2020/2021 Version 2 Gearbox Full Guide

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-Any comments/suggestions to improve this guide? Let us know!

The idea of opening your gearbox—let alone modifying it—can be a daunting thought for many. In this guide, we will discuss not only parts and upgrades, but also full disassembly and reassembly of a standard Version 2 gearbox along with video guides. You will learn the inner workings of a gearbox, and be able to diagnose problems and install upgrades.

Part 1- Common Problems/Questions

Gearbox is locking up

- Bent/sticking/incorrectly installed ARL
- Weak battery/motor
- Bad wiring
- Backspin
- Stripped gears
- Motor is not properly insulated or is not properly installed
- Battery is dead(This should be the first thing you check!)

Gun makes grinding sound

- Stripped gear teeth
- Incorrectly installed bearing/bushing (not properly flat)
- Gears are way too tight/faces are grinding against each other
- Forigen object lodged in gearbox
- PME

Gun sounds whiney

- Shimming is too tight or loose
- Gears are not meshing correctly
- Motor is too weak

Gun is not feeding correctly

- Overspin

- Cracked air nozzle
- Broken tappet plate/incorrectly installed/broken tappet spring
- Firing too fast for the tappet plate to keep up (Tappet spring needs to have a coil or two cut to increase return speed)

Gun only fires on full auto

- Missing selector plate/cutoff lever spring
- Broken/sticky cut-off lever
- Sensor (micro switch or optical) for mosfet is damaged/dirty

Gun gets very hot

- High amp draw (low TPA motors often have this problem) (Poor shimming/motor height and alignment)
- Malfunctioning/small battery
- Thin wiring
- Short in the AEG circuit
- Mechanical failure/stoppage in the gearbox

Low FPS/FPS inconsistencies

- Air seal leaks (Gearbox compression or hopup assembly)
- Bucking lips improperly sealing with nozzle
- Poor quality spring
- Midcap Syndrome

Part 2- How a Gearbox Works

Understanding what you're working with is always a good idea before tampering with your gearbox. Here is a good animation displaying the inner workings of a gearbox, and how they work together- https://www.youtube.com/watch?v=qlW11m5d4Uk

In simple terms, a standard airsoft AEG uses a battery to power a motor that turns gears in order to compress a spring and fire a BB.

Note - It is recommended that you watch ALL the videos provided before attempting anything mentioned. As there is only so much one can convey in words, the videos will provide you with a visual aid and a fuller understanding of the concepts mentioned in this guide.

Part 3- Part Names and Functions

Gears- In a gearbox, gears are one of the most important pieces, and also one of the most prone to breaking. They are "the heart" of the gearbox. Each gear works to perform a separate job in order to keep the gearbox functioning correctly. There are four main gears, the Pinion gear, the Bevel gear, the Spur gear, and the Sector gear.

Pinion Gear- The Pinion gear is the gear attached to the motor armature (the exposed spinny bit), and the first gear in our lineup. The Pinion spins on a plane perpendicular to all the other gears, and therefore is the most at risk for energy loss.

Bevel Gear- The Bevel gear is the second gear in our lineup. Called the Bevel gear because of the angle it has in order to engage the pinion gear, this gear transfers energy to a plane parallel with the other gears.

Spur Gear- The third gear in our lineup, the Spur or "step" gear is the gear that sits between the Sector and Bevel gear. It is used to transfer energy to the Sector gear.

Sector Gear- The fourth gear in our lineup, the Sector gear is in charge of pulling the piston back. It has a little peg on it to engage the tappet plate to feed BB's. There are two types of Sector gears-

- SSG - Single Sector Gear, or SSG, is the most common type of Sector gear. It comes in variants of 15,16, and 19 teeth - for different pistons and gearboxes. About half of the gear has teeth to pull back the piston, and the rest has no teeth in order to release the piston.
- DSG - Dual Sector Gear, or DSG, has two seperate sets of teeth on each side of the gear, with room for the piston to release in between them. DSG's are often used in trigger response or very high ROF builds, and are an advanced upgrade.

