through the new millennium and expanded into an entire line of low priced yet high performance electronic paintball guns including the 2003

Bushmaster, the B2K and new BKO. The BKO is an entirely new concept in that it is a true electropneumatic paintball gun available for well under four hundred dollars.

The 2003 Bushmaster is available with an LCD screen and PDS (Paintball Detection System) anti-chop eye, while other models are equipped with only a simple on/off switch. All the Bushmaster series of paintball guns are extremely light weight, well under three pounds, thanks to the all aluminum construction that also creates an extremely durable piece of paintball equipment. This all aluminum construction also allows for multiple body cuts, fancy milling and availability in numerous colors. All Bushmasters are delivered stock with an easily adjustable high-pressure regulator and a low-pressure regulator that maximizes efficiency and consistency, and a .45 grip frame and double trigger for high rates of fire. A vertical feed mid-rise is standard, making ambidextrous shooting simple and the Delrin bolt is simple and maintenance free. The entire Bushmaster series operates at low pressure out of the box, between 225 and 275psi. Any player in search of an extremely competitive, fast, reliable, light electronic paintball gun priced at well below a thousand dollars should get to know the Bushmaster line.



Planet Eclipse Bushmaster

Most recently, several new, custom models of Bushmaster and BKO have arrived on the market. These include the Murder Inc. Bushmasters and BKO's and Shocktech Bushmaster that helped professional paintball team Aftershock win the 2002 National Professional Paintball League/Paintball Sports Promotions

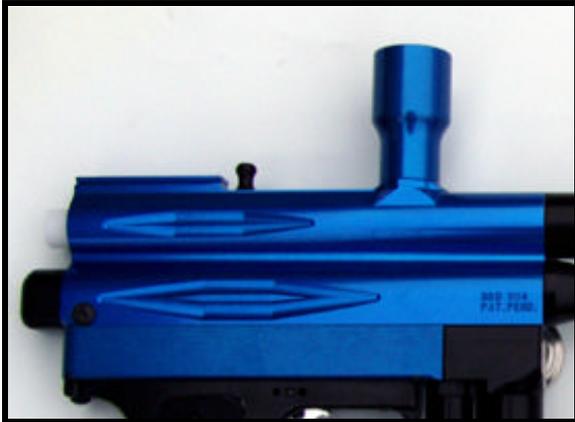
World Cup in Orlando, Florida. The Shocktech Bushmaster has been lusciously machined and anodized, and may be the lightest electronic, tournament-level paintball gun available. It has been threaded for Autococker barrels rather than the standard Bushmaster-exclusive thread and is standard with an Anti-Chop eye system, LCD display, custom tray, pull pin, vertical adapter and semiautomatic-only circuit board.



LCD Bushmaster

Basic Components

Receiver

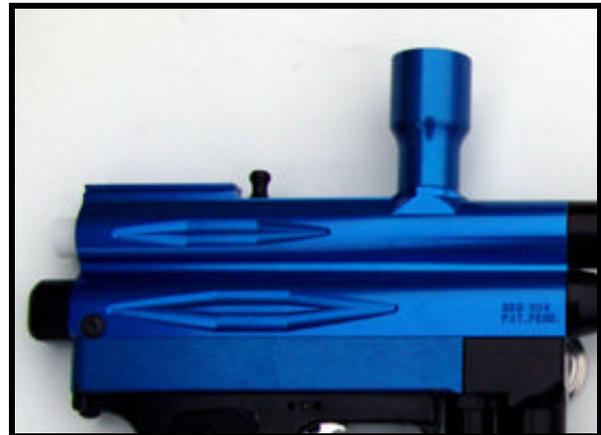


Bushmaster Receiver

Manufactured of high quality, aircraft grade aluminum, the receiver of the Bushmaster family holds the bolt and feed tube at the top chamber and the valve and low-pressure regulator (LPR) at the bottom front. The rear of the lower half of the receiver houses the Bushmaster's ram.

Tray

The tray, connected to the grip frame with two screws and to the bottom of the receiver by four long screws, contains the nine-volt battery, wiring harness and solenoid in Bushmaster models, while in the BKO the nine-volt battery is moved into the grip frame. On LCD-equipped models, the LCD readout is housed at the rear of the tray.



Tray



Bushmaster in action

Grip Frame



Powerlyte's Bushy grip frame

The aluminum, .45-style grip frame of the Bushmaster series of paintball guns contains a double trigger, adjustable for pull length, micro switch activation and in BKO's even the angle at which the trigger pivots. In the BKO the nine-volt battery is housed in the grip along with the circuit board.

High Pressure Regulator (HPR)

Air enters all Bushmasters through an adjustable high-pressure regulator, threaded into the receiver just in front of the trigger guard, intended for use as a fore grip. A large, easily readable gauge shows pressure at which the regulator is operating. Older model Bushmaster high-pressure regulators were slotted for adjustment with a coin or large screwdriver, and the ribbed fore grip also acted as a tournament locking cap that prevented any adjustment on the field. This worked well, but most well used Bushmaster high-pressure regulators became gnarled and scarred due to velocity adjustments with coins or screwdrivers. Newer models of Bushmasters and BKO's are equipped with a new HPR, adjustable via an Allen key at the side of the HPR body.



HPR

Older Bushmaster high-pressure regulators were a one-piece design that required the purchase of an adapter before they could be replaced with any aftermarket regulator such as a Palmer Stabilizer. New Bushmasters and BKO high-pressure regulators are equipped with standard ASA threads so that users may replace them with aftermarket regulators should they desire to do so.

LPR



LPR and HPR

All Bushmasters are sent out of the factory with a standard low-pressure regulator. This regulator controls the amount of air used to by the solenoid to re-cock and operate the bolt and fire the paintball gun. On Bushmaster models the LPR is located at the front of the receiver and is adjustable via a coin, pair of small pliers or a screwdriver depending on how new the model is. On the BKO, the LPR has been moved to a vertical configuration behind the high-pressure regulator and is adjustable with a small Allen key. The LPR operates at approximately 90psi and is simple to adjust, a user need only turn the pressure up until the solenoid leaks, then back the adjuster out until the leak stops, setting the LPR at the proper pressure.

Bolt and Pin

The Bushmaster's bolt is a simple Delrin tube connected to the ram via a knurled metal pin. No lubrication of any kind is recommended for use with the bolt and no metal bolts should ever be used with the Bushmaster. To remove the bolt, simply remove the pin by pulling upwards, and slide the bolt out the rear of the receiver.



Disassembled Bushmaster - top right, bolt

Tools Required



Bushmaster Strap Wrench

The Bushmaster series of paintball guns is extremely simple to use, care for and maintain, and requires few tools in order to properly do so. Dow Corning 33 or Shocker grease is the only lubricant that should be used with the Bushmaster; never use oil of any kind. A complete set of standard Allen keys is required to disassemble the Bushmaster or BKO, and a dental pick will be useful for removing o-rings. A strap wrench or a vice grip and piece of neoprene may be necessary for removing the LPR

assembly from the front of the receiver safely. Several paper towels or a clean rag will be required to clean paint, dirt and residue from the internals, and regulator adjustments on older model Bushmasters may require a large flat head screwdriver. A spray bottle of warm water will be necessary for cleaning.

Complete Disassembly



Disassembly of the Bushmaster series of paintball guns is relatively simple. First, remove any paintballs, the hopper, air source and barrel, then pull the bolt pin upwards and slide the bolt out the rear of the receiver. When disassembling a Bushmaster, unthread the low-pressure regulator assembly from the front of the receiver, providing access to the valve. When disassembling a BKO, unthread the volumizer from the front of the receiver in a similar manner.

Allow the spring and valve stem to drop out of the front of the receiver. Remove the four screws connecting the tray to the receiver and carefully separate the tray and grip frame from the receiver so as not to damage the delicate wiring harness. Unthread the rear plug from the rear of the receiver and slide the ram

assembly out of the receiver. Unthread the high-pressure regulator from the receiver.

Indian Creek Bushmaster Online Tips and Manuals

<http://www.icdpaintball.com/Support/Bushmaster/bushmaster-tuning.htm> - Bushmaster Tuning Guide

<http://www.icdpaintball.com/Support/Bushmaster/bushmaster-triggerpull.htm> - Bushmaster Trigger Adjustments

<http://www.icdpaintball.com/Support/Bushmaster/schematic-bushmaster.htm> - Bushmaster Schematics

<http://www.icdpaintball.com/Support/Bushmaster/bushmaster-Cleaning.htm> - Cleaning the Bushmaster

Bushmaster Reviews

<http://pbreview.com/products/man/17/> - PB Review

<http://www.pbstar.com/high-tech-semi-review/bushmaster-2000/> - PB Star

Owners Groups

<http://obdo.flipty.com/> - Online Bushmaster/Defiant Owners Network

Maintenance

Maintaining the Bushmaster series of paintball guns is extremely simple and requires little time and effort. A well maintained Bushmaster or BKO will function flawlessly for quite some time, while a poorly maintained model will experience almost constant problems.



Squeegee your barrel for a quick cleaning on the field.

marker. Remove the bolt and wipe it clean with a wet rag, then dry it and set it aside. Clean the hopper adapter and breech with a rag and spray bottle of warm water, and ensure that the ball detent is clean and functioning properly. If necessary, remove the ball detent and clean it with a rag and spray bottle of warm water. Run a pull-through squeegee through the entire upper tube of the receiver of the Bushmaster to ensure that no paint or other debris remains there. Run warm water through the barrel, squeegee it dry and replace it and the bolt. Also, replace the nine-volt battery of the Bushmaster or BKO if more than three or four cases of paintballs have been fired. Remove the battery from a Bushmaster by unthreading the two small screws that hold the battery door in place on the right side of the tray. On a BKO, remove the left grip panel to access the battery.

Once every month or two, a complete disassembly, cleaning and lubrication of the Bushmaster or BKO is in order to ensure proper function. Clean the barrel and upper receiver of the Bushmaster or BKO as discussed above. Consult the complete disassembly section of this guide and remove the valve. Clean the valve stem and seat with a damp cloth then spread Dow 33 (Shocker) grease on the valve stem and examine the valve seal for nicks, cuts or other damage. If the valve seal is damaged, replace it. A quick fix for a damaged valve seal is to simply flip it over.

After every day of play, the Bushmaster or BKO should be cleaned thoroughly. To accomplish this, remove the hopper, and ensure that no air source is connected to the



Battery door

Move to the rear of the receiver and unthread the end cap from the Bushmaster, exposing the ram. With a BKO, remove the grip frame and tray, and then remove the front regulator mount. This will provide access to the ram of a BKO. Clean the lower tube of the receiver with a damp rag and wipe the piston and hammer off with a clean, damp rag, then spread Dow 33 grease on the piston to lubricate the ram and reinstall it. If several cases of paintballs have been fired since the last battery replacement, replace the nine-volt battery. In a Bushmaster, do this by removing the two small screws holding the "Bushmaster" jewel in place, as this is the battery door. Drop the old battery out and replace it. In a BKO, remove the left grip panel to locate the battery.



Upgrading

While older model Bushmasters' performance could be greatly improved with the addition of several upgrades, the newer models are extremely high performance directly from the factory and require few upgrades, if any. The stock Bushmaster barrel is extremely large in bore. In fact, the bore is so large that if a user pulls the bolt pin while the Bushmaster is pointed down, the bolt will slide down the barrel and out the front of the marker. A tighter bore barrel from nearly any custom barrel manufacturer such as Custom Products, Smart Parts, Powerlyte, Empire, 32 Degrees, J&J or Dye will immediately improve accuracy over all ranges, and performance over the chronograph.

Grip Frame

While the new standard .45 grip frame of all Bushmasters and the BKO are extremely comfortable to use and high quality, aftermarket frames are available from Powerlyte. The Powerlyte Grip Styx replacement grip frame for the Bushmaster series includes a small drop forward and moves the grip angle forward five degrees to reduce stress on the wrist during firing.

High Pressure Regulators



Eclipse reg mount

The latest stock high-pressure regulators available on the BKO and Bushmaster series are quality regulators that perform much better and adjust much simpler than the older models available on early Bushmasters. Early model regulators were incapable of handling the high output pressures of lower cost compressed air systems, leading to blown solenoids, velocity spikes and other problems. Newer Indian Creek regulators are much better capable of handling high output pressures of modern compressed air systems. Older Bushmasters equipped with older regulators will require an adapter in order to replace the stock regulator with an aftermarket model from a company such as Palmer, but newer models will accept aftermarket high-pressure regulators without any adapters.

Troubleshooting

Leak Down the Barrel

A down the barrel leak with any Bushmaster is most often attributed to a worn, dirty or damaged valve seal. Remove the valve seal with the instructions from the complete disassembly section, examine and replace the seal.

Chopping Paintballs: A worn or dirty ball detent can cause more than one paintball to feed at a time, leading to chops. Ensure that the ball detent is clean and functioning properly. If it is worn or damaged, or stuck, clean or replace it as necessary



- C The Bushmaster series of paintball guns are capable of firing extremely fast. Only motorized loaders such as a Viewloader Revolution, eVLution 2 or HALO should be used with any Bushmaster or BKO.
- C The entire Bushmaster series is a high quality, high performance line of paintball guns capable of high rates of fire. Only the freshest, highest quality paintballs should ever be used with the Bushmaster. Low quality, old paintballs, or paintballs that have been exposed to the elements such as heat or moisture will cause the Bushmaster to chop.
- C The breech, feed neck and PDS (if equipped) area of the Bushmaster line must be as clean as possible in order to ensure proper operation. Should paint or other dirt enter this area, it could cause paintballs to chop during firing. Clean the entire area of the receiver.

LED/LCD Display Functions but Bushmaster Will Not Fire: Change the nine-volt battery

Extremely Erratic Velocity: Change nine-volt battery

Velocity Dropoff:

- C Ensure that the compressed air tank is full.
- C Ensure that output pressure of the compressed air tank is at least 400psi.

- C Ensure that a fresh nine-volt battery is installed, as a dead nine-volt may not provide enough power to ensure proper function of the solenoid.
- C Ensure that the high and low-pressure regulators are clean, greased and functioning properly.

Air Leak from Inside the Tray Area:

- C An over pressurized LPR may cause the solenoid to vent excess pressure to prevent damage. Back the LPR adjustment nut out until the leak stops
- C Check to ensure that the solenoid is tightened against the underside of the receiver
- C Should the solenoid itself be found to be leaking, contact Indian Creek Designs from www.icdpaintball.com as the solenoid itself is extremely susceptible to damage from attempted repairs.

The Matrix

In This Chapter of The Airsmith Survival Guide



Matrix

[Introduction](#) - Various models and versions of the Matrix

[Downloads & Web Links](#) - Clickable links to download Matrix manuals and instructions, manufacturers' websites, accessory company websites, reviews sites, and more

[Basic Components](#) - All you need to know about the receiver, grip frame, regulator, bolt, and the rest of the Matrix components

[Complete Disassembly](#) - Breakdown instructions

[Matrix Maintenance](#) - Learn how to do basic maintenance on your Matrix

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[Troubleshooting](#) - Instructions on how to troubleshoot and fix your Matrix

About the Matrix

Originally designed and distributed through Diablo Direct, the Matrix came into being in 1999. It wasn't until 2000, however, that it made its official debut at the World Cup in October. Since that time the Matrix has undergone several changes, including its recent move to Generation E for manufacturing and distribution.

Since the Cup in 2000, the Matrix's popularity has increased dramatically. To date, several top pro, amateur and numerous novice and rookie have adopted the marker for their own. These include the LA Ironmen, Baltimore Trauma and New York Extreme, just to name a few. And as these teams make the marker their own; each contributes a small improvement to the overall performance of the Matrix. Increased air efficiency and the ability to shoot deeper into a tank are a few performance enhancements of note.

Models

Matrix Standard (LED/Slide Switch)



Baltimore Trauma Matrix

This is the bare bones of Gen E's Matrix. This marker comes complete with the Matrix's spool valve (more on this later), electronic trigger (think WDP's Angel), low pressure operation, double ball detents, and a double trigger.

Now that I've finished reading the sales brochure, let's break down what you actually get with the LED/Slide Switch models. There have been problems with the reliability of the slide switch. While the switch could be replaced it was often an annoyance most people didn't want to deal with. Both the slide switch and the LED versions allow you to adjust the max rate of fire which has a direct impact

on your air efficiency through dip switches located in the grip frame. Overall, the standard Matrix is an excellent jump off point for anyone interested in a Matrix. With the cost a little lower than some of the custom Matrix's and the LCD models, it allows the user to customize the marker to their liking.

www.genenow.com

Matrix LCD

This is Generation E's flagship Matrix marker. While maintaining most of the features of the standard model, the LCD also includes an image/red bolt kit (depending on where you purchase your marker), a low pressure regulator, and of course, the LCD grip frame.

The LCD version boasts the same accuracy, but with increased air efficiency (due to the upgraded bolt kit), the ability to adjust the bolt pressure (dramatically decreasing ball breakage), and several LCD functions that are common with WDP's Angel. Many of the LCD owners claim the best upgrade from the standard Matrix is the fact that the LCD reads "Pow" every time you pull the trigger, but this fact is still highly debated.