Sector Delay Chips- Sector delay chips are little pieces of plastic or metal that sit on the peg of the Sector gear, and cause the tappet to spend more time pulled back against the cylinder head to allow BBs to feed properly. You must be careful not to install these backwards.

Bushings- Thick washer like pieces of metal that go inside the gearbox shell to retain the gears

Bearings- More efficient but can be more fragile than bushings, bearings can offer higher efficiency due to their reduced friction between the gear axle and gearbox shell.

Anti-Reversal Latch- The Anti-Reversal Latch, or ARL, is used to keep the gears from spinning backwards. It contacts the Bevel gear by only permitting it to spin forward, and will lockup if the gears try to spin backwards. Be very careful to install this correctly.

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<u>Compression parts-</u> Compression is one of the most important things in an airsoft AEG. This can often determine reliability and FPS consistency within your AEG.

Main Spring - A strong spring that determines the desired energy output of your AEG.

Spring Guide- Holds the main spring.

Piston- Forced forward by the spring into the cylinder.

Piston Head- Sits at the front of the piston. Uses vents to expand an O-ring and push the air outwards towards the cylinder head.

Cylinder- A cylindrical tube to compress air into.

Cylinder Head- Sits inside the cylinder.

Air Nozzle- Sits on top of the cylinder head, in charge of loading the next BB.

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Tappet Plate & Spring- The Tappet plate holds the air nozzle up to the cylinder head and is moved backwards by the peg on the Sector gear, the tappet spring then pulls it forwards.

Selector Plate- Engages the cut-off lever and safety lever - allowing for safe, semi-auto, and full auto function.

Cut-Off Lever- Interacts with the selector plate and Sector gear for semi or fully automatic fire.

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The Rest

Motor- Situated inside the grip, the motor is one of the most important components in the gearbox. Used to turn the gears, the motor is central to proper function. When selecting gears, make sure to get a motor that complements the gears. This will be discussed more in part 4.

Trigger Assembly- Consisting of many unnamed components, the trigger assembly is two metal contacts that, when connected by the main trigger contact, allow energy to flow from the battery to the motor.

Gearbox Shell- Encases all the other components

Part 4- Upgrades and Recommended Products

- ➔ Gears
  - ◆ Budget: SHS/Rocket, SLD(SLD has better QC than SHS but is nearly identical)
  - ◆ Best: Siegetek *(Especially good for DSGs)*
- ➔ Motor - In a motor you should be looking for neo or "nsFb", as ferrite motors are now obsolete.
  - ◆ Budget: ZCI High Torque (22 TPA), SHS High Torque (16 TPA)
    - Be cautious when purchasing ZCI as they have bad QC
  - ◆ Ideal: Star Wei, Tienly GT, ASG INFINITY CNC-U *(ASG pinion doesn't mesh the best but can be replaced with an SHS O-Type pinion),* AAC
    - (SSG: ~28 TPA + 13:1/12:1 gears for efficient but possibly slower semi trigger response, ~22 TPA + 13:1/12:1 gears for a balance of efficiency and semi trigger response, and ~16 TPA + 12:1/13:1 gears for ROF.
      - Modifications may be necessary to correct overspin or PME.
    - (DSG:Includes 8 and 9 tooth variants. Your motor needs will change some depending on the desired joule output of the build. The principle behind SSG/DSG setups is largely the same in terms of motor and ratio combos. Some simple DSG setup examples include; 14:1 DSG + ~28 TPA motor for trigger response and a lower ROF, 14:1 DSG + ~22 TPA motor for a

balance of ROF and trigger response, or a 10:1 DSG + ~22 TPA motor for even faster trigger response. You may need to short stroke the piston, use a stronger spring, and trim the tappet plate fin to allow proper feeding

➔ Spring - In a spring you are looking for a consistent temper all the way through the spring, and no coatings.
- ◆ Budget: Stock
- ◆ Ideal: Guarder (SP), Prometheus (M), ASG (M) *(SP rating can be slightly stronger than M. rating)*

➔ Bushings/Bearings
- ◆ Budget: Stock, FLT bushings, SHS bearings/bushings
- ◆ Ideal: NSK bearings, FLT bushings

➔ Tappet Plate - Upgrade is usually only needed as you climb in ROF, a good tappet is especially important in a DSG.
- ◆ Budget: Stock, SHS/Rocket, Lonex
- ◆ Better: Prometheus
- ◆ Ideal: Retro Arms CNC

➔ Anti-Reversal Latch
- ◆ Budget: Stock
- ◆ Ideal: Lonex

➔ Piston - You are looking for a full steel-tooth rack here. FMR = Full metal rack
- ◆ Budget/Ideal: CYMA FMR, SHS 15/14 Tooth, Lonex red FMR , APS FMR.
  - Make sure to superglue the piston rack in so as to prevent it from kicking out from the piston body during use

➔ Shims
- ◆ Budget/Ideal: Most steel shims work fine(example: SHS)

➔ Air Nozzle
- ◆ Budget: Stock (Such as VFC)
- ◆ Ideal: Lonex, SHS, Maxx

➔ Cylinder Head

- ◆ Budget/Ideal: Lonex, SHS

➔ Piston Head

- ◆ Budget/Ideal: Lonex POM *(Don't buy mushroom piston heads, they're a gimmick)*
  - Make sure to use some Loctite on your piston head screw so that it doesn't walk out when firing your AEG
  - X-rings are nice for a potentially better and faster airseal if your O-ring does not produce desired results

➔ Cylinder

- ◆ Anything can work here: non-ported brass or steel, so long as they polish and provide a good airseal. Avoid aluminum as they do not polish and can get marred easily

➔ AOE Correction - Chemical resistant, hard sorbothane or polyurethane.

➔ Gearbox Shell

- ◆ Budget: Stock, VFC, G&P, Krytac, Specna Orion, ICS, Lonex
- ◆ Ideal: Retro Arms CNC

➔ MOSFET

- ◆ Budget: Jefftron Mosfet 2, GATE NanoASR, DIY 3034
- ◆ Better: BTC Spectre MK2, GATE Aster, GATE Warfet
- ◆ Ideal: GATE Titan Advanced

➔ Lube

- ◆ Ideal/Budget: Superlube PTFE Synthetic Grease *(Good for general multipurpose use)*

➔ Batteries

- ◆ Budget: Turnigy Nanotech, Tenergy
- ◆ Ideal: Turnigy Graphene, Matrix High Performance

Part 5- Good practice and habits

Shimming- A shim is a piece of metal resembling a washer that goes onto the axle of your gear. The purpose of shimming is to eliminate up and down movement of the gears, and to minimize friction between the gears. If done correctly, this will create a relatively quieter, more efficient, and more reliable AEG.

I will walk you through the steps to properly shim your AEG, and link some videos to reference to. Note - Some people shim Spur to Bevel, but you should ALWAYS shim Pinion to Bevel, so you don't throw off your Motor height and Pinion to Bevel meshing. Remember that every gearbox is different, and may require a different amount of shims & work.

- https://www.youtube.com/watch?v=m0yU-_prZyY&t=1689s
- https://www.youtube.com/watch?v=ApS1xMFN3yg&t=2s
- https://www.youtube.com/watch?v=ZahpxfCsSAY&t=221s

1. The first step in shimming your AEG is to take everything out of the gearbox(see part 5).
2. After you have removed everything, you should be left with just a gearbox shell. Make sure your gearbox shell is clean. At this point, superglue in your bushings or bearings and ensure they are perfectly flat inside the gearbox - you WILL NOT achieve proper/good shimming results without this step. Put only the gears into the gearbox, tighten it down with screws, and observe the up and down movement of the gears. Spin the gears and listen to the rubbing sound that they make.
3. Set appropriate motor height and shim the Bevels bottom side. The best way to adjust motor height is visually. Put only the Bevel gear into the right side of the gearbox shell, put the motor into the grip, and manually adjust motor height until it meshes just right with the Bevel. You may need to shim the bottom of the Bevel gear to raise it up enough for the Pinion to correctly mesh. (see 12:30 in video 1)
4. Now shim the Bevels top side. Ideally, only about 0.1mm of wiggle room up and down and side to side should be present. Put the gearbox shell together with only the Bevel gear inside and screw it down. Attach the pistol grip with the motor inside and observe the meshing between the Bevel and Pinion. You're looking for a symmetrical alignment of the motors Pinion with the Bevel. With a small screwdriver, you can test the play in the gear by trying to move it up and down, left and right. Take out the pistol grip and test if

the gear is free spinning. If it’s not, remove shims from the top. Removing a shim from the bottom will destroy your hard work on the motor height and meshing. Keep all shimmed gears inside the gearbox after shimming for proper meshing.