Toxic Matrix



Toxic Matrix

Toxic Performance has produced some of the most beautiful markers to have graced the planet and the Toxic Matrix is no exception. The Toxic Matrix takes the LCD Matrix and throws in some gorgeous milling and anodizing, a magnetic trigger frame, and a soon-to-be-released Matrix eye. While limited in numbers these are highly sought after.

KAPP Flame Matrix

Another limited run of the Matrix is a version by KAPP. The Flame Matrix is a LED version with a very unique flame design on the main body. The Flame Matrix comes standard with a KAPP Rhino LPR and several other of their upgrades, including KAPP's adjustable top hat.

Shocktech Matrix

Shocktech was one of the first to produce a custom Matrix. This Matrix includes some very distinctive milling and the favorite silver and black color scheme that suit most of Aftershock's markers. These Matrices include an LCD, and a Shocktech LPR.

Freeflow Matrix

One of the most highly anticipated custom Matrices to be released, the Freeflow Matrix has had its share of problems. Due to manufacturing set backs and shipping issues, the first batches were delayed and delayed and delayed yet again. Unfortunately, when the markers finally arrived there were some issues with the anodizing and quality of the assembly. Professional Paintball, who manufactures the Freeflow, has managed to solve most of these problems as of this writing. The marker itself is a LCD model with several of Freeflow's upgrades, as well as several new upgrades released only for this marker.

The marker is to include an optional magnetic trigger frame, a newer (supposedly more efficient) valve, and a soon to be released eye (which also requires a new board). When these upgrades are released this marker will be a force to be reckoned with.

Demonic Matrix

Roughneck Paintball produces this custom Matrix. Famous for their Demonic Impulses, Demonic Cockers, and their Demonic Stranglers (it's a clamping feed neck for those of you who have been in a cave), Demonic has put their unique performance touches to this Matrix. Coming with a custom Delrin bolt, a custom Matrix eye, a custom Demonic trigger, Demonic milling, and Angel double ball detents, the Demonic Matrix is truly a work of art.

Tequila/Tequila Sunrise Matrix

Described as some of the most beautiful matrices ever to sling paint, these markers were produced by Aardvark Paintball. While these LED versions are not produced any longer, they are however, arguably the most highly sought after. Combining some amazing milling, a Trinity LPR, a windowed main body (yep, watch that bolt work), and a beehive regulator, the Tequila series of Matrices are top quality.



Matrix Downloads and Online Info

Matrix manuals can be found at www.genenow.com

[Click HERE for the Diablo Matrix manual](#)

Matrix Reviews

Reviews of the various custom matrices can be found at www.pbreview.com under the Marker: Electro category.

Matrix Owner's Group

This large group of very knowledgeable and competent individuals can be found at www.matrixowner.com. They can provide any answers that are missing or pertain to the Matrix after this has been published.

Another area where you can find answers to simple questions is the Generation E-Matrix forums located on the Pbnation site (www.pbnation.com)

Basic Components and Maintenance

Okay, here's where the Matrix differs from just about every paintball marker on the market today.

Receiver

The Matrix's receiver is, for the most part, a single tube. There are two separate air chambers that line the outside (you can see the plugs for these when you look directly down the front of the marker), and there are several modifications that are associated with these.

There is a breech knob located directly on the rear of the receiver. This knob is connected to a threaded rod that runs the length of the receiver and secures not only the back plate to the receiver but also keeps your breech attached to the marker.

Maintenance on this part of the marker is fairly straight forward. Keep it clean and wipe it down when needed. To remove the breech, simply unscrew the breech knob at the back of the marker (remember if you do this to hold onto the breech as it will fall off the marker the second the breech rod is unthreaded, especially if a hopper is still attached). By removing the back plate, you can also see where the battery for the Matrix is housed.

The breech on the Matrix is a fairly straight forward affair also. After removing the breech, you can easily clean it with your fingers and a damp rag. Be careful to examine the ball detents, these can easily wear with regular use and often are a simple fix to some paint chopping issues. The ball detents are simply push-in rubber stops that can be purchased from several online stores. There are also several modifications (some standard on the custom markers) that replace these detents with a differently threaded version (Impulse in some cases, and Angel's in others).

The Matrix's feed tube can also be removed from the breech. Like all rounded objects that need to be removed from your markers, be extremely careful while gripping the tube. I prefer a strap wrench that I purchased from a local automotive store, which won't scratch up or gouge your anodizing. The feed tube is threaded for Matrix's only, but luckily most of the companies that provide aftermarket feed tubes already carry a Matrix threaded tube (Chipley's, Works, and Demonic Products are a few of the better ones available). Several of the companies producing Matrices often use red Loctite (the non permanent version) in their feed tube threading, and a little patience and heat may be necessary to remove them.

Grip Frame



Matrix grip frame

The Matrix grip frame will vary from marker to marker, depending on the manufacturer of the Matrix that you own. However, most grip frames are universal in maintenance and removal. The grip frame is what houses most of the electronics in the Matrix family of markers, and therefore, extremely important. The grips that can be used on a Matrix marker are a little limited at this time, but you can use Angel LCD grips in place of the stock grip. One of the problems with using Angel grips concerns the LCD version of the Matrix. The Angel LCD window doesn't match up with the LCD window on the Matrix, but unless this is extremely important to you, it shouldn't be a huge deal.

Removing the grip frame is fairly simple. Simply unscrew the two screws that attach it to the receiver, unplug the connections, and you're done. On a side note, once you remove the grip frame screws you may want to use a little Loctite to keep them steady when you re-attach the grip frame, there have been more than a few reports of these screws working their way loose and falling out.

Maintenance on the grip frame is also simple. Keep it dry, clean and you should have no problems. By remembering that it does house *electronics* and proper care should be taken.

Front Vertical Regulator

The regulator you will have on your Matrix will greatly depend, once again, on the manufacturer of the marker. Maintenance and upkeep of these regulators can usually be found on the manufacturer's websites or through several of the online forums dedicated to the Matrix marker. Keep in mind that the front regulator is the main velocity adjustment on the marker and your consistency is only as good as the regulator you use. As long as we're on the vertical regulator, I think now would be a good time to mention that the ASA on the Matrix doesn't come with a gauge for your input pressure. However, several companies offer ASAs that can be tap and threaded to fit your favorite low pressure gauge (and LCD version ASAs can also be tapped properly).

Matrix Bolt

This is the bread and butter of the marker. This is the part of the marker that will make or break you. This is the part of the marker that everyone claims is impossibly complex to maintain. Are you scared yet? Good, you shouldn't be, its not that difficult. Can you change an o-ring? That's all there is to it.

The Matrix bolt consists of eight different pieces: back plug, rear wall, spacer, sleeve, top hat, bolt, beer can, and the front wall. The only differences between the Aardvark bolt kit/Gen E bolt kit and the stock bolt kit are in the spacer and the beer can. The shape of the beer can is a little different on the stock model, and the stock spacer is cut in half and doesn't have a front and back (whereas the Aardvark/GenE versions do).

Stock Bolt Removal

The first step is to get the bolt assembly out of the gun. You need to remove the breech by unscrewing and removing the knob and the backplate at the back of the gun. Once out you can slide the breech off. This should expose the tip of your bolt. Using whatever method you prefer (dental pick or fingernails), remove the o-ring from the exposed tip at the front of the gun and lay it aside. Now, get your Allen wrench set and unscrew the back plug of the bolt. Once it has been unscrewed far enough you can pull it out and set it aside.

You may be tempted to just pull the bolt out via the skinny plunger that is now exposed. *This is a bad idea.* It can lead to damaged bolts. Instead, push on the tip of the bolt that is exposed at the front of the gun. It will slide the assembly out the back of the gun until you can gently pull it out. Be careful, a little half moon piece will most likely fall out as you do this. Don't lose it! This is the spacer and is important for the gun to work. You do not need to worry about this if you have the Aardvark Bolt Kit, as the spacer is closed and will not fall off.

Once you have the bolt, top hat, sleeve, spacer, back wall, and plug out, you may want to remove the beer can and the front wall as well. There is no easy way to do this. I use my index finger to push it through as far as I can, then pull it out from the rear. Others use a barrel. Whatever you use be gentle.

I usually fully disassemble my bolt to clean and inspect it. If you have the stock bolt, you first need to remove the back wall, then the spacer (if it has not fallen off), then the sleeve. Set these aside. Now, using your dental pick or finger nails, remove the two o-rings on the plunger at the very end of the bolt. Once these are off, you can remove the top hat easily.

Aardvark/GenE Bolt Removal

Taking the Aardvark/GenE bolt apart is a bit simpler. You need not remove any o-rings. Once the bolt is out of the marker, simply slide the back wall off, then slide the spacer off, then remove the sleeve, then the top hat.

Cleaning and Lubing

With the bolt fully apart, you should wipe the old lubricant off with a clean cloth rag. *Do no use paper products.* It is possible, believe it or not, to scratch your bolt with a paper towel. Once you have cleaned the old gunk off, inspect o-rings for visible damage and replace any that are obviously not going to seal.

Next you need to lubricate the bolt. It is important to find a lubricant that will not damage your o-rings. Real gun lubricants will break down your o-rings and should not be used. The best lubricant to use is Matrix Muck



which is made by Aardvark.

Battlelube will also work. You can also make your own "Matrix Muck". Whip three parts Battlelube or Dow 33 grease with one part paintball oil, such as Love Juice, or PMI oil.

When lubing your bolt, remember that more is not better. Too much lube and you will find yourself with consistency problems. Starting from the front wall, you want to put a thin layer on the outer o-ring as well as some on the

inner o-ring. Put this back into your gun. It does not matter which way it is facing. Then take the beer can and put a light coat of lube on both outer o-rings. Insert it into the gun with the longer side pointing towards the front wall. Next take your bolt and spread a light coating of lubricant down the length of the bolt in front of the o-ring. Put a fair amount on the bolt o-ring. Now, make sure the thick area and the little bit thinner area behind the o-ring (where the top hat sits) is lubricated well. This is crucial to reducing bolt stick. It is not important to lubricate the part with the thinner radius. Insert the bolt into your gun, but leave the back half of it sticking out.

Now take your top hat and slide it onto the bolt. Work it up and down the bolt a little bit to spread the lubricant around. Put a thin layer of lube on the outer o-ring of the top hat and push the assembly a bit further into the gun. Next, put your sleeve into the gun, you do not need to lubricate this. Then put your spacer on. The spacer can go either way on the stock bolt, but on the Aardvark bolt it is important to make sure the indentation is facing towards the front of the gun so that it will line up with the top hat. Next take your back wall and put a thin coat of lube around the outer o-ring. Put it on the bolt so that the two half moons are facing the back of the gun. Now, if you had a stock bolt you will need to replace the plunger o-rings. They look very similar in size but there is actually a small difference. The slightly larger, #10, one goes towards the front of the gun and the smaller one, #9 sits on the very end of the bolt at the back of the gun. On the Aardvark/GenE bolts these two o-rings are the same size, #9. Apply a fair amount of lube on each of these o-rings as well. Then, take your back plug and put a small amount of lubricant on the outer o-ring. Push it onto the plunger and into the gun. This will slide the whole assembly forward. Use your Allen wrench to screw it back into place.



Matrix Breach

Once the plug is in all the way, if you have a stock bolt: back it out until it is flush with the back of the marker (about 1/4 turn out). If you have an Aardvark Bolt: back it out 1/4 turn. This is necessary and shouldn't be skipped!

Now take the bolt tip o-ring that you removed at the very beginning and put it back on the front of the bolt. Grab the bolt tip and push it in and out a few times to work the lubricant around inside marker. You may want to apply a small amount of lube to

this last o-ring so that it moves freely inside the breach.

Slide your breech into place and put the back wall and knob back in and you're ready to go!

Trouble Shooting

If your having problems with your marker it is 99 percent of the time going to include one of these issues. (This guide can also be found on MatrixOwner.com)

Solenoid Gasket Leak: This occurs when you gas up and hear a huge leak coming from the middle of the grip/gun. Depending if you have blown your gasket or not, open up the solenoid and push in the 3 black gaskets with your thumb (one gasket on the bottom two on the sides) If you have blown your solenoid, go to www.thematrixcenter.com and they can replace it for you. Also while you're taking off the solenoid, you'll find the long silver piece (the manifold). Unscrew that and you'll see two holes for small o-rings. Make sure those are in place and if they are blown get some new ones and replace them.

Bolt Tip Leak: Either your top hat o-ring is blown (if it is, replace it) or you have not lubed the top hat o-ring up enough. I recommend Matrix muck if you don't have any use white lithium grease and really cake it on.

Trinity Frame Leak: This sounds like it iss coming from the middle of the marker and could possibly be the gasket leak, but isn't. It sounds a lot smaller than a gasket leak and is not half as loud. Unscrew your trinity and replace the two o-rings around the trinity (if there broken) and also make sure the one small o-ring in the back is centered and put a little matrix muck on it (the seat where the small o-ring sits) to make it stay.

Leak from the adjusting knob hole on Trinity: It's the o-ring around the solid middle shiny thing which is the piston. You find it when you unscrew the knob all the way, take out the spring, and look down. It can be removed by forcing a rod through the hole on the opposite side. The o-ring you want to use is the larger in the set of extras that came with your trinity.

When you shoot you feel air coming out of the grip: These air puffs are from the two holes under the black plate of your Matrix. They are the solenoid vents which dump excess air. You will feel them throw air on your hand when you fire. It is perfectly normal.

Gas up your gun, faint hiss, then blows an o-ring: This is due to a creeping beehive (regulator) Your beehive has too much pressure going into it and it either needs to be fixed (Aardvark can do this or the www.thematrixcenter.com can also fix this) or replaced (good replacements: AKA Sidewinder, Mac Dev Gladiator)

My gun is leaking through the ASA: Check the o-ring on the ASA and/or put more Teflon/Blue locktite on the screw going into the gun.

My gun is leaking through the backplate: Check the last o-ring on the back of the bolt. It should be #9, if it leaks from around the bolt replace the large o-ring on the backcap.

Non Leak Problems/Fixes/Recommendations

How do I set my Trinity?: There's a couple of different ways to do this. One is to adjust the trinity to where the marker would cycle when you walk the trigger, then turn the knob 1/4 way in. Another way is to chrono the gun where you want it with the Trinity wide open (on full), then turn it in one quarter or one half in, then shoot, repeating the process, until the chrono goes down. Then turn the regulator out one quarter turn and you're set.

This is the patented Astroglide Technique (from Matrixowner.com)

Velocity is horribly inconsistent like +/- 250 at the chrono: The beer can (check out the link if you don't know what the "beer can is" http://aardvardirect.com/index.php?page=s_boltclean&sflag=1) piece behind the front wall is in backwards and if you don't know what your looking for you could miss it entirely. The bolt will go together and the marker will still function but it will make your life miserable. This is a problem with the bolt kits only (not stock bolts).

My gun is acting weird/leaking and the problem isn't on your guide:

Check out the guide that Master Aardvark made and make sure you have assembled your bolt correctly and have also lubed your bolt well/replaced the battery.

(http://aardvardirect.com/index.php?page=s_boltclean&sflag=1)

What's a good pressure for my regulator?: Most recommend is 150 to 160 psi. Do not run your regulator over 180 psi or you risk damaging your solenoid.

What's a good pressure for my adjustable tank?: I recommend 500 to 600 psi. Remember do not run this too low or you'll be starving your regulator causing crazy drop off.

How do I lube my marker?: Good lubrication is very important in the Matrix and it solves a lot of "mystery" leaks and bolt-stick. Paintball gun oil works well, but does not last very long. Do not use oil made for firearms. Some people use DOW 33 (Shocker grease) but it is a little expensive and kind of sticky. White lithium grease works well, isn't sticky, is cheap and can be found at any hardware store. Grease will last longer

than oil, but the bolt seems to cycle easier with oil.

O-rings are the only contact points, but you should put a little extra grease and oil on all parts as to have a reserve of sorts.

What you should make slippery:

- C Front wall
- C Cylinder
- C Top Hat (very crucial that you lube this well)
- C Bolt (get it *all* lubed up)
- C Back wall
- C Rear plug

Were can I find the dip switch settings and which is the most efficient settings?: The most efficient Dip Switch setting is DUDU (down, up, down, up). This is the fasting setting enabling the bolt to close the fastest saving air. LCD settings can be set using the LCD interface (the lower the setting the faster and more efficient the marker). However, if the settings are too low, it will dramatically increase your chance of a chopped paintball.

That will cover most of the troubles you may have with your Matrix and the fixes for them.

As more and more upgrades are produced for the Matrix, the problems may differ. If you discover you have a problem not listed in this guide or one which you can't solve, you should check with several of the online forums for a solution and advice.

Upgrades for the Matrix

While the amount of Matrix aftermarket parts increase every day, some modifications are for cosmetic reasons and others are for efficiency. The modifications for efficiency are what I would like to focus on in this manual. Cosmetic upgrades are all well and good, but they really don't affect anything on the marker.