5. Shim the bottom side of the Spur gear. Put your gears in the left side of the gearbox shell. Observe the gap between the Bevel and Spur gear, you want to minimize this gap as much as possible while not having the gear faces touching or rubbing. Add shims to the bottom of the Spur until you achieve this. You want to have as much gear teeth contact as possible for maximum transfer of energy and meshing.
6. Shim the Spurs top side. Test the up and down movement of the Spur by pushing up on the gear axle. Add an appropriate amount of shims to the top and close the gearbox shell. Repeat until you have approximately 0.1mm of movement. Again, test the free spin of the gears and remove/add shims as necessary.
7. Shim the Sector gears bottom side. By now, you may have a rough estimate on how many shim need to go onto the bottom. Observe how the Sector gear sits on top of the Spur gears gearface. Add enough shims to just raise the Sector gear so the gearfaces don’t touch.
8. Shim the Sectors Top side. Add/remove shims until you have approximately 0.1mm of up and down movement.
9. Test all the gears together in the gearbox. Screw down the gearbox, and spin the gears. If done correctly, there should be very little resistance between the gears, and should be very free spinning. If you hear rubbing or squeaking noises, check the gears position and alignment.
10. Test it all together! Observe the sounds your gearbox makes when shooting. The noise in your AEG should be drastically reduced and should sound much cleaner.
    Note - This is a very watered down view of shimming. It will take a lot of trial and error to get this just right. The best way to learn is hands on following video tutorials.

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Cleaning & Lubing- When opening up your gun for the first time, you’ll want to clean out the stock lube. Stock lube is often low-quality, cheap, sticky residue that will gum up your gears.
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Take everything apart, clean the bushings/bearings, gears, gearbox shell, and anything else that may have stock lube on it. Clean using rubbing alcohol, paper towels, and a toothbrush to scrub it all off. Once dry, use Super lube to grease the gears, piston track, tappet track, and gear axles. Use a very small amount of lube on the inside of the cylinder. Do not over lube. Here is another video for reference- https://www.youtube.com/watch?v=cK3ihESAakk&t=536s

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AOE- Angle of engagement, or AOE, is the area in which the first tooth of the Sector gear contacts the first tooth(Pick up tooth) of the piston. Oftentimes, this will need correcting in stock guns. If you find that your Sector gear is contacting the second to last tooth instead of the pick up tooth of the piston, you will need to correct this by adding a sorbothane pad to your cylinder head then shaving off one or more teeth from your piston from the pickup end if needed, so that initial contact between the sector and piston pickup teeth is parallel (do not take off the pickup tooth). This is done to eliminate "rolling contact" between the sector and piston teeth, to enhance durability of both. Here is a video depicting this process- https://www.youtube.com/watch?v=sI7agUdUsz4&t=15s

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Airseal & Compression - Airseal and compression go hand in hand. To check compression, take your piston, cylinder, and cylinder head. Push the piston into the cylinder fast, covering the hole on the front of the cylinder head. If you feel resistance and cannot push the piston any farther, you have good compression. If the piston has little to no air resistance, you have leaky/bad compression and will need to determine what is causing the leak, which may require new parts. Some compression leaks can be fixed using $1 PFTE tape from your local hardware store, such as between the cylinder and cylinder head. Here is a video for reference - https://www.youtube.com/watch?v=0nHHu-E2KC8&t=432s

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Radiusing - To radius a gearbox means to take material off of the corners of the gearbox shell cylinder window in order to strengthen the gearbox and prevent cracking by spreading the force exerted by the piston around the corners of the window. To radius a gearbox, first locate your "steps". A step is any sharp corner in the cylinder window. To eliminate these sharp corners use a
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metal file or dremel. Here is a video showing the process of radiusing-
https://www.youtube.com/watch?v=lkuqMdKR4fo&t=134s
Note- This does not have to be an immediate modification, but is a good practice. However, due to G&G gearboxes being composed of a high zinc-content alloy, radiusing is a **highly** recommended modification to extend the life of this weak gearbox shell.

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Meshing - Meshing is how your gears interact and transfer energy to one another. The better the meshing, the more efficient the transfer, and quieter the gears. Gear shape matters significantly for proper meshing. For example; some gears such as a ZCI 9T or SHS10T bevel can mesh well with Siegetek spur gears, where some gears will not mesh well when put together. An example of this would be an ASG motor pinion gear and an SHS bevel gear.

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Rewiring - Typically, stock wiring isn't ideal. It is recommended to change wiring to a solid core 16 gauge copper wire to allow for faster transfer of energy. When changing wiring, Deans connectors are always preferred over Tamiya because of the lesser resistance offered by deans connectors. Specifics on soldering, heat shrinking, etc, can be found in this video-
https://www.youtube.com/watch?v=nr6xU3i-6cY&t=203s

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Short Stroking - Short stroking is the process of removing gear teeth and (optionally) piston rack teeth, and is usually done in conjunction with using a heavier spring. This is traditionally done to reduce cycle times, or correct overspin if needed. This process is often done using a dremel to remove around 2-3 of the back teeth from the Sector gear most of the time (or half of the entire piston rack when using a DSG). By doing this, you reduce your FPS as the spring is not as compressed, so you will also need to use a heavier spring to compensate. What this does is it reduces the return time of the piston to the cylinder head, therefore reducing the chance of PME. A general rule of thumb is for every tooth you remove, you will lose ~15 FPS and will need to use an appropriate spring to compensate. Video for reference-
https://www.youtube.com/watch?v=1WJUcJLvIeA
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PME Correction - This can be done to reduce the chance of or fix “PME” or premature engagement, which is when the gears cycle too quickly and catch the teeth of the piston rack before it has fully returned into the cylinder head. When premature engagement happens, it can destroy your sector gear and piston rack teeth, breaking your AEG. Correcting PME can be done in multiple ways including but not limited to: lightening the piston, using a stronger spring, slowing down the cycle via gear ratio or motor speed, or (not really recommended) a mosfet with active braking.

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Voluming - There is a certain ratio of the air volume of your cylinder and the air volume of your barrel. A simple, typically agreed upon ideal cylinder:barrel volume ratio is around 2:1, with the ratio being even higher when you use heavier BBs.
When your ratio is too low, you will experience a loss in joules. Undervoluming(a ratio of <1:1) often happens with stock guns when using heavier BBs (Imagine having 400 FPS with .20g BBs (1.49j) and then putting .32g BBs in and getting 280 FPS (1.17j).). You experience a loss in energy from using heavier BBs, usually due to manufacturers using improper parts to promote proper voluming such as: Bad airseal, ported cylinders, and unnecessarily long inner barrels.

Part 6- Disassembly

There are many guides on YouTube showing how to take the gearbox out of your AEG, but I will describe the general process:

For most AEG’s, you simply remove the body pin, slide off the upper receiver, unscrew the mag release and buffer tube, undo the wires to the motor, take off the pistol grip, remove the pin just above the trigger, and remove the gearbox. Here is one of many videos showing this process -
https://www.youtube.com/watch?v=dqAbDGKazuY
I will walk through the steps required to take apart your AEG’s gearbox, and will also list videos for reference.
https://www.youtube.com/watch?v=-CH0enjjQ_c
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https://www.youtube.com/watch?v=5gK7D4pl524&start=3s