Low Pressure Regulator

The LPR is what makes the Matrix great. The models of this marker that come equipped with an LPR are by far more effective at preventing chopped paint. Anyone with a properly adjusted LPR will find it difficult, if not impossible to chop a ball. There are numerous LPRs on the market today, but by and large they all work on the same principle. They lower the bolt pressure. This is a definite for any Matrix owner.

Bolt Modifications/Additions

Increasing the efficiency of the Matrix bolt requires the addition of several aftermarket parts. One of the simplest and easiest is to replace the stock/original bolt spacer with an aftermarket one. Several manufacturers have developed these, which allow you to shoot farther into a tank, thereby increasing the number of shots per tank.

Another improvement has been designed by Shocktech. They've designed a Delrin sleeve which will increase the internal bolt pressure and increase the efficiency of the marker. Another similar modification involves taping your top hat. By taping the top hat on your bolt, you can also increase the internal operating pressure of your marker (increase the pressure, and you can usually increase the shots per tank). The downside of this modification is that it isn't permanent. Luckily, there are adjustable top hats on the market that can do exactly this same modification, but it looks a lot cleaner.

The next modification that's become popular is the Leethal modification. This modification involves re-milling the back wall and the back plug to increase airflow and the air volume in the back chamber. Most Matrix owners swear by this modification.

While most of the modifications are drop-in (can be removed if there's a problem), there's also the option of having some internal milling performed on your marker. The idea behind the modification is to have the dead air chambers opened up for your marker to more easily use the air flow into the bolt. The downside of this modification is that it is permanent and to date there has been some controversy concerning the effectiveness of this modification.

Non Bolt Upgrades

As of the Las Vegas event in 2003, we also have to include the addition of eyes for the Matrix. While some manufacturers have included these new eyes into their markers only (NY Xtreme Matrix), several have promised to produce an eye for the thousands of Matrices already in circulation.

Some of the other notable products that are being introduced in the near future include a Delrin bolt from Demonic Products, a more efficient bolt kit from Pro Paintball (as of this typing, several reports have discovered some dramatic increases in shots per tank), the "M-frame" from Hyper Sport Works (think I-frame for Impulse), magnetic trigger grip frames from Toxic Performance, and several different custom milling options.

Tools Required for the Proper Maintenance of your Matrix

- C Standard Allen keys - For removal of the grip frame screws, bottom line, vert. regulator adjustment.
- C Dental Picks - For removing and replacing o-rings
- C Phillips Screwdriver - For removing the grip panels
- C Dow-33 "Shocker" Grease/BattleLube/Matrix Muck - For lubricating o-rings and the bolt
- C Paper Towels and Spray Bottle of Water - for cleaning bolt, feed tube,
- C Barrel, receiver, breech, and grip frame

32 Degrees Rebel

In This Chapter of The Airsmith Survival Guide



[Introduction](#) -

Various models and versions of the Rebel

[Downloads & Web Links](#) - Clickable links to download Rebel manuals and instructions, manufacturers' websites, accessory company websites, reviews sites, and more.

[Complete Disassembly](#) - Breakdown instructions

[Troubleshooting](#) - Instructions on how to troubleshoot and fix your Rebel

Downloads and Online Tips

<http://www.32degrees.com> - Rebel Home Page

Reviews

www.pbreview.com/products/reviews/407/

www.pbreview.com/products/reviews/534/

<http://paintballbrain.com/reviews/itempage.php?prodid=38>

<http://paintballbrain.com/reviews/itempage.php?prodid=37>

<http://paintballbrain.com/reviews/itempage.php?prodid=36>

<http://paintballbrain.com/reviews/itempage.php?prodid=39>

General Description and Basic Use Instructions

The 32 Degrees Rebel is almost ready to use out of the box. All that is needed is a CO2 tank, paintballs, and a feeder and you are ready use your marker.

Make sure you are wearing paintball approved goggles before you install the air system on the Rebel.

With your goggles on and the safety in the "safe" position, attach your feeder elbow and feeder to the power feed tube. Turn the power feed plug so that it does not allow paintballs to enter the chamber. Screw the low pressure chamber into the front end of the marker, just below the barrel. Screw in your barrel (hand tight). Make sure your marker is not cocked. Install the CO2 tank and your Rebel is ready to fire. Make sure you chronograph your marker before you use it.

Like any other paintgun, maintenance is the key to keeping the Rebel shooting consistently. This chapter is a basic overview of what it takes to keep the Rebel functioning properly.

Lubrication: To keep your Rebel's internal components operating smoothly, place about four drops of oil in your gun's CO2 adapter and dry fire the gun (after removing the barrel). This will spread the oil throughout the gun. After cleaning your Rebel internally, lube the hammer/push strut assembly as well--be careful not to over-oil this area.

Warning: Some petroleum based oils can damage your gun's o-rings. Use only oil manufactured specifically for paintball markers.

If you expect any degree of consistency from your Rebel, you must keep it clean internally and externally. The two external areas you'll need to be the most careful with are the power feed/feed tube and the barrel. If you break a ball in the barrel, you will lose most of your accuracy until you clean it completely. On the field, remove the barrel and run a pull-through squeegee through it. For a more complete cleaning (off the field) you'll need to clean the barrel with warm water or barrel cleaner/treatment and squeegee it until it is dry. A pull-through squeegee can also be used to clean the power feed once the plug is removed.

Internally, inspect the hammer/push strut assembly and clean with warm water if necessary. Always lube the internal parts after cleaning as described above. Check the o-rings on the bolt and striker for wear and replace if necessary. Standard tank o-rings work well on the bolt, but don't use the black rubber type.

To ensure that your Rebel will be operational at the paintball field, there are a few parts and tools you'll need. The most common o-ring in the Rebel is the "tank" o-ring. If you need to change any of these o-rings, you'll probably need an o-ring pick to remove the old ones. You really should keep several of these on hand at all times.

Adjusting the velocity: To adjust the velocity of your Rebel, screw the thumb screw velocity adjuster (found in the bag of parts) into the rear lower hammer plug. The further in you screw the adjuster, the higher your velocity will be. Conversely, the further out the screw is, the lower your velocity will be.

To properly clean and lubricate or troubleshoot the Rebel, you'll need to remove the hammer/push strut, main spring, and two plugs. After de-gassing the gun, make sure the cocking handle is in the forward position.

Remove the pin located in the rear portion of the main body of the marker. To do this, take an allen wrench and carefully push the pin out while holding the hammer plug and velocity adjuster plug. Be carefully, both plugs are under pressure from the main spring.

Pull upward on the cocking handle/connecting pin, keeping in mind that it will be difficult until the marker is broken in. Slide the silver push strut (also known as the bolt) out of the back of the marker. Squeeze the trigger and slide the hammer out of the rear of the lower chamber,

To remove the grip frame unscrew the two allen screws that hold the grip frame to the main body.

To reassemble the gun simply follow the above instructions in reverse order. If you have any trouble cocking the gun, check the connecting pin/cocking handle--you probably need to push it into place. Also when reassembling the Rebel you'll have to push the trigger sear down to slide the striker through the main body. Use a bent tip pick or small allen wrench to do this.

Troubleshooting

Gun does not recock: If you fire the Rebel and it does not recock by itself, remove your air source and disassemble the gun (after you've made sure that your CO2 tank has enough gas). Look for paint chips wedged between the bolt and the breach. Clean the gun, reassemble it and you should be ready to go. Also inspect the push strut/bolt and hammer o-rings for damages. Check to see if the connecting pin is still in place. Sometimes the connecting pin will shift up or down and "lock" the bolt and hammer.

Low velocity: The first thing you'll need to do (after you make sure your CO2 tank is not empty or low) is to check the velocity adjusting screw located in the rear of the hammer plug. To increase the velocity, turn the screw clockwise and re-chronograph the gun. Still shooting low? Check to make sure the gun is clean and lubricated internally. Look for paint shell fragments on or around the bolt/hammer assembly and clean if necessary. Another possible cause of velocity problems with the Rebel is a weak striker spring. You may need to order a stiffer or longer spring. If all else fails, you can place a spacer between the velocity adjusting screw and spring guide.

Air leaking out of the barrel: If air is leaking anywhere, first check the bolt/push strut and hammer o-rings. Most air-leak problems can be fixed by changing one or more of these rings. If the o-rings are okay, you may have a bad cup seal. Contact the manufacturer or your local distributor for a replacement. Finally, low CO2 will sometimes cause a leak down the barrel.

Excessive ball breakage: A point of reference, the Rebel will break around one ball per thousand if the gun is properly tuned and you are using good paint in average weather. Check your paintballs for flat spots, color fading, etc.

If your paint is fine, check the front end of your bolt for scratches or burs. A scratched bolt can "cut" the ball as it pushes it into the barrel. If your bolt is okay, check the ball detent on the side of the gun (held in place by the recoil spring cover--two allen screws). Is it still there? If not you'll need a ball detent to fix the problem. This prevents balls from double feeding or feeding too far into the breach.

Another less common cause of ball breakage in the Rebel is a damaged barrel. The threaded end of the Rebel is manufactured from thin aluminum and could easily be bent or damaged in some way. This could cause the barrel to be slightly out of alignment which will increase your ball breakage.

Inconsistent velocity: Usually this is caused by dumping liquid CO2 into the gun. Simply de-gas the gun and reinstall your CO2 tank or for a quick fix, point the gun up and dry-fire it several times. If this doesn't cure your problems, check to see if your gun is clean and properly lubricated. Look for worn o-rings on the bolt/hammer assembly as well.

High velocity: Are you using a siphon tank? If you are you shouldn't be. If not check the striker spring area. Look for some type of debris that could be wedged between the spring and the velocity adjuster. If that's not it, check the cup seal area. Make sure it is still in order.

Double feeding paintballs: If your Rebel is double feeding, you've probably lost the ball detent. A new one will almost certainly fix the problem. If not, your paint is probably very small.

Double firing on one trigger pull: This can be caused by liquid CO2 in the valve. Follow the above instructions to fix the problem. If your double firing problem is not caused by liquid CO2, inspect and clean the trigger assembly.

The gun fires but does not recock: Most likely your CO2 tank is low. There may be enough pressure to fire the gun at low velocities, but not enough to re-cock the gun. Simply refill the tank and you should be okay. Remember to let the tank warm a bit before you use the gun. This will help prevent liquid CO2 from getting into the gun. Check your connecting pin. Is it still where it's supposed to be?

The gun fires but no paint comes out: Make sure the power feed plug is turned the right direction. Check your paint for swollen balls. This will cause the gun to mis-feed. Never pick paint up off of the ground. It will cause more problems than you could imagine.

Bass Eagle Stingray

In This Chapter of The Airsmith Survival Guide



[Introduction](#) - About the Stingray

[Basic Components](#) - All you need to know about the receiver, grip frame, regulator, bolt, and the rest of the Stingray's components

[Complete Disassembly](#) - Breakdown instructions

[Stingray Maintenance](#) - Learn how to do basic maintenance on your Stingray

[Troubleshooting](#) - Instructions on how to troubleshoot and fix your Stingray

[Click HERE to open Brass Eagle's website](#)

About the Brass Eagle Stingray

The Brass Eagle Stingray was introduced to the paintball industry in 1990 and has been the most successful budget-priced semi-auto ever since. For under \$100 retail, the Stingray features a removable barrel, no-tool takedown, external velocity adjuster, and carbon fiber light weight design. Over the years there have been many companies manufacturing after-market products for the Stingray including barrels, bottom-line set ups, pull-pins, bolts, and just about everything else you could imagine.

The Stingray is a useable first semi-auto and makes an adequate inexpensive field rental once you get to know how to maintain the gun. The Stingray comes standard with a 60-round ammo box, an elbow, instruction manual, and a 12-gram twist change (on some models). More recently, Brass Eagle has introduced the Stingray II which has a few improvements over the original gun. We'll look at those improvements as we go along.

How the Stingray Works

CO2 is supplied to the gun at 550-1200 pounds per square inch (psi). The temperature determines the tank pressure. When the trigger is pulled (with the gun cocked), the hammer hits the valve releasing a CO2 burst while at the same time the bolt pushes a paintball into the barrel. The CO2 burst from the front of the valve stem propels the paintball and the CO2 released from the back of the valve re-cocks the gun.

The velocity adjuster located on the top of the frame is used to increase or decrease the CO2 flow to the valve. This determines the velocity of which the gun will fire.

The Stingray's Basic Components

Barrel Shroud: The barrel shroud is manufactured from a carbon fiber plastic and attaches to the main body via the two barrel push pins. The barrel shroud incorporates a molded-in fixed sight.

Receiver (main body): The receiver is also manufactured from carbon fiber plastic and is extremely durable. The receiver houses both the valve and transfer tube assemblies. The feed port is molded into the receiver.

Grip assembly: The grip assembly attaches to the receiver with two push pins. The grip assembly holds the trigger assembly which includes the sear assembly, trigger spring group, and safety assembly.

Constant-air adapter: The c/a adapter is manufactured from aluminum and is held in place by two pins.

Internals

Bolt: The Stingray's bolt is manufactured from aluminum and is attached to the bolt transfer link with a steel pin. The other end of the transfer link fits into a groove in the hammer. The bolt contains one black rubber o-ring.

Transfer tube: The transfer tube is also manufactured from aluminum and contains two urethane o-rings. The tube rests between the constant air adapter (donkey) and the rear of the valve body.

Valve: (includes valve body, valve washer, valve seal, valve stem, valve seal retainer, and valve seal spring)

Valve body: The valve body is manufactured from hard aluminum and houses the valve assembly. The valve body o-ring (black) sits inside the machined groove on the outside of the unit. The velocity adjusting screw (and spring) threads into the top of the valve body.

Valve assembly: If you unscrew the notched brass valve seal, the valve assembly will be exposed. There are two o-rings on the brass seal and a plastic disk washer on the valve stem. That plastic seal is the most important seal in the gun. When you remove the threaded brass seal, inside the valve housing there will be a brass washer with an o-ring beneath it. Be careful not to lose them, they are in there loose. There is also a spring located in the valve assembly.

Hammer: The hammer is manufactured from stainless steel and contains one rubber o-ring. The hammer assembly includes the hammer spring, hammer spring guide, and hammer bumper. The cocking knob screws into the hammer.

Barrel: The Stingray's barrel is manufactured from aluminum and is located inside the barrel sleeve. To access the barrel remove the two barrel push pins and slide the sleeve out. The barrel will slide out freely at this point.

Disassembly

Never disassemble your paintgun until it is depressurized and unloaded of all paintballs

To disassemble the Stingray down to the valve, first remove the two barrel push pins. Next remove the three push pins located in the main body and unscrew the cocking screw. At this point you should be able to pull the grip frame and the barrel sleeve off. Put the barrel sleeve, barrel, and grip aside.

Slide the valve and tube assembly out of the receiver (main body). Pop the bolt transfer tube and bolt out of the slot in the hammer. Tap the two pins holding the constant air adapter out. Use a punch and rubber mallet if necessary. Pull the transfer tube and c/a adapter out of the valve body. At this point the hammer spring, guide, bumper, and hammer should slide out the back of the aluminum housing (hook an allen wrench in the hammer and slide it out). Now remove the valve assembly from the front of the aluminum housing.

To take it one step further, unscrew the brass valve seal retainer from the valve assembly. Be careful, it's under pressure from a spring. Now you can inspect the flat rigid washer that makes the most important seal in the gun. If it is damaged you will have a slight leak down the barrel of the gun. Sometimes you can just flip it over and re-assemble the gun and the leak will stop. Be careful not to lose the brass washer (valve washer) and o-ring (valve o-ring) located inside the valve assembly housing. When you re-assemble the valve assembly make sure the valve washer goes in after the o-ring and that the beveled edge is facing down. Re-assemble the entire gun in reverse order.

Getting Started

This chapter is written for players that are already familiar with the Stingray.

Always wear paintball approved goggles before pressurizing your paintgun.

The Brass Eagle Stingray operates on gas CO2 only. Although it can take a little liquid from time to time it is really a gas gun. Liquid CO2 will eat at the Stingray's o-rings and cause the gun to leak CO2.

Once you've installed your CO2 tank on the Stingray, attach the plastic elbow to the feed tube and feeder to the elbow. All you need to do now is load some paintballs into the feeder and you're ready to go.

Before you use your Stingray make sure you chronograph it. Most Paintball stores and all fields should have a chronograph for you to use. Although your gun's velocity is factory preset, temperature changes will effect your velocity greatly, possibly causing a dangerous situation. Please be careful. Any time you make velocity adjustments, dry fire the gun a few times to get a more accurate reading. Always leave your gun on safety and use a barrel plug any time you are not in a game situation.

Always let a trained airsmith make modifications to your paintgun.

Cold Weather Performance

Cold weather performance with the Stingray will be inconsistent at best and non-existent at worst. However there are several methods of increasing the usability of the Stingray in the cold. First let's take a look at why your gun doesn't perform at it's best in the cold.

Tank pressure: The Stingray is designed to operate at about 600 psi (pounds per square inch) or more. In the cold temperatures the CO2 tank pressure will drop below 600 psi and will not supply the gun with enough working pressure. That's it in a nutshell.

Even with tank pressures below 600 psi, the Stingray will operate but not as consistently as it would in the warm weather. Rapid firing causes your tank to "chill" and will drop your velocity even lower. A partial solution to this problem is to use a 20-ounce CO2 tank. The larger tank holds more CO2 so it will take longer to chill. Try to space your rapid firing out. Constant firing in the cold will cause you all kinds of problems.

Another way to get better cold weather performance from your Stingray is to use an expansion chamber. Expansion chambers can be expensive though, but there are a few for under \$40 retail. Expansion chambers

provide room for the liquid CO₂ to expand back into gas giving you more consistent working pressures.

In the cold weather paintballs are much more fragile than they are in the warm weather. When the CO₂ burst hits the fragile paintball, the odds of it breaking are much greater. A broken paintball tends to get thick and "gummy" making it difficult to squeegee clean as well. One method of improving this problem is to use a venturi bolt. The venturi bolt hits the paintball with a more even burst of gas and will reduce the stress on the paintball somewhat. Don't look for miracles though.

Maintenance

Like any other paintgun, maintenance is the key to keeping the Stingray shooting consistently. This chapter is a basic overview of what it takes to keep the Stingray functioning properly. Other chapters such as "Trouble Shooting" and "Basic Components" will provide you with more technical maintenance tips as well.

Lubrication: To keep your Stingray's internal components operating smoothly, place about four drops of oil in your gun's CO2 adapter and dry fire the gun (after removing the barrel). This will spread the oil throughout the gun. After cleaning your Stingray internally, place a few drops of oil on the hammer and hammer o-ring. A word about paintgun oils: Some petroleum based oils can damage your gun's o-rings. Unless you know more about this than I do, stay with oils that are made specifically for paintguns. The Stingray's manual suggests using automatic transmission fluid. I did and it seems to work well.

If you expect any degree of consistency from your Stingray you must keep it clean internally and externally. The two external areas you'll need to be the most careful with are the feeder attachment and the barrel. If you break a ball in the barrel, you will lose most of your accuracy until you clean it completely. On the field use a straight squeegee to quickly clean the inner barrel. For a more complete cleaning (off the field) you'll need to clean the barrel with warm water or barrel cleaner/treatment and squeegee it until it is dry. A pull-through squeegee can also be use to clean the breach.

After each outing, disassemble your Stingray and clean the internals with warm water. Use a small paintbrush to get into the smaller areas. Before reassembly, oil the gun as described above.

Upgrading the Stingray

Barrels: The Stingray comes with an aluminum barrel which is moderately accurate at best. However if you're looking to improve your gun's accuracy, you might want to take a look at some of the aftermarket barrels that are available. Here's a look at some of the more popular Stingray barrels:

The Armson Rifled Barrel is manufactured in South Africa and distributed by Pro Team Products of Flagler Beach, Florida. The Armson barrel is the only internally twist-rifled barrel available for the Stingray. The Armson barrel is very accurate but is loud compared to some other barrels. In the cold or damp weather, the Armson barrel is one of the best. The Armson barrel is the only after-market Stingray barrel that fits inside the barrel shroud.

The Smart Parts "Original" drilled barrel is available in twelve and sixteen-inch lengths and a variety of colors and finishes, including "splash." Smart Parts barrels are spiral drilled and are the quietest you'll find anywhere. Like the Armson barrel, all Smart Parts original barrels are manufactured from aircraft grade aluminum and are beautifully finished. The Smart Parts drilled barrel is probably the best warm weather barrel available.

J & J Performance Barrels and Accessories manufactures several Stingray barrels. J & J manufactures both brass and hard chrome barrels with straight rifling, ports, spiral drilling, etc. The hard chrome coating reduces friction between the paintball and the barrel interior which helps stabilize the ball as it travels through the barrel. J & J barrels are easy to squeegee clean and are gas-efficient. J & J also markets barrel sleeves that are available in a variety of "splash" colors and patterns.

There are many third-party manufactured accessories available for the Stingray. Proline Inc., distributed by National Paintball Supply makes more Stingray accessories than anyone. Some of Proline's more popular upgrades for the Stingray include their Commando bottom-line system which allows you to set your CO2 tank in the bottom-line position. This gives you much better sighting ability. They also market a very inexpensive set of replacement pins called pull pins. These five pins have rings (key ring type) attached that allow them to be removed without using tools. Proline also manufactures a fore-grip for the Stingray.

Marker Products sells a venturi bolt for the Stingray. Pro Team Products manufactures a very nice add-on power feed for the Stingray as well. I & I Sports, Exotic Sportz and Proline make parts kits for the Stingray for under \$20 retail.

Trouble Shooting the Stingray

Low Velocity: This is the most common Stingray problem. Check these things in this order. Is your tank full and reasonably warm? Have you checked the velocity adjusting screw? Is it very cold outside? Okay you know all of that stuff, let's try these things. Make sure your Stingray is clean internally and well lubed. Most paintgun problems are fixed by cleaning and oiling.

If those suggestions don't get your velocity up, there are a few modifications you may be able to do yourself. If you don't feel comfortable doing them, bring your Stingray to an experienced airsmith.

The Stingray's hammer stem slides into the valve retainer seal and pushes the valve stem open. This allows a gas burst to be released to fire the ball. If you slightly sand down the outside face of the retainer seal, the hammer stem will push the valve stem open further. This will allow for a larger CO2 burst increasing the velocity in which the ball will be fired. Use a very fine emery cloth and be careful not to sand off more than about a 1/16" of an inch. Another trick you can try to increase your Stingray's velocity is to place a washer or spacer of some type between the hammer bumper and spring guide. This will increase the pressure in which the hammer hits the valve stem.

The valve stem can be polished with a very fine emery cloth as well. This will allow the stem to move more freely also increasing the gas burst. Again, sand very little of the surface. Finally, polish the hammer in the same manner so it moves more smoothly.

Inconsistent velocity: Again the first thing you should do is to make sure that the gun is clean and well lubricated. Check the hammer o-ring. It could be swollen and not moving freely. Also make sure you're not getting liquid CO2 into the gun. This will cause your velocity to be up and down. If liquid is present in the system simply degas the gun, reinstall the tank and you'll be alright. Remember there is almost always liquid in the tank. If you point the gun down at the ground you will pour liquid into the gun.

Air leaking down the barrel: Air leaking down the barrel is almost always caused by a bad seal in the valve assembly. Disassemble the gun down to the inner valve. Inspect the flat white washer for damages and replace if necessary. If you're lucky, you may be able to just flip the washer over for a good seal. It's a good idea to keep a spare washer in your parts box. If you don't have one, you'll be renting a gun for the day.

Excessive ball breakage: If you're breaking more than one ball per nine hundred or so, you probably have some type of problem that needs to be fixed. First is your paint fresh? You might want to try a few different paint batches or brands. Some paint works better than others in each gun. If you don't have a paint problem, disassemble your gun and inspect the front end of the front bolt. Look for nicks or burs and replace the bolt if necessary. Also while you have the gun apart, check to see if the anti-double feed ball is still in place. If not, you may be feeding more than one ball at a time thus cutting the second one.

Is your gun is breaking balls only when you rapid fire? You may have to work on your trigger timing. The Stingray has a long trigger pull that takes some getting used to.

Air leaking out of the constant air adapter: The o-ring on your CO2 tank is probably cut or damaged in some way. Replace the o-ring with a urethane type. When you remove your CO2 tank from the gun, unscrew the tank until you hear the gas escaping and dry fire the gun while removing the tank. This will purge the gun of CO2 without freezing the tank o-ring.

The gun fires but does not recock: Most likely your CO2 tank is low. There is probably enough air in the tank to fire the gun at low velocities, but not enough to re-cock the gun. Simply fill your tank and you should be okay. Remember to let the tank warm a bit before you use the gun. This will help prevent excess liquid CO2 from getting into the gun.

The gun fires but no paint comes out: Check your paint. It might be swollen. This will cause the gun to misfeed. Never pick paint up off of the ground. Without a doubt it will be more trouble than you can imagine. If the paint is not your problem, you've probably got a bad ball break in the barrel. Squeegee the barrel and give it a try.

The paintballs won't feed into the gun: Again, check your paint for swollen or out of round balls. If you are using the standard ammo box type feeder, the balls are probably just jammed in the feeder. Shake the gun a bit and that should help free them up. Don't overfill the feeder.

32 Degrees PT Xtreme

In This Chapter of The Airsmith Survival Guide



The 32 Degrees PT Xtreme is almost ready to use out of the box. All that is needed is a CO2 tank (or 12 gram cartridge), and paintballs, and you are ready use your marker.

With your paintball approved goggles on and the safety in the "safe" position, screw your CO2 tank into the constant air adaptor, or for 12-gram versions, after cocking the gun, lift the 12-gram cartridge quick disconnect latch and install the 12-gram cartridge with the thin end facing the back end of the marker.

Be sure to chronograph the PT Xtreme before using it.

[Click HERE to open the 32 Degrees website](#)

Maintenance

With your goggles on and the Pt Xtreme in the "safe" position, you may now load your CO2 cartridge and paintballs. To load paintballs remove the feed tube plug and slide the small silver spring loaded handle forward (This is located on the left side of the marker if you are looking at it from the rear.)

If you have the bottom-line version of the PT Xtreme you can simply screw the CO2 tank into the bottom-line CO2 tank adapter.

Like any other paintgun, maintenance is the key to keeping the PT Xtreme shooting consistently.

Lubrication: To keep your PT Xtreme's internal components operating smoothly, place about four drops of oil in your gun's CO2 adapter (bottom-line version) and dry fire the gun (after removing the barrel). This will spread the oil throughout the gun. After cleaning your PT Xtreme internally, lube the hammer area as well--be careful not to over-oil this area.

Warning: Some petroleum based oils can damage your gun's o-rings. Use only oil manufactured specifically for paintball markers.

If you expect any degree of consistency from your Rebel LE/Deluxe, you must keep it clean internally and externally.

The two external areas you'll need to be the most careful with are the paint tube and the barrel. If you break a ball in the barrel, you will lose most of your accuracy until you clean it completely. On the field, remove the barrel and run a pull-through squeegee through it. For a more complete cleaning (off the field) you'll need to clean the barrel with warm water or barrel cleaner/treatment and squeegee it until it is dry. A pull-through squeegee can also be used to clean the paint tube once the plug is removed.

Internally, inspect the hammer/cocking handle assembly and clean with warm water if necessary. Always lube the internal parts after cleaning as described above. Check the o-rings on the hammer for wear and replace if necessary. Standard tank o-rings work.

To ensure that your PT Xtreme will be operational at the paintball field, you should always have a spare hammer o-ring on hand.

Adjusting the Velocity: To adjust the velocity of your PT Xtreme, screw the thumb screw velocity adjuster inward. The further in you screw the adjuster, the higher your velocity will be. Conversely, the further out the screw is, the lower your velocity will be.

Troubleshooting

Low velocity: The most obvious cause of low velocity is a low/empty CO2 tank or empty CO2 cartridge. Always check those things first if you are having low velocity problems.

Once you've checked those items take a look at the velocity adjuster. Is it screwed in as far as it can go? If so you may have a weak main spring. You can order replacement springs from your local paintball retailer or through 32 Degrees directly. If all else fails, you can place a spacer between the velocity adjusting screw and spring guide.

Air leaking out of the barrel: If air is leaking anywhere, first check the hammer o-ring. Most air-leak problems can be fixed by changing this o-ring. If the o-ring is okay, you may have a bad gas stop valve. Contact the manufacturer or your local distributor for a replacement. Finally, low CO2 will sometimes cause a leak down the barrel.

Excessive ball breakage: A point of reference, the Pt Xtreme will break around one ball per thousand if the gun is properly tuned and you are using good paint in average weather. Check your paintballs for flat spots, color fading, etc. and replace if necessary.

If your paint is fine, check the front end of your cocking handle/bolt for scratches or burs. A scratched bolt can "cut" the ball as it pushes it into the barrel.

Another less common cause of ball breakage in the PT Xtreme is a damaged barrel.

Inconsistent velocity: Usually this is caused by dumping liquid CO2 into the gun. Simply de-gas the gun and reinstall your CO2 tank or for a quick fix, point the gun up and dry-fire it several times. If this doesn't cure your problems, check to see if your gun is clean and properly lubricated. Look for worn o-rings on the bolt/hammer assembly as well.

High velocity: Are you using a siphon tank on your bottom-line PT Xtreme? If you are you shouldn't be. If not, check the hammer spring area. Look for some type of debris wedged between the spring and the velocity adjuster. If that's not it, check the cup seal area. Make sure it is still in order.

Double feeding paintballs: If your PT Xtreme is double feeding, you've probably lost the ball detent. A new one will almost certainly fix the problem. If not, your paint is probably very small.

Double firing on one trigger pull: This can be caused by liquid CO2 in the

valve. Follow the above instructions to fix the problem. If your double firing problem is not caused by liquid CO₂, inspect and clean the trigger assembly.

Smart Parts Impulse



In This Chapter of the Airsmith Survival Guide

[Introduction](#) - Various models and versions of the Impulse

[Downloads & Web Links](#) - Clickable links to download Impulse manuals and instructions, manufacturers' websites, accessory company websites, reviews sites, and more.

[Basic Components](#) - All you need to know about the receiver, grip frame, regulator, bolt, and the rest of the Impulse's components.

[Complete Disassembly](#) - Breakdown instructions.

[Impulse Maintenance](#) - Learn how to do basic maintenance for your Impulse.

[Tools](#) - A list and description of tools you'll need to work on your Impulse.

[Upgrading](#) - Some suggestions on upgrading your gun.

[Troubleshooting](#) - Instructions on how to troubleshoot and fix your Impulse.

Smart Parts Impulse



Philadelphia American at the MGO

The Impulse, manufactured by [Smart Parts](#) in Pennsylvania, is one of the most remarkable success stories in paintball's history. The simple electropneumatic Impulse, after some small early problems, has become the paintball gun of choice for thousands of paintball players around the world, from the recreational level to the very top level of the sport of paintball.

Such successful paintball teams as Strange, the All Americans, Nasty,

Farside, ESP Eclipse, OBR, Freak Factory, Adrenalin, the All Americans Two and Ground Zero Silver all do their shooting from behind various models of low pressure Impulse. Even individual players like Bea Youngs and stars like Steven Segal play their paintball with the Impulse as well. What could have been an average paintball gun trapped in mediocrity, has instead been upgraded, machined, accessorized and marketed into a champion trophy-winning, thousand dollar price tag-wearing super paintball gun for professional paintball players and movie stars.

Models

Smart Parts' Own



Smart Parts manufactures the standard, base model Impulse and numerous upgraded versions of the standard model, in addition to building most of the custom super-Impulses in-house. The stock Impulse is delivered in a luscious, black polished anodizing finish, while slightly more expensive versions of the stock model are available in equally gorgeous colors or faded anodizing patterns. Smart Parts' own super customized Impulse, the type used by their legendary factory team,

the professional ten-man All Americans, is the Freak Factory, originally conceived by Aaron Stephens. Subtle, lined milling, an extremely low-slung low rise feed adapter, a fast magnetic trigger modification, machined vertical air-through fore grip and a myriad of polished fade anodizing patterns make the Freak Factory a paintball gun capable of competing with, if not out shooting, any paintball gun in the world.

Nasty



One of the newest highly competitive ten-man amateur paintball teams in the world, team Nasty, playing out of northern Maryland, have created and market a truly Nasty version of the Impulse, a highly customized, tournament-ready version known as, of course, the Nasty. The Nasty Impulse is graced with aggressive milling including the word "Nasty" on its lower receiver, that is

available in predominantly bead blasted single colors or two-color fade anodizing. The Nasty's mid-rise hopper adapter and volumizer are milled and anodized to match the receiver. The Nasty is also equipped with a matching anodized Freak barrel, tapeworm solenoid optimizer, matching anodized grip frame, magnetic trigger modification, the option of a vertically mounted, matching anodized Max-Flow regulator, Vision anti-chop eye and a titanium bolt pin. A fully equipped Nasty Impulse is one of the best-equipped, highest performance Impulses on the market, and it carries a price tag of well over one thousand dollars. These can be found at www.paintballwholesalers.com.



Toxic

Toxic Performance, a New York company sponsoring and providing a home for many Ground Zero players, has been manufacturing an outstanding version of the Impulse known, surprisingly, as the Toxic Impulse. The Toxic, used exclusively by Ground Zero Silver during the 2002 season, shoots remarkably fast and is

available with the full gambit of upgrades and accessories, in addition to its edgy body milling, Smart Parts Freak or All American Barrel, and a large choice of bead blasted single colors, and two and three-color fade anodizing patterns. While looking incredible and performing well, its lack of a magnetic trigger may keep its rate of fire below that of other, competitive models in the eyes of some players. The Toxic is available at www.toxicperformance.com

Adrenalin

One of the most radical versions of the Smart Parts Impulse is the model produced and sold by maverick paintball company Adrenalin. Adrenalin, picking up the mantle of the Impulse as a successor to their successful Adrenalin Angel, left average and similar on the drawing board and chose to develop and produce a truly radical departure from the normal Impulse concept. The Adrenalin Impulse, if it can truly still be called an Impulse, has been machined, milled, customized and accessorized almost into its own paintball gun model rather than just another upgraded Impulse. Its fourth-axis milled, fifteen-degree ASA-equipped body is truly unique in the paintball industry and its twisted hopper adapter and fore grip are fitting accessories. Its Vision Eye prevents chopped paintballs almost completely, as it does with every Impulse model, and its short, custom trigger is capable of remarkable rates of fire. The Adrenalin Impulse may be found at www.paintballcity.com, a part of the Adrenalin online paintball network. Watch out for a semi-professional Adrenalin team using these Impulses in 2003.



Strange

Recently the most successful Smart Parts team on the ten-man professional, and lately also in the new X-Ball league, Florida's team Strange, has created their own version of the Impulse. The Strange Impulse, now available for retail sale, possesses an impressively milled, cut and lightened receiver that helps make the Strange Impulse one of the lightest on the market, as does a cut-down Delrin bolt. A volumizer mounted low-pressure regulator is also standard on the bead blasted, two-color fade anodized Strange Impulse.

Eclipse

Eclipse, long known for their ability to create a truly unique, incredibly high-performance and beautiful competitive paintball gun, have crossed the pond from the United Kingdom with their Eclipse Impulse, as used by the members of their successful factory teams, ESP Eclipse (with Jacko of Eclipse himself on the roster) and professional team OBR. The Eclipse rendition of the Impulse is truly European in its interpretation in that it is a departure from the aggressively milled, often over-machined versions conceived in the United States. Many of Eclipse's Impulse accessories are standard on their polish-anodized machine, including their vertical, matching anodized Max Flow regulator and mount, solenoid optimizer (otherwise known as a "Tapeworm" modification) designed to prevent the re-cocking problems common to earlier Impulse models, and a magnetic Blade trigger assembly. The Eclipse Impulse is a true example of

European flair in which something that may be one of the best looking items of its kind may also be one of the best performing, akin to a Jaguar or Range Rover automobile. www.planeteclipse.com has all the details.

Impulse Downloads

- C Download the Original Smart Parts Impulse Manual by [clicking HERE.](#)
- C Download the Impulse Circuit Board Installation Instructions by [clicking HERE.](#)
- C Download the Impulse Vision Eye Instructions by [clicking HERE.](#)

Impulse Version Web Links - Impulse sales, tech, accessories.

[Smart Parts Website](#)

[Eclipse Website](#)

[Adrenalin Website](#)

[Toxic Performance Website](#)

[Paintball Wholesalers Website](#)

Impulse Accessory-Only Web Links - places to buy Impulse accessories.

[Paintball Online](#) - Direct link to Paintball Online's Impulse web section.

[Hypersportworks](#) - Direct link to their frames, Button Kits, Grips, Boards, Valves, etc.

[Push Paintball](#) - Link to their Volumizer, high rise, etc.

Online Impulse Reviews

[PB Review.com's Impulse Reviews](#)

[PB Review.com's Impulse Turbo Reviews](#)

[PB Review.com's Impulse Vision Reviews](#)

[Impulse Owner's Group Impulse Gun and Accessories Reviews](#)

Impulse Owner's Groups

[Impulse Owner's Group](#)

Impulse Forums

[PB Nation's impulse Forums](#)

[OnlyPaintball.com general marker forums](#)

Basic Components



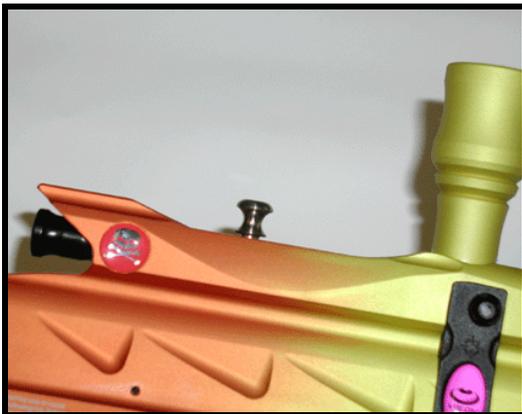
Nasty Impulse receiver

Receiver

The receiver or main body of the Impulse performs many functions. The upper portion of the receiver contains a chamber in which the bolt rides. The upper chamber, as Smart Parts refers to it, should always be kept spotlessly clean to ensure proper operation of the bolt and to ensure the fastest feeding of paintballs. Paintballs feed into the upper chamber of the Impulse body via a vertical feed hopper adapter. The front of the upper chamber is

threaded to accept Impulse specific barrels.

The bottom chamber of the Impulse receiver, referred to as the firing system by Smart Parts, contains the hammer, held in a tube parallel to the bolt in the upper chamber. The hammer moves forward in the lower chamber and strikes the valve, opening it and allowing air to flow up into the bolt and down the barrel, firing the paintball.



Toxic Impulse upper receiver.

Below the hammer on the main body is the solenoid housing. This area contains the solenoid, which sends air to the hammer for firing the gun. This area of the receiver also contains the circuit board, which is the electronic brain of the Impulse. Smart Parts states that the circuit board should never be removed or tampered with in any way. At the rear of the solenoid housing is the on/off switch for newer Impulses equipped with the so-called 2002 "cricket board" due to its chirping noises. On older Impulses, an LED light that is the battery life indicator is housed at the

rear of the solenoid housing. The on/off switch for older Impulses is a plastic sliding switch on the left side of the receiver.

Grip Frame



Nasty Impulse grip frame.

The grip frame of the Smart Parts Impulse is standard with a double trigger, and is also the area of the paintball gun that houses the standard nine-volt battery from which the Impulse draws its power. Two holes threaded for standard bottom line screws are milled into the bottom of the grip frame.

Max Flow Regulator

The Impulse is delivered standard with a horizontal bottom line mounted Smart Parts Max Flow regulator that enables the Impulse to operate at extremely low pressure. Most Impulses function extremely well at

approximately 180psi. The Max-Flow regulator also acts as the main means for adjusting the Impulse's velocity. Turning the Max Flow's end cap clockwise will increase velocity, and only incremental adjustments to the end cap should be necessary in order to change the Impulse's velocity. The Max Flow should never send more than two hundred psi to the Impulse, as this could severely damage the solenoid. When adjusting the Impulse's velocity, a user should pay close attention to the Max Flow's output pressure gauge to ensure that the amount of air pressure being sent to the Impulse never exceed two hundred psi.



Bolt

Naturally the bolt of an Impulse is the piece that moves forward with the hammer when the trigger is pulled, pushing a paintball into the barrel then channeling air down the barrel to fire the paintball. Stock Impulse bolts require lubrication with Dow Corning 33 lubricant, better known as Shocker Grease, that is provided with every Impulse and available for sale from Smart Parts as well. No other lubricant should be used with the Impulse.



Stock Impulse bolt

Some custom Impulses are delivered with aftermarket Delrin self-lubricating bolts. Delrin, as a self-lubricating material, does not require Shocker

grease or any other lubricant at any time, however an owner should follow

the advice of their owner's manual on the recommendation of the company that manufactured their particular brand of Impulse when deciding whether or not to grease their bolt.

Titanium Bolt Pins

Some early Impulses were delivered with bolt pins that could shear off during play due to the rigors of holding the moving bolt to the hammer during rapid firing. Most custom Impulses are now delivered with titanium bolt pins that, due to their lightweight but incredibly strong material, are indestructible. All modern Impulses are free from any problems associated with bolt pins.

Tapeworm/Solenoid Optimizer

Early Impulse models often encountered problems with bolt stick, a situation in which the Impulse would fire but not re-cock. This problem has been solved by the invention and installation of what Smart Parts calls



Tapeworm Kit

a Tapeworm, a solenoid optimizer that increases the amount of air available to the Impulse to re-cock the hammer and bolt after firing. With this modification installed on nearly all new and custom Impulse models, re-cocking problems are a thing of the past.

Vision Eye

Perhaps the most important innovation to the Impulse is

its optional Vision Eye. This system senses the paintball dropping into the breech and will not allow the paintball gun to fire until each ball completely feeds, thereby preventing chopped paintballs. This outstanding anti-chop system makes the Impulse capable of the amazing rates of fire that it reaches.

Complete Disassembly

Always remove all paintballs and air sources from any paintball gun before dismantling for any reason

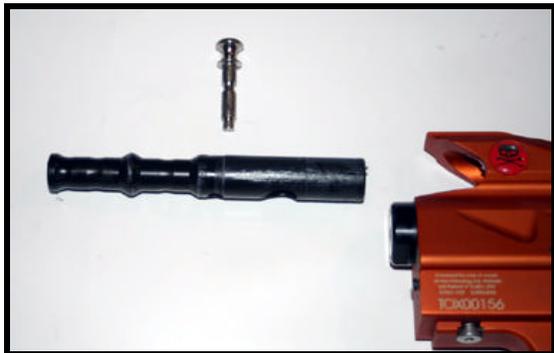
- C Remove barrel
- C Pull bolt pin and slide bolt out of the rear of the top body tube
- C Remove the grip frame screws, lower the grip frame and disconnect the battery from the circuit board.
- C Remove the hammer assembly by removing the rear cap and sliding the hammer assembly out the rear of the receiver.
- C Remove the valve end cap by unscrewing it from the front of the main body.
- C Remove the valve spring and valve stem.

While the Impulse solenoid is connected to the receiver with small screws, Smart Parts highly recommends that the solenoid never be removed, as this could easily strip the threads, requiring the purchase of a new Impulse receiver.

Maintenance

The Impulse must be well maintained in order for it to consistently deliver optimum performance.

After each day of play, remove the bolt by pulling the bolt pin out and sliding the bolt out the rear of the receiver. Remove the barrel and clean it by running warm water through it to remove any paint, and then squeegee it dry. Run a squeegee through the top tube of the Impulse's body to remove any paint or dirt. Run warm water over the Impulse's bolt and examine its o-rings for wear. Replace any damaged or worn o-rings and apply a thin coating of Dow 33 Shocker grease to the entire bolt after drying it.



Next, remove the valve cap and slide the valve spring and valve stem out. Wipe the valve stem off with a damp cloth then apply a thick coat of Dow 33 grease to the entire valve stem, and replace the valve stem, spring and

cap.

Smart Parts states that no thread tape or Teflon tape should ever be used anywhere in conjunction with the Impulse, as this could clog the solenoid and cause damage. Loctite 271 thread sealer should be used instead.

Tools Required

Standard Allen keys - For removal of the grip frame screws, hammer assembly, bottom line and ball detent.

Dental Picks - For removing and replacing o-rings

Phillips Screwdriver - For removing the grip panels and replacing nine-volt batteries

Dow-33 "Shocker" Grease - For lubricating o-rings, the bolt, valve and hammer piston

Paper Towels and Spray Bottle of Water - for cleaning bolt, feed tube, barrel, valve, and hammer and ball detent

Upgrading

While all the custom Impulse "super guns" on the market are upgraded and accessorized to the hilt, and the stock Impulse is an outstanding paintball gun out of the box, upgrades are available and improve both the form and function of the Impulse.

Vertical Max Flow Mount - some players who start with a stock Impulse may desire a better-balanced, more ergonomic paintball gun, achievable by mounting their bottom line Max Flow regulator in a vertical position just in front of the trigger guard. Eclipse manufactures an outstanding vertical Max Flow vertical mount.



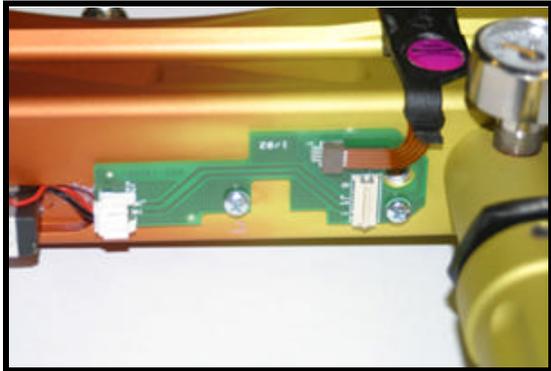
Clamping Rise - the standard vertical hopper adapters used by nearly all Impulses hold some hoppers well and others not so well, as not all hopper necks are the same size. The beset solution to this on the market is the clamping "strangler" feed neck manufactured by Demonic. Demonic's rise twists down around the neck of the hopper and holds it so tightly that there is no chance of it ever falling out.

Magnetic Trigger - the fastest firing Impulses on

the market are those equipped with the magnetic trigger modification. This does away with springs and returns the trigger to the ready position with magnets that push away from one-another. Smart Parts and Eclipse both manufacture excellent magnetic trigger modification kits.

Operation of the 2002 "Cricket" Circuit Board

The newest addition to the design of the Impulse is a new 2002 "cricket" circuit board. This board moves the on/off switch and all anti-chop eye operations to one button at the rear of the receiver. Pushing and holding the button until the board beeps turns the Impulse on in an eye-off mode, allowing the Impulse to fire each time the trigger is pulled. Pushing the button again activates the anti-chop eye, which will prevent the Impulse from firing until a ball is fed into the breech. Pushing and holding the button until the board chirps again will switch the Impulse off.



Toxic Impulse Circuit Board

Also, the dwell adjustments, controlling how long the valve opens and closes sending air to the solenoid, have been moved to push-pots on the right side of the receiver. Inserting a flat-ended tool into the front pot and

pushing once will open the valve one quarter of a millisecond longer, and doing the same to the rear port will close the valve one-quarter millisecond sooner. Dwell is pre-set at the factory and should not require adjusting. Any adjustments to the dwell can affect the Impulse's velocity and should any adjustments be made, the Impulse should be chronographed before allowed onto the field.

Troubleshooting

The Impulse, if regularly cleaned and greased according to Smart Parts instructions or this guide, is an extremely trouble-free high performance tournament paintball gun. However, some problems, most of them simple, can arise with the Impulse, as can occur with any paintball gun.



Bolt Sticking Forward

- C Is Impulse an older model, and if so is a "Tapeworm" Solenoid Optimizer installed? If not, Smart Parts and Eclipse manufacture quality products of this type that will cure almost all bolt stick.
- C Chopped paint may be causing drag, wedging the bolt forward. Pull bolt pin, examine bolt and upper receiver tube for paint, shell or dirt. Clean and grease the bolt and squeegee the upper receiver tube.
- C Is bolt pin connected to the hammer? A bolt pin not properly connected to the hammer will cause the bolt to move forward when the Impulse is fired, but not re-cock. Pull bolt pin, remove bolt, ensure that hole in bolt is facing down, reinsert bolt and bolt pin.

Impulse Fails to Fire When Trigger Pulled

- C Is the Impulse turned on? Check for blinking light at rear of receiver.
- C Is battery dead? Replace battery.
- C The Vision Eye may be preventing the paintball gun from firing. Is the hopper feeding paintballs into the breech? Ensure that hopper is turned on and that hopper has fresh batteries. Use only motorized hoppers with the Impulse.
- C Chopped paint may be preventing paintballs from dropping into the breech, causing the Vision Eye to prevent the Impulse from firing. Clean feed neck and breech.

Chopping Paintballs

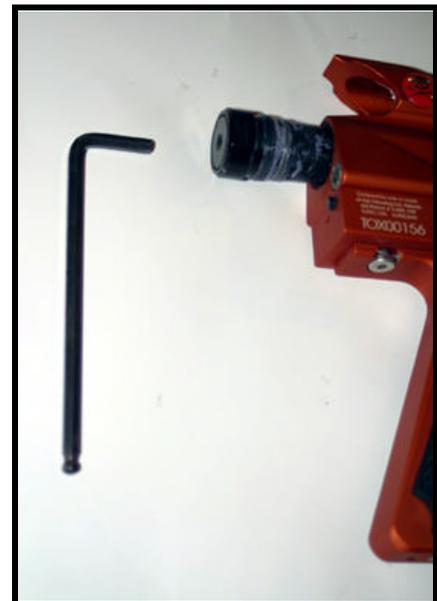
- C Is Impulse equipped with Vision Eye? If so, turn Vision Eye on.
- C If Impulse is not equipped with Vision Eye, reduce rate of fire, try fresher, thicker shelled paintballs, and use only a motorized hopper with fresh batteries.
- C Ball detents may be worn or clogged with paint. Check ball detents for existence and function. Replace and/or clean.

Air Leak Down Barrel

- C Valve o-rings may be worn or damaged. Remove valve, check o-rings for quality and lubrication. Replace damaged o-rings, grease entire valve and replace.
- C Valve may be dry. Remove, lubricate with Dow-33 Shocker grease and replace.

Impulse Fires but Paintballs Barely Leave Barrel

- C Bolt may be upside down. Remove bolt pin and bolt, ensure that hole in bolt is facing down, replace.
- C Is air tank empty? Re-fill air tank.
- C Check regulator gauge, is at least 150psi entering the Impulse?
- C Dwell may be set too low. Increase dwell setting.



Contacts

Smart Parts Tech Support

tech@smartparts.com

Tech Support phone # 724-539-2660



Philly Americans at the 2003 MGO

Tippmann Model 98



In This Chapter of The Airsmith Survival Guide

[Introduction](#) - About the Model 98

[How The 98 Works](#) - All you need to know about the receiver, grip frame, regulator, bolt, and the rest of the 98's components

[Complete Disassembly](#) - Breakdown instructions

[M 98 Maintenance](#) - Learn how to do basic maintenance on your Model 98

[Model 98 O & A](#) - Instructions on how to troubleshoot and fix your 98

First Things First

It is super important to wear your paintball goggles whenever you work on any gun and always remove the power source before doing anything. Got it?

You can't really learn how to maintain the Model 98 if you don't know how it works. So here goes. The Tippmann Model 98 is an open bolt, blow-back semi-automatic paintgun, for those of you that need to know the little stuff. CO2 or high pressure air is supplied to the gun at 500-1200 psi (pounds per square inch) depending on the temperature and other assorted things you'll learn about later (the pressure can actually be higher or lower in extreme conditions). When the trigger is pulled, the sear releases the bolt (rear bolt). The drive spring pushes the bolt forward where it hits the valve. The valve opens causing the CO2 to flow from both the front and rear of the valve body. The CO2 burst from the front of the valve flows through the power tube and bolt propelling the paintball that rests in the breach. The CO2 that flows from the rear of the valve is used to re-cock the gun.

Complete Model 98 Disassembly



The Model 98's main body is manufactured from cast aluminum and comes apart in two halves, leaving the internals in tact.

Using an 1/8" allen wrench, remove the five allen screws that hold the two-piece body together. Next use a 5/16" allen wrench to remove the four hand grip screws in the .45 grip frame. Under the rubber grips you'll find another allen screw that needs to be removed.

You can now pull the two sides of the receiver (main body) apart. Be careful--the end cap is under pressure from the drive spring and if it comes out of its cavity, you can lose the spring pretty easily.

At this point you should have six receiver screws, four hand grip screws, the end cap, drive spring, and guide detached from the Model 98. You should also have the front sight, sight spring, and rubber ball latch. You can now slide the front bolt off of the power tube.

There are two allen screws holding the power tube/valve assembly to the right side of the gun (looking from the back end to the front). Removing the two power tube mounting screws will allow the power tube assembly to be separated from the receiver.

You'll need a 7/16" wrench to remove the steel braid hose from the power tube/valve assembly. This must be "Loctited" when you reinstall it. Using a 1/4" wooden dowel rod down the power tube, gently push the valve assembly out of the back end of the power tube assembly. Looking at the front end of the valve assembly you will see the brass valve plug. The plug is held in place by a snap ring. This can be carefully removed by pulling it out with a needle-nose pliers. With the snap ring removed, push on the valve pin and the valve assembly should come out.

To disassemble the trigger assembly pull upward on the trigger spring and slide the trigger assembly off of the pin. Next disconnect the sear spring and slide the sear off of the sear pin. This is literally as far as the Model 98 can be disassembled.

How the Model 98 Works Best

Like the Tippmann 68 Carbine, the Model 98 functions best on "gas" CO2. Occasional "liquid" in the valve won't do any harm though. High pressure gas (compressed air/nitrogen) can be used with the Model 98 as well. Getting started with the Model 98 is a breeze. Simply screw in your gas source, slide your hopper into the feed elbow (and tighten the locking screw), and you're ready to chronograph the gun. Make sure you are wearing Paintball approved goggles at all times.

Be sure to chronograph the Model 98 (or any other paintgun) several times throughout the day. Velocities can change dramatically with temperature changes. Remember, different paintballs will chronograph differently as will different CO2 or high pressure tanks.

Cold Weather Performance

The Model 98 works very well in the cold, but you probably should add an expansion chamber of some type. For the best results, use a 20-ounce CO2 tank in the cold. The larger tank has a tendency not to "chill" quickly which will give you more consistent performance.

The best way to improve the cold weather performance of any paintgun is to use high pressure (nitrogen/compressed air). High pressure systems start at around \$150, which is close to the cost of the gun. One of the nice things about the Model 98 is that it comes with the 45-grip frame and bottom-line adapter. This makes installing an on-gun high pressure system much easier.

Other Cold Weather Tips

Be careful how you store your paintballs when playing outside in the cold weather as well. The shell is much more fragile than it would be in the warm weather. Try to keep both the gun and your paintballs in your car or other warmer place, but remember the CO2 in your tank (and gun) will expand if the gun is placed next to the heater.

Whatever you do, expect to get more ball breakage in the cold than you do in the warm weather. That's just a fact of life when playing cold weather Paintball.

Lubrication: To keep your Carbine's internal components operating smoothly, place about four drops of Tippmann gun oil (don't substitute unless you really know what you're doing) in your gun's CO2 adapter and dry fire the gun (after removing the barrel). This will spread the oil throughout the gun. After cleaning your Model 98 internally, place a few drops of oil in front and behind the rear sight.

Keep your Model 98 clean internally and externally. The two external areas you'll need to be the most careful with are the feeder attachment and the barrel. If you break a ball in the barrel, you will lose most of your accuracy until you clean it completely. On the field, pull the elbow latch back and run a pull-through squeegee through the breach and barrel. For a more complete cleaning (off the field) you'll need to clean the barrel with warm water or barrel cleaner/treatment and squeegee it until it is dry. A pull-through squeegee can also be used to clean the breach.

Internally, inspect the front and rear bolt/hammer and clean with warm water if necessary. Always lube the internal parts after cleaning as described above. Check the o-rings on the bolts and replace if necessary.

Some Model 98 Questions & Answers

Is the barrel on the Model 98 interchangeable with Prolite or Carbine barrels? No the barrel threads are completely different.

Do I need a motorized feeder (VL-2000) for my Model 98? You may if you are the type of player that shoots a lot of paint. The Model 98's trigger pull can be shortened and the gun is capable of firing faster than any of Tippmann's other semis.

Is the Model 98 a good cold weather gun? Yes, but an expansion chamber or remote will make it even better.

Can I use a high pressure system with the Model 98? You can if you want to take on the price. High pressure systems start around \$150-plus and run as high as \$500.

Would an expansion chamber improve the performance of the Model 98? Yes, the more consistent CO₂ you deliver to the gun, the better performance you'll get. You may also want to try using a remote system as well.

What is the pressure inside my CO₂ tank under normal conditions? At 70 degrees (F) your tank pressure will be about 825 psi, assuming your tank is properly filled. Your internal tank pressure will raise about 11 psi for every degree your tank temperature rises. So if your full tank is 90 degrees, your internal pressure will be somewhere around 1050 psi.

Someone told me that CO₂ tanks need to be tested after they are a few years old. Is this true? Yes. Any CO₂ tank that is two-inches in diameter must be hydro-tested when they reach five years old. This applies only to twenty-ounce or larger tanks. Hydro-testing can be done at most fire extinguisher service centers. The cost is around \$15-20. Filling an outdated tank can/will land you a very hefty fine and the possibility of jail time.

What is the best method of cleaning my barrel internally? There are several barrel cleaners and treatments available that will remove the gelatin build-up from the inside of your barrel. If you want to save a few dollars, just clean the barrel in warm soapy water, rinse, and run a pull-through squeegee through the barrel to dry it.

Why can't I use an anti-siphon tank with my remote system? An anti-siphon tank when not aligned to your gun's ASA will act as a siphon tank drawing liquid into the gun. There's no way to guarantee that an anti-siphon tank in a remote pouch will line up properly or stay put after being aligned.

PMI Trracer/ACI Maverick

[Introduction](#) - About the Trracer

[Basic Components](#) - All you need to know about the receiver, grip frame, regulator, bolt, and the rest of the Trracer's components

[Complete Disassembly](#) - Breakdown instructions

[Trracer Maintenance](#) - Learn how to do basic maintenance on your Trracer

[Troubleshooting](#) - Instructions on how to troubleshoot and fix your Trracer

About the Trracer

The PMI Trracer paintball gun was manufactured by Air Concept industries of Upland, California and distributed by Pursuit Marketing Inc. of Northbrook, Illinois. The Trracer is a Nelson based, auto-trigger pump-gun that was named PCRI's "Pump Gun of the Year" in 1992.

The PMI Trracer is one of the best selling paintguns of all time. The reasons are obvious. The gun is very inexpensive and gives you the performance of guns costing twice the price. The Trracer is an outstanding entry level paintgun and makes a perfect field rental.

There are three versions of the Trracer available and they retail anywhere from \$99-150 depending on which options you buy the gun with. Internally, the three versions are almost identical with the biggest differences being an adjustable bolt on the Deluxe, and Tagmaster, and the undercocking pump arm on the Tagmaster.

So I do not have to continually repeat the phrase "and Maverick", it should be understood that the PMI Trracer and ACI Maverick are virtually identical. From this point forward I will use the Trracer to mean the Trracer and Maverick.

How the Trracer Works

CO2 is supplied to the gun at 550-1200 pounds per square inch (the temperature determines the tank pressure and can actually be higher or lower in extreme conditions). With the gun uncocked, paintballs are stacked inside the feed tube, resting on the bolt. When the gun is cocked a paintball drops into the breach and the main spring is compressed. When the pump handle is pushed forward, the bolt pushes the paintball into the barrel. When the trigger is pulled the sear is tripped. The spring forces the hammer back into the rear end of the power tube, releasing the CO2 that propels the ball.

Rule #1 - Always chronograph your Trracer after making velocity adjustments.

The Trracer's Basic Components

The Trracer is manufactured from a variety of materials, both internally and externally.

Grip frame (lower receiver): The Trracer's grip frame is manufactured from a carbon fiber plastic that is super durable. The grip frame houses the trigger mechanism, euro-style hand grips (on all post-1994 models), and trigger safety. The grip frame attaches to the receiver (main body) with two thumb screws (sometimes referred to as field strip screws).

Receiver (main body): The Trracer's main body is manufactured from aluminum and houses the hammer, power tube, main spring, and bolt. The aluminum sight rail is mounted to the top of the main body as well.

Back-bottle adapter: The back-bottle adapter slides into the rear end of the main body and is held in place by the rear thumb screw. Inside the back-bottle adapter you will find the cup seal assembly. If CO2 is leaking out of the barrel when you pump the gun, chances are that you'll need to change the cup seal.

Ball detent: The ball detent (anti-double feed) is a small spring that is housed in the bottom of the main body.

Internals

Bolt: The bolt is manufactured from aluminum and contains one o-ring. The bolt is held in the receiver with two thumb screws that are placed through the pump handle and receiver, and into the bolt. When you cock the gun, the bolt is pulled back where it is engaged by the sear. The bolt contains a velocity adjusting screw (on all models except for the basic model) that is accessed using the "down the barrel" allen wrench adjuster.

Hammer/sear/power tube: The hammer assembly is manufactured from aluminum and stainless steel and is housed within the receiver. Every few months you should inspect the inside edge of the sear for wear. If your Tracer is firing when you pump the gun (without pulling the trigger), your sear may be worn. The main spring slides over the power tube.

Cup seal assembly: The cup seal assembly consists of the cup seal, valve stem, one black o-ring, brass valve seat, spring, and impulse seal. The very rear of the cup seal assembly is the cup seal. It's a brass nut that screws onto the end of the valve stem. Check or replace the cup seal if you are experiencing air leaking down the barrel or a popping sound when you pump the gun. You may also want to check the black rubber seal on the valve stem.

Cold Weather Performance

Cold weather performance with the stock Trracer will be fair, but there are several things you can do to make the Trracer a better cold weather gun.

Tank pressure: In the cold weather your tank pressure will drop and there's nothing you can do to change that. Since the Trracer works fairly well on lower pressure, you should expect decent performance in the cold. One of the reasons for this is that unlike a semi- auto which uses CO₂ to cock the gun, you manually cock a pump gun.

Rapid firing your gun tends to chill the tank. As you rapid fire the gun, the liquid CO₂ in your tank is changing to a gas to replace the gas that is being used. This will freeze your tank and drop the gun's velocity. In the cold this problem is magnified. Save your rapid firing for when you really need it. Also, try using a twenty-ounce CO₂ tank. This will give you better performance than a small tank (seven, nine, twelve-ounce) because you won't chill the tank as fast. With a twenty-ounce tank there is more gas in the tank, so freezing will take longer.

Paintballs: In the cold weather your paintballs will be much more fragile than when it is warm outside. Try to keep both the gun and your paintballs in your car or someplace warm until you are ready to use them. A word of caution: Be careful not to leave your paintgun near your car's heater or directly next to a fire, heating duct, etc. The extreme change in temperature will probably burst you CO₂ tank's safety disk.

Maintenance

Like any other paintgun, maintenance is the key to keeping the Trracer shooting consistently. This chapter is a basic overview of what it takes to keep the Trracer functioning properly. Other chapters such as "Trouble Shooting" and "Basic Components" will provide you with more technical maintenance tips as well.

Lubrication: To keep your Trracer's internal components operating smoothly, place about four drops of oil in your gun's CO2 adapter and dry fire the gun (after removing the barrel). This will spread the oil throughout the gun. After cleaning your Trracer internally, lube the bolt and hammer assembly as well--be careful not to over-oil the bolt area. Just place enough oil on the bolt and o-ring to allow it to move freely. A word about paintgun oils: Some petroleum based oils can damage your gun's o-rings. Unless you know more about this than I do, stay with oils that are made specifically for paintguns.

If you expect any degree of consistency from your Trracer, you must keep it clean internally and externally. The two external areas you'll need to be the most careful with are the feed tube and the barrel. If you break a ball in the barrel, you will lose most of your accuracy until you clean it completely. On the field, remove the barrel and run a pull-through squeegee through the barrel. For a more complete cleaning (off the field) you'll need to clean the barrel with warm water or barrel cleaner/treatment and squeegee it until it is dry. A pull-through squeegee can also be used to clean the power feed once the plug is removed.

To ensure that your Trracer will be operational at the Paintball field, there are a few parts and tools you'll need. The most common o-ring in the Trracer is the "tank" o-ring. If you need to change any of these o-rings, you'll probably need an o-ring pick to remove the old ones. You really should keep several of these on hand at all times. Also, it's a good idea to keep an extra cup seal in your parts box. Occasionally your cup seal will need to be changed and if you don't have one, you probably won't find one at your local Paintball field. You may even want to keep an extra one of each of the field strip screws in your parts box. Occasionally check the rubber o-rings on your bottom field strip screws. In addition to an o-ring pick, you'll need the velocity adjuster allen wrench, the field strip allen wrench, flat-head screwdriver, adjustable wrench, and some Teflon tape. Don't forget to get a good squeegee or two and some paintgun oil.

Occasionally check the field strip screws to make sure they 're tight. Hand tighten your barrel before you go out onto the field. To keep your Trracer in good shape, you may want to invest in a good gun bag. Unique Sporting, J T Paintball, Scott USA and others manufacture good quality gear bags.

Disassembly & Reassembly

Disassembling your Trracer is fairly simple once you've done it a few times. First and most importantly, make sure your CO2 source is disconnected and that there are no paintballs left in the gun. Unscrew the two field strip screws located under the grip frame/lower receiver. Pull the grip frame apart from the receiver (main body) and pull the back-bottle adapter out of the receiver. Remove the two pump handle screws and unscrew the barrel. At this point the bolt should come out. Be careful not to lose the small spring in the bottom of the receiver.

Upgrading the Trracer

Barrels: The Trracer comes with an aluminum barrel which is very accurate. However if you're looking to improve your gun's accuracy, you might want to take a look at some of the aftermarket barrels that are available. Here's a look at some of the more popular Trracer barrels.

The Smart Parts "Original" drilled barrel is available in twelve and sixteen-inch lengths and a variety of colors and finishes, including "splash". Smart Parts barrels are spiral drilled and are the quietest you'll find anywhere. All Smart Parts original barrels are manufactured from aircraft grade aluminum and are beautifully finished. The Smart Parts drilled barrel is probably the best warm weather barrel available.

The Armson Rifled Barrel is manufactured in South Africa and distributed by Pro Team Products of Flagler Beach, Florida. The Armson barrel is the only internally twist-rifled barrel available. The Armson barrel for the Trracer will likely be available in several lengths starting at eight inches. The Armson barrel is very accurate, but is loud compared to some other barrels. In the cold or damp weather, the Armson barrel is one of the best. Tip: The shorter the barrel, the louder it will be.

J & J Performance Barrels and Accessories manufactures several types of barrels. J & J manufactures both brass and hard chrome barrels with straight rifling, ports, spiral drilling, etc. The hard chrome coating reduces friction between the paintball and the barrel interior which helps stabilize the ball as it travels through the barrel. J & J barrels are easy to squeegee clean and are gas-efficient. J & J also markets barrel sleeves that are available in a variety of "splash" colors and patterns.

Converting your Trracer to bottom-line CO2 is fairly easy. There are several bottom-line kits available that will make this easy to do. Be sure to get the right kit--if your grips are the smooth molded type, you want the euro-style bottom-line adapter. If not, you probably need the standard M-16 bottom-line kit.

If your Trracer does not have a velocity adjustable bolt, you can pick one up for around \$25 retail. You adjust the velocity by using a down the barrel allen wrench that puts more or less pressure/tension on the main spring. This is much easier than changing springs. Speaking of springs, you can get a good set of color-coded springs for around \$10. This will help you get your velocity up in the cold, and down in the heat.

Other than those upgrades, you've got red dot sights, better feeders, etc. that can slightly improve the performance of the PMI Trracer.

Trouble Shooting the Trracer

Low velocity: Low velocity can be caused by several things. The first thing to check is your CO2 tank. If you don't have a good fill or your tank is very cold, your velocity will likely be low. After you've filled a CO2 tank you'll need to let it warm before getting a good chronograph reading. If your tank is okay, check the velocity adjuster or springs if your gun does not have an adjustable bolt.

If you're using color-coded springs they usually are set in this order--blue (weakest), green (second weakest) yellow (second strongest), red (strongest). Something to remember is that the main spring and the cup seal spring work in conjunction with each other. To increase your velocity you need to use a strong spring in the front and a weaker spring in the back (cup seal).

If your low velocity is not a result of your velocity adjuster, tank, or springs, you may have a power tube problem. For this one you'll need to bring your gun to an airsmith or try substituting

Air leaking out of the barrel: If air is leaking anywhere except for the back-bottle adapter, first check the cup seal area. Sometimes air will leak down the barrel if your CO2 tank is low as well.

Excessive ball breakage: A point of reference, the Trracer will break around one ball per fifteen hundred if the gun is properly tuned and you are using good paint in average weather. Check your paintballs for flat spots, color fading, etc. A fairly reliable way to see if your paint is good is to drop about

If your paint is fine, check the front end of your bolt for scratches or burs. A scratched bolt can "cut" the ball as it pushes it into the barrel. If your bolt is okay, check the ball detent (spring) located in the receiver. Is it still there? If not you'll need a ball detent to fix the problem. This prevents balls from double feeding or feeding too far into the breach.

Check your velocity--is it over 300 feet per second? High velocity will "blow up" your paintballs in the barrel. Another less common cause of ball breakage in the Trracer is a damaged barrel. The threaded end of the Trracer is manufactured from very thin aluminum and could easily be bent or damaged in some way. This could cause the barrel to be slightly out of alignment which will increase your ball breakage.

Inconsistent velocity: Usually this is caused by dumping liquid CO2 into the gun. Simply degas the gun and reinstall your CO2 tank or for a quick fix, point the gun up and dry-fire it several times. If this doesn't cure your problems, check to see if your gun is clean and properly lubricated. This causes more problems with pump guns than you could believe. If your gun is getting on in years your springs may be weakened. This can also cause velocity problems.

High velocity: Are you using a siphon tank? If you can't get the velocity down with the internal adjuster, try changing either the front or rear spring. Are you using a siphon tank? You probably shouldn't be in the warmer weather.

Double feeding paintballs: If your Trracer is double feeding, you've probably lost the ball detent. A new one will almost certainly fix the problem. If not, your paint is probably very small.

Popping sound when you pump the gun: This is usually caused by a heavy main spring or a bad cup seal. You should always have spare springs to swap out since they fix a variety of problems with your Trracer.

Commonly Asked Questions

Can I get my Trracer anodized? Yes but it will probably cost you as much as you paid for the gun. Do you really want to spend \$100+ anodizing a \$100 gun?

Is the Trracer a good cold weather gun? In general, pump guns work well in the cold since they don't need CO2 to recock (you do it manually).

Can I use a high pressure system with the Trracer? You can but I wouldn't recommend it. Unless you think the Trracer is the gun you're going to use for a long while, why spend the \$300+ on a \$150 gun? Although it's highly unlikely, if the high pressure system's regulator should fail, the Trracer is not capable of handling 3000 pounds per square inch (psi) of pressure going into it.

What is the pressure inside my CO2 tank under normal conditions? At 70 degrees (F) your tank pressure will be about 825 psi, assuming your tank is properly filled. Your internal tank pressure will raise about 11 psi for every degree your tank temperature rises. So if your full tank is 90 degrees, your internal pressure will be somewhere around 1050 psi.

Someone told me that CO2 tanks need to be tested after they are a few years old. Is this true? Yes. Any CO2 tank that is two-inches in diameter must be hydro-tested when they reach five years old. This applies only to twelve-ounce or larger tanks. Hydro-testing can be done at most fire extinguisher service centers.

What is the best method of cleaning my barrel internally? There are several barrel cleaners and treatments available that will remove the gelatin build-up from the inside of your barrel. If you want to save a few dollars, just clean the barrel in warm soapy water, rinse, and run a pull-through squeegee through the barrel to dry it.

Why can't I use an anti-siphon tank with my remote system? An anti-siphon tank, when not aligned to your gun's ASA, will act as a siphon tank drawing liquid into the gun. There's no way to guarantee that an anti-siphon tank in a remote pouch will line up properly or stay put after being aligned.

Can I use a remote CO2 set-up with my Trracer? Sure you can. If you don't want the extra weight of the tank on the gun you can easily set up a remote line and put the tank on your back. Most players prefer to have the CO2 tank in the bottom-line position though--it helps stabilize the gun when it is placed against your shoulder when firing.

What is the difference between the Trracer and the ACI Maverick? The Trracer has the PMI logo engraved on the gun, and the Maverick uses the ACI logo (sorry I couldn't resist).

Trracer Tips

1. Keep your Trracer's bolt and hammer lightly lubricated and clean. This will improve every performance area of the gun, especially velocity consistency.
2. The pump-handle screws on the Trracer will occasionally loosen during play. To remedy this, wrap some Teflon tape around the threads of the screws and install as usual. This will provide some friction between the threads and the knob screw, thus holding the knob in place longer. Also make sure the black rubber o-rings on the screws are in place-- they will also help prevent the screws from getting lost.
3. If the hand grip on your Trracer develops some "play", simply tighten the allen screw inside the grip. This will cure the problem in a matter of seconds.
4. For under \$12 retail you can purchase a barrel bag. Barrel bags are made to hold as many as five barrels. This will save your barrel from getting nicked on the muzzle end during transport or storage.

The Kingman Spyder

In This Chapter of The Airsmith Survival Guide



[Introduction](#) - Various models and versions of the Spyder

[Downloads & Web Links](#) - Clickable links to download Spyder manuals and instructions, manufacturers' websites, accessory company websites, reviews sites, and more

[Basic Components](#) - All you need to know about the receiver, grip frame, regulator, bolt, and the rest of the Spyder's components

[Complete Disassembly](#) - Breakdown instructions

[Spyder Maintenance](#) - Learn how to do basic maintenance on your Spyder

[Tools](#) - A list and description of tools you'll need to work on your Spyder

[Upgrading](#) - Some suggestions on upgrading your gun

[Troubleshooting](#) - Instructions on how to troubleshoot and fix your Spyder

About the Spyder

The Spyder is manufactured in Taiwan and imported by Kingman USA of Los Angeles, California. Kingman International, also the maker of the Hammer Series of pump-paintguns, originally introduced their pump-guns in England in the mid nineties. Within a few years, the Spyder semi-auto series has become one of the most popular around.

Spyder Classic

This is the basic bottom-line gun.

Spyder 2000

Comes with low pressure chamber and pressure gauge.



Spyder TL

Spyder TL

Gas-through foregrip, filter system, rear cocking, bottom-line.

Spyder Compact Special Edition

Splash finish, double finger trigger, bottom-line, expansion chamber.
Spyder Shutter: Gas-through grip, double finger trigger, regulator/gauge, rear cocking.

Spyder Xtra

Low pressure chamber, gas-through grip, mini-expansion chamber, special anodizing, double finger trigger.



Spyder Xtra

Spyder Compact

Vertical CO2 configuration.



Spyder Compact

The Spyder is an open-bolt, blow back semi-automatic paintgun that uses CO2 to fire the ball as well as to re-cock the gun. All Spyderys come with a power feed, ball detent, removable barrel, and external velocity adjuster. Internally, all Spyderys are similar in design with only subtle differences (bolt, trigger, etc.).

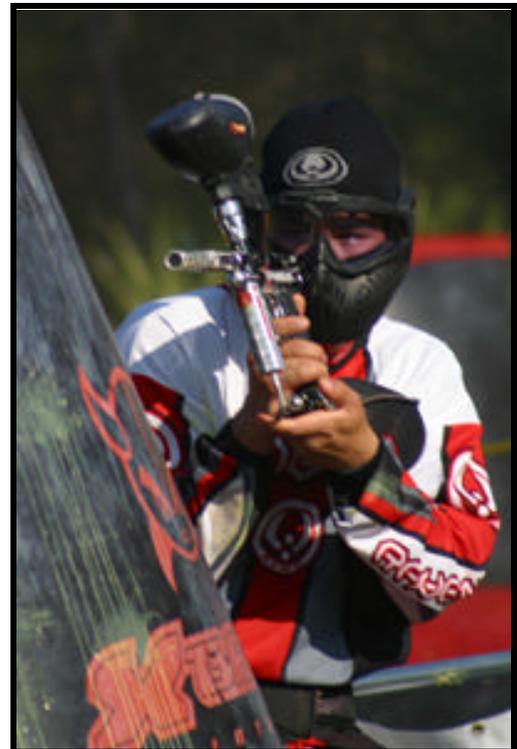
How the Spyder Works



C02 is supplied to the gun at 550-1200 pounds per square inch (psi) (the temperature determines the tank pressure). When the trigger is pulled (with the gun cocked), the bolt/striker assembly pushes the paintball forward into the barrel. The striker and bolt move forward and hit the valve pin. The valve

pin is pushed into the valve body, releasing the C02 (from the reservoir) that propels the paintball and re-cocks the gun.

The velocity adjuster is used to put more or less pressure on the striker spring, which in turn determines how hard or soft the striker (and bolt) hits the valve pin. The harder it hits the pin, the more C02 will be released from the valve and the higher your velocity will be.



The Spyder's Basic Components

The Spyder is manufactured from a variety of materials, both internally and externally.



Trigger frame (grip frame): The trigger frame is manufactured from a carbon fiber material or aluminum depending on the version you have. The grips are interchangeable with the M-16 types with some minor adjustments or .45 grips, again depending on your particular version. With the Spyder Compact, the grips are "built-in" to the frame so changing the grip handle is not possible.

On older Spydres like the Spyder Compact-A however, the grips are upgraded to the M-16 style, and the frame is manufactured from aluminum. These also come with a plastic trigger shoe that is attached with a small allen screw.

Receiver: The Spyder's receiver (main body) is manufactured from aluminum and contains a power feed system and feed plug. The feed plug is interchangeable with the Automag version. The feed tube accepts a one-inch feeder elbow. The receiver also comes with a bolt-on sight rail which makes attaching a sight or scope a breeze.

Internals

Bolt and striker assembly: The striker is manufactured from forged steel and contains one urethane o-ring (the same size o-ring you'll find on a CO2 tank's pin valve). The bolt assembly contains two urethane o-rings (same size as above) and connects to the striker via the bolt pin. The striker spring measures 4-3/16" in length and is manufactured from round wire. The striker spring guide is manufactured from a carbon fiber plastic.



The strike plug is manufactured from aluminum and contains the velocity adjusting screw and a small flat disk that is used to put even pressure on

the spring guide. When disassembling the gun, be careful not to lose the metal disk. The bolt plug, also manufactured from aluminum, is used to seal the rear end of the gun.

Cup seal assembly: The reservoir plug is manufactured from aluminum and contains one o-ring (#015). The valve spring is attached to the cup seal and rests against the cup seal guide. The valve pin screws to the cup seal and slides into the valve. On the Spyder Compact, the reservoir plug contains two o-rings as well as the vertical bottle adapter. Finally, the Spyder's valve uses two tank o-rings as well.

To remove the valve from the Spyder's main body (lower receiver), first remove the brass screw from the underside of the body. Then using a wooden dowel or brass rod, tap the valve out of the front end of the body. The stainless pin that protrudes through the main body prevents the valve from being pushed too far into the main body.

Getting Started

This chapter is written for players that are already familiar with the Spyder.

Always wear Paintball approved goggles before pressurizing your paintgun.

Like most other semi-autos, the Spyder operates best on gas CO₂ or high pressure air. Liquid CO₂ that enters the valve will cause your Spyder to shoot at erratic velocities, go full auto, or cycle inconsistently. Although the Spyder's o-rings will usually not be damaged from small amounts of liquid entering the valve, the performance will be diminished. Liquid in the valve will also boil back into a gaseous state causing velocity spikes.

Since your CO₂ tank almost always contains liquid CO₂ in the bottom portion, you never want to fire the gun downward at the ground. This will pour liquid CO₂ into the valve and immediately cause problems. The Spyder Compact is set up for vertical bottle CO₂ which does not permit liquid into the gun as easily. Just don't fire the gun upside down and you'll be okay .

There are several methods of preventing liquid from entering your Spyder. The easiest method of preventing liquid from entering the gun is to have an anti-siphon tube installed in your CO₂ tank. This copper tube screws to the bottom of your tank's pin valve and is positioned to prevent liquid CO₂ from being drawn into the gun. Using a remote CO₂ set up is another excellent liquid prevention method. By placing the tank in a pouch on your back, the CO₂ leaving the tank in liquid form has a chance to expand back into gas before entering the gun. Remote systems are available starting at about \$20.

If you choose to run high pressure air with your Spyder, the easiest way to do so is by using one of the many systems that screw directly into your Spyder's ASA (a.k.a CO₂ adaptor). Otherwise you'll have to buy cradles, fittings, etc.

The Older, No Longer Manufactured Spydres

There are three basic older Kingman Spydres; the Spyder, Spyder Compact, and Spyder Compact-A. Internally, the guns are exactly the same; same bolt, valve, etc. Here are the differences between the three.

The Spyder: The Spyder (standard) is available in either black or grey and is set up for bottom-line CO₂. A wire braided hose runs from the bottom of the receiver and is attached to the bottom of the grip frame via the constant air adapter. The barrel is eight inches in length and may or may not be ported (some are, some are not). The frame on the Spyder was originally manufactured from a carbon fiber plastic. Recently I have seen some that are metal.

Spyder Compact: The Spyder Compact differs from the Spyder (standard) in that it is set up for vertical-bottle CO₂. In addition, the barrel is almost two-inches smaller than the original Spyder's.

Spyder Compact-A: The Spyder Compact-A has two improvements over the regular Spyder Compact. Those are a metal frame and M-16 style grips.

Cold Weather Performance

Cold weather performance with the stock Spyder will be fair, but there are several things you can do to make the Spyder a better cold weather gun.

Tank pressure: The Spyder performs best at an operating pressure of 650-700 pounds per square inch (psi). It will operate at lower pressures, but you will have problems getting your velocity as high as you might want. In cold temps your tank pressure will drop as low as 450 psi or less. Although your Spyder will operate, you won't get great performance. The best way to fix this problem is to use high pressure air.

You can also use a remote system. As described above, a remote will give the liquid CO₂ time to expand into gas before it enters the gun. Some players run the remote hose under their shirt to help keep the CO₂ warm. This may help a bit, but don't expect miracles.

Rapid firing your gun tends to chill the tank (using CO₂). As you rapid fire the gun, the liquid CO₂ in your tank is changing to a gas to replace the gas that is being used. In the cold this problem is magnified. Save your rapid firing for when you really need it. Also, try using a twenty-ounce CO₂ tank. This will give you better performance than a small tank (seven, nine, twelve-ounce) because you won't chill the tank as fast. With a twenty-ounce tank there is more gas in the tank, so freezing will take longer.

Maintenance

Like any other paintgun, maintenance is the key to keeping the Spyder shooting consistently. This chapter is a basic overview of what it takes to keep the Spyder functioning properly.

Lubrication: To keep your Spyder's internal components operating smoothly, place about four drops of oil in your gun's CO2 adapter and dry fire the gun (after removing the barrel). This will spread the oil throughout the gun. After cleaning your Spyder internally, lube the bolt/striker assembly as well. A word about paintgun oils: Some petroleum based oils can damage your gun's o-rings. Unless you know more about this than I do, stay with oils that are made specifically for paintguns.



If you expect any degree of consistency from your Spyder you must keep it clean internally and externally. The two external areas you'll need to be the most careful with are the power feed/feed tube and the barrel. If you break a ball in the barrel, you will lose most of your accuracy until you clean it completely. On the field, remove the barrel and run a pull-through squeegee through the barrel. Close off the power feed plug, make sure no balls are in the breech, and place your hand over the barrel ports and dry fire the gun. This will blow out most of the paint from the ports. For a more complete cleaning (off the field) you'll need to clean the barrel with warm water or barrel cleaner/treatment and squeegee it until it is dry. A pull-through squeegee can also be used to clean the power feed once the plug is removed.

Internally, inspect the striker/bolt assembly and clean with warm water if necessary. Always lube the internal parts after cleaning as described above. Check the o-rings on the bolt and striker for wear and replace if necessary. Standard tank o-rings work well, but don't use the black rubber type.

To ensure that your Spyder will be operational at the paintball field there are a few parts and tools you'll need. The most common o-ring in the Spyder is the #015, which is also known as a "tank" o-ring. If you need to change any of these o-rings you'll probably need an o-ring pick to remove the old ones. You really should keep several #015's on hand at all times. Also, it's a good idea to keep an extra cup seal in your parts box. Occasionally your cup seal will need to be changed and if you don't have one, you probably won't find one at your local paintball field. You may even want to keep an extra cocking knob in your parts box. You can lose the knob if it's not tightened down properly.

In addition to an o-ring pick, you'll need the velocity adjuster allen wrench (5 mm), the field strip allen wrench, flat-head and phillips screwdrivers, and adjustable wrench, and some Teflon tape. Don't forget to get a good squeegee or two and some paintgun oil.

Disassembly



Disassembling the Spyder down to the venturi bolt is fairly simple. First, depressurize the gun and remove your hopper and paintballs. Remove the cocking handle, and the two striker plug screws (be careful the unit is under pressure from the spring). Next remove the sight rail screw, striker plug and the striker spring. The striker guide will slide out. Hold the trigger down and slide out the bolt plug, striker buffer (this may come out when removing striker plug), striker, and venturi bolt. It may help to hook a small allen wrench or bent-tip pick in the cocking handle hole when pulling the unit out.

When re-assembling, you'll need to push the trigger sear assembly down. Slide bolt assembly in and attach the cocking handle. Slide the spring, buffer, and guide in and reinstall two side screws. Slide in

the bolt plug and reinstall sight rail screw.

Upgrading the Spyder

Barrels: The older Spyder (most of them anyway) came with a brass-lined, ported barrel which is fairly accurate. However, if you're looking to improve your gun's accuracy, you might want to take a look at some of the aftermarket barrels that are available. DYE, PMI, 32 Degrees, Smart Parts, Armson, J & J, and many other companies make excellent aftermarket barrels for the Spyder.

Internal components: There is a plethora of aftermarket bolts available for the Spyder and some of them may actually do something to improve the performance of the gun — some will not.

DYE makes a great .45 frame for the Spyder. Shocktech and AKA have a nice selection of quality parts for the Spyder as well. LAPCO has great aftermarket cup seal and a bunch of other metal components for the Spyder..

In addition to the upgrades made specifically for the Spyder, there are other useful accessories that you should consider. The first improvement you should make is to purchase a larger loader (feeder). Viewloader, Allen Paintball Products, and Indian Springs all manufacture upgrade loaders. Get yourself a good squeegee too. You won't get good accuracy without a super clean barrel. You might also want to consider a red dot sight. ADCO International, Armson, DYE, and Daisy make good quality sights. Finally, a good gear bag to carry your equipment is almost a must buy.

Other than the above upgrades, you are probably better off going for the higher end Spydery than upgrading piece by piece.

Trouble Shooting the Spyder

Low velocity: This is probably the most common Spyder problem. The first thing you'll need to do (after you make sure your CO2 tank is not empty or low) is to check the velocity adjusting screw located in the rear of the striker plug. To increase the velocity, turn the screw clockwise and re-chronograph the gun. If that doesn't do it, loosen the reservoir plug slightly to take some of the pressure off of the valve spring. Still shooting low? Check to make sure the gun is clean and lubricated internally. Look for paint shell fragments on or around the bolt/striker assembly and clean if necessary. Another common cause of velocity problems with the Spyder is a weak striker spring. You may need to order a stiffer or longer spring from Kingman International. F-1 (or F-2) Illustrator springs are of better quality and can be used in the Spyder if you remove the "ribs" from the striker spring guide. You may want to have an airsmith do that for you. Finally you can place a spacer between the velocity adjusting screw and spring guide rod.

Gun does not cock: If you fire the Spyder and it does not cock itself, remove your air source and disassemble the gun (after you've made sure that your CO2 tank has enough gas). Look for paint chips wedged between the bolt and the breach. Simply clean the gun, reassemble it and you should be ready to go.

Air leaking out of the barrel: If air is leaking anywhere, first check the bolt and striker o-rings. Most air-leak problems can be fixed by changing one or more of these rings. Remember, the bolt and striker o-rings are the same size as your standard tank o-rings (#015). If the o-rings are okay, you probably have a bad cup seal. Contact the manufacturer or your local distributor for a replacement. Finally, low CO2 will sometimes cause a leak down the barrel.

Excessive ball breakage: A point of reference, the Spyder will break around one ball per thousand if the gun is properly tuned and you are using good paint. Check your paintballs for flat spots, color fading, etc. A fairly reliable way to see if your paint is good is to drop about twenty or so balls (one at a time) from a height of about six feet onto a hard surface. If more than half of the balls break, you probably have a problem with your paint. Either way, try switching paint batches or brands before you go crazy with everything else it could be.

If your paint is fine, check the front end of your bolt for scratches or burs. A scratched bolt can "cut" the ball as it pushes it into the barrel. If your bolt is okay, check the ball detent (known as the ball stopper in the older one-page Spyder manual, that's just how they spelled it) on the side of the gun. Is it still there? If not you'll need a ball detent to fix the problem. This prevents balls from double feeding or feeding too far into

the breach.

Another less common cause of ball breakage in the Spyder is a damaged barrel. The threaded end of the Spyder is manufactured from very thin aluminum and could easily be bent or damaged in some way. This could cause the barrel to be slightly out of alignment which will increase your ball breakage.

Inconsistent velocity: Usually this is caused by dumping liquid CO2 into the gun. Simply de-gas the gun and reinstall your CO2 tank or for a quick fix, point the gun up and dry-fire it several times. If this doesn't cure your problems, check to see if your gun is clean and properly lubricated. Look for worn o-rings on the bolt/striker assembly.

High velocity: It's not very often that the Spyder's velocity cannot be brought down below 300 feet per second, but it can happen. First check the striker spring area. Look for some type of debris wedged between the spring and the disk. If that's not it, check the cup seal guide. Make sure it hasn't come loose. If it has, it may cause the cup seal to remain open longer than it should. This will allow more CO2 into the valve raising your gun's velocity. Simply tighten it and your problem should be solved.

Double feeding paintballs: If your Spyder is double feeding, you've probably lost the ball detent. A new one will almost certainly fix the problem. If not, your paint is probably very small.

Double firing on one trigger pull: This can be caused by liquid CO2 in the valve. Follow the above instructions to fix the problem. If your double firing problem is not caused by liquid CO2, inspect and clean the trigger assembly.

Tippmann Pro-lite

In This Chapter of The Airsmith Survival Guide

[Introduction](#) - Various models and versions of the Pro-Lite

[Basic Components](#) - All you need to know about the receiver, grip frame, regulator, bolt, and the rest of the Pro-Lite's components

[Complete Disassembly](#) - Breakdown instructions.

[Pro-Lite Maintenance](#) - Learn how to do basic maintenance on your Pro-lite

[Lube](#) - Keeping your Pro-Lite lubricated

[Upgrading](#) - Some suggestions on upgrading your Pro-Lite

[Troubleshooting](#) - Instructions on how to troubleshoot and fix your Pro-Lite

About the Pro-lite

The Tippmann Pro-Lite is one of the most durable, reliable, and versatile semi-automatic paintguns available. The Pro-Lite came to market as a new version of the Pro/Am, and at the time was, in my estimation, the best of the mid-priced semi-autos. It worked very well in the cold; it was as ready out of the box as any gun on the market; it was very durable paintgun; and was manufactured by a company that's been in the industry since the early 1980's.

Tippmann Pneumatics, the manufacturer of the Pro-Lite, was the first company to introduce semiautomatic paintguns to the market back in 1990 with the 68 Special. They've been a leader in the industry since "day one." Tippmann was the first company to manufacture a fully automatic paintgun, the SMG-60; they were the first company to make a reliable semi-auto; they invented the paint grenade, and they brought constant air to the general playing public. Their customer service is second to none.

How the Pro-Lite Works

The Tippmann is an open bolt, blow-back semi-automatic paintgun. CO2 is supplied to the gun at 500-1200 psi (pounds per square inch) depending on the temperature (the pressure can actually be higher or lower in extreme conditions). When the trigger is pulled the sear releases the bolt (rear bolt). The drive spring pushes the bolt forward where it hits the valve. The valve opens causing the CO2 to flow from both the front and rear of the valve body. The CO2 burst from the front of the valve flows through the power tube and bolt propelling the paintball that rests in the breach. The CO2 that flows from the rear of the valve is used to re-cock the gun.

Two Basic Models

Both the Pro-Lite and the Mini-Lite are descendants of the 68-Special, one of the world's first semi-autos. Originally introduced as the Pro/Am, the Pro-Lite differs in that the fore-grip and pistol grip are manufactured from a carbon fiber light-weight plastic. In addition, the Pro-Lite's trigger has been reworked somewhat to increase the rate of fire.

Pro-Lite

The Pro-Lite comes with a wire pull-through squeegee, allen wrenches, barrel plug and owners manual. The gun features a bottom-line CO2 set up, external velocity adjuster, built-in sight rail, fixed sight, a shoulder sling, and a foregrip that slides forward to allow the user to run a squeegee through the barrel.

Mini-Lite

The Mini-Lite is identical to the Pro-Lite internally. The two guns differ in that the Mini-Lite has a vertical-bottle CO2 adapter mounted on the bottom of the receiver. This allows you to use a vertical-bottle, back-bottle or dual bottle CO2 set up. A plug that can be used to close off either of the CO2 adapters is supplied with the gun. The Mini-Lite comes with the same accessories as the Pro-Lite.

Basic Components

Barrel: The Pro-Lite's stock barrel is ten and one-half inches in length, and is a smooth bore type. The barrel is manufactured from aluminum and polished internally at the Tippmann factory. The barrel screws into the upper receiver and is locked by tightening the barrel pinch bolt. To remove the barrel simply loosen the pinch bolt and unscrew counter-clockwise.

Upper Receiver: The upper receiver is manufactured from aluminum and houses the front bolt, power tube, and rear bolt. The small rubber anti-double feed is also located in the upper receiver. The fore-grip is attached to the upper receiver with an allen screw; the rear sight is attached to the top of the receiver with the rear sight jam screw; the end cap screws onto the threaded end of the upper receiver; and the lower receiver is connected to the upper receiver with four allen screws (with attached sleeves).

Lower Receiver: The lower receiver houses the trigger assembly (trigger, sear, springs, etc.). The lower receiver is manufactured from a composite carbon fiber plastic. The sling attaches to the front end of the lower receiver, opposite the bottom-line CO2 adapter. The gas line runs through the lower receiver to the bottom of the valve. It also acts as a trigger guard.

Fore-grip: The fore-grip, also manufactured from carbon fiber plastic is attached to the receiver via the barrel pinch bolt. The fore-grip incorporates an elbow-less feeder attachment with an allen lock-down screw. A fixed sight is also molded into the fore-grip.

Grip latch: The grip latch is manufactured from polished stainless steel and contains a spring and pin. The grip latch allows you to slide the fore-grip forward to run a squeegee through the breach and barrel.

Rear Sight: The rear sight is attached to the sight rail via the rear sight jam screw. The rear sight must be attached to keep the linkage arm in place.

Internals

Front Bolt: The front bolt is manufactured from a light-weight carbon fiber material and contains one o-ring. It connects to the rear bolt via the stainless steel linkage arm.

Power tube: The aluminum and stainless steel power tube is located between the front bolt and valve inside the upper receiver. A machined-in lip in conjunction with the velocity adjustment screw hold the power tube in place.

Valve: The Pro-Lite's valve lies between the power tube and rear bolt. It is held in place by a stainless steel spacer and the power tube. The valve contains one o-ring.

Rear Bolt: The rear bolt is manufactured from stainless steel and hard coated for extra durability. The rear bolt connects to the front bolt by way of the linkage arm. The rear bolt contains one o-ring.

Disassembly

First remove the allen screws in the lower receiver (hand-grip). With older models there were two push pins holding the upper receiver to the grip (lower receiver). This will allow you to separate the upper and lower receivers. Be careful not to twist the gas line. Next unscrew the gas line nut using a half-inch box wrench or adjustable wrench. Loosen the barrel pinch bolt and unscrew the barrel. Next remove the fore-grip. At this point you should have four pieces; the barrel, upper receiver, lower receiver, and fore-grip with attached sling.

Remove the rear sight by unscrewing the allen screw, and sliding the unit off of the back and of the upper receiver. Unscrew the end cap but be careful because it is under pressure from the main spring. Slide the spring and guide out (be careful not to lose the rubber washer). Using a pick, pop the linkage arm out and slide the front bolt out of the front of the receiver (When you assemble the gun, the front bolt should be reinserted o-ring end in last.). Pull the cocking knob (bolt handle) out and the rear bolt should slide right out of the back of the receiver. At this point the gun is broken down far enough to give it a good cleaning.

Cold Weather Performance

As stated earlier, the Pro-Lite works very well in the cold, but you probably should use a siphon tank. For the best results, use a 20-ounce CO2 tank in the cold. Be careful how you store your paintballs when playing outside in the cold weather as well. The shell is much more fragile than it would be in the warm weather. Expect to get more ball breakage in the cold that you do in the warm.

Maintenance

Like any other paintgun, maintenance is the key to keeping the Pro-Lite shooting consistently.

Lubrication: To keep your Pro-Lite's internal components operating smoothly, place about four drops of oil in your gun's CO2 adapter and dry fire the gun (after removing the barrel). This will spread the oil throughout the gun. After cleaning your Pro-Lite internally, place a few drops of oil in front and behind the rear sight. A word about paintgun oils: Some petroleum based oils can damage your guns o-rings. Unless you know more about this than I do, stay with oils that are made specifically for paintguns.

If you expect any degree of consistency from your Pro-Lite you must keep it clean internally and externally. The two external areas you'll need to be the most careful with are the feeder attachment and the barrel. If you break a ball in the barrel, you will lose most of your accuracy until you clean it completely. On the field, pull the grip latch back and run a pull-through squeegee through the breach and barrel. For a more complete cleaning (off the field) you'll need to clean the barrel with warm water or barrel cleaner/treatment and squeegee it until it is dry. A pull-through squeegee can also be use to clean the breach.

Internally, inspect the front and rear bolt and clean with warm water if necessary. Always lube the internal parts after cleaning as described above. Check the o-rings on the bolt and replace if necessary.

Upgrading the Pro-Lite

DYE, PMI, 32 Degrees, Smart Parts, Armson, J & J, and many other companies make excellent aftermarket barrels for the Pro-Lite.

Other than barrels, there are not that many upgrades available for the Pro-Lite. The reason is simple. The Pro-Lite comes with many amenities that you don't usually get for a gun in this price range. The Pro-Lite already comes with a bottom-line set up and the Mini-Lite has a dual bottle option.

Probably the most useable upgrade for the Pro-Lite is the Speed Feed. This is basically a power feed that uses CO2 blow-back to help chamber the paintballs. This will give you better feeding and cut down on ball breakage. The Speed Feed replaces the fore-grip completely with a much smaller feeder attachment. When you're finished you have a smaller paintgun which makes you less of a target to your opponent. There are several replacement bolts available for the Pro-Lite, but the one's I've seen to date don't work as well as the stock one. Finally, Marker Products manufactures a nice vertical-bottle adapter for the Pro-Lite.

Trouble Shooting the Pro-Lite

Low velocity: First is your CO2 tank full and warm? Is your velocity screw too far in? If so, that could be your problem. If it's cold outside you may not be able to get your gun's velocity up without a siphon tank. Also Tippmann has a winter spring that will increase your Pro-Lite's velocity by about 30 feet per second. Finally, make sure your Pro-Lite is adequately oiled.

Inconsistent velocity: Check to see if your gun is properly lubed. If you are using a regular gas CO2 tank, are you getting liquid CO2 in the valve? Make sure that the end cap is tightened down. If it is loose you could be getting inconsistent pressure on the drive spring.

Air Leaking out of the constant air adapter: The o-ring on your CO2 tank is probably cut or damaged in some way. Replace the o-ring with a urethane type.

Double firing: Check the trigger sear. It's probably worn and won't catch onto the bolt. You may be able to file it to the point where it catches, but unless you know exactly what you're doing, let Tippmann Pneumatics replace it for you.

Shooting full auto: This one is almost always caused by too much oil in the linkage arm area. Break the gun down and dry off the front and rear bolt and your problem will probably go away. If it does not, inspect the trigger sear for wear (see double firing).

Excessive ball breakage: If you're breaking more than one ball per thousand, you probably have some type of problem that needs to be fixed. First is your paint fresh? You might want to try a few different paint batches or brands. Some paint works better than others in each gun. If you don't have a paint problem, disassemble your gun and inspect the front end of the front bolt. Look for nicks or burs and replace the bolt if necessary. Also while you have the gun apart, check to see if the anti-double feed device is still in place. If not you may be feeding more than one ball at a time thus cutting the second one. Is your gun breaking balls only when you rapid fire? If so it is probably caused by one of two things. Either you are trying to fire faster than the balls will feed, or your feeder may not be feeding smoothly.

Bolt is sticking in the forward position: First pull the cocking knob back and push the fore-grip forward. Look into the breach and see if the linkage arm has disconnected from the front bolt. If it did it's probably because the rear sight screw loosened allowing the arm to "bounce" during firing. Simply reattach the linkage arm and tighten the rear sight screw.

Air leaking from inside the valve area or down the barrel: Check the o-rings on both the front and rear bolt. You may also need to look at the front of the valve. Look for small burs or nicks and polish out with very fine emery cloth. Be careful not to over polish. If you don't feel confident doing this, bring your gun to a qualified airsmith.

Grip latch is loose: This one is easy. Your grip latch spring probably came loose and is lost. Give Tippmann a call and they'll send you a new one.