https://www.youtube.com/watch?v=-CCWdq6Tg-Y

https://www.youtube.com/watch?v=SPovCo8wHi4

https://www.youtube.com/watch?v=c0i6YrWd1cE

https://www.youtube.com/watch?v=YrcrE1Q53oE&t=345s

1. Gather the correct tools needed for the job. Typically an IFixit kit will have everything you need
2. If your piston is not in a resting position, trip the ARL by putting a small screwdriver into the bottom of the gearbox and pull back the ARL. Unscrew the gearbox screws.
3. Insert a screwdriver into the hole in the spring guide to keep the spring guide from shooting out. Make sure to hold down the cylinder while doing this, and gently remove the top half of the gearbox shell. Once removed, unload the spring tension by taking the spring guide out with the screwdriver. If your gearbox has a quick change spring system, Inset the correct key and turn until the spring guide comes out the back.
4. Remove the tappet plate spring located in the front of the gearbox, and take out the entire cylinder/piston assembly.
5. Remove the gears, starting with the Bevel, then the Sector, then the Spur. This order does not particularly matter. Unless you are reshimming, be careful to keep the shims on the correct gears
6. Remove the ARL and trigger. The trigger has a little spring that fits into a groove on the gearbox, do not lose this spring. The ARL also has a very small spring prone to falling off, do not lose that either.
7. Remove the safety lever. This lever also has a tiny spring that you shouldn't lose. The safety lever is located right in front of the trigger
8. If the bushings are not glued, remove those as well
9. Remove the trigger harness/wiring assembly. Remove the spring tensioning the assembly, then undo the screws holding it in.
10. Remove the cut-off lever by undoing the screw holding it in.

11. Remove the Selector plate. Remove the spring on the selector plate first, then slide the plate out.
12. Perform basic maintenance listed in Part 4 if needed.

Part 7- Reassembly

Now that you have your AEG disassembled, how in the world are you going to reassemble it? Again, I will walk you through the steps required to reassemble your AEG, the videos listed in part 5 can still be used for reference.

1. Install the selector plate. Make sure it fits well inside it's tracks and moves freely.
2. Install the cut-off lever and attach the spring that goes between the selector plate a cut-off lever.
3. Install the wire/trigger harness and screw it in. Install the tensioning spring. Make sure the wires fit in the correct tracks in the gearbox
4. Install the safety lever, making sure to tension it with its spring. It should move freely
5. Install any bushing/bearings. It is recommended that these are glued into the gearbox shell, but not essential.
6. Install the gears. Start with the Spur and Sector. Now install the ARL and tension it all the way back and install the Bevel gear. If you did this correctly, it should prevent the Bevel from rotating clockwise. If it sits anywhere between the Spur and Bevel, placement is incorrect. The ARL is somewhat tricky to place, and will sometimes pop out of the gearbox. A handy tip to keep it in place is to use a strong magnet on the underside of the gearbox.
7. Place the cylinder head inside the cylinder, the air nozzle inside the tappet plate, and then slide the air nozzle over the cylinder head. Place the piston inside the cylinder. Put the entire assembly into the gearbox, making sure the holes on the cylinder head line up with the gearbox shell. Place the tappet plate spring back into the gearbox. The air nozzle and

tappet plate should move back and forth with each other. Make sure that the piston moves inside the tracks in the gearbox shell.

8. Install the trigger. This can be a little tricky because of the spring. You can use a little bit of superglue to keep the spring attached to the trigger if needed.
9. This is the trickiest part of all. Install the spring and spring guide. Place a screwdriver inside the spring guide and push inwards until the spring guide sits in the groove inside the gearbox. Make sure to hold down the cylinder while you do this or it will pop out.
10. Place the top half of the gearbox on. Do not force it, make sure that each post fits in correctly with the top half of the gearbox. If the gearbox appears to go back together but not exactly all the way, oftentimes pushing in the nozzle or pushing the spring guide in a little will allow the gearbox to close all the way.
11. Screw down the gearbox, check to make sure the piston is on its tracks, the air nozzle moves freely, no wires are in the way, gears are not too tight, etc.
12. Place the gearbox back into the AEG. Make sure you don't reverse the polarity on the wires to the motor.

Part 8- Things/Products to Avoid

- Plastic Piston Tooth Racks: These will wear out very fast and should be replaced with full metal rack pistons as soon as possible.
- Plastic Spring Guides: Replace these with a metal and preferably ball bearing spring guide.
- Plastic/brass Bushings, Gears, ARLs, and Cutoff Levers: Should be good metal (quality steel, 7075, chromoly, etc)
- Clear nylon air nozzles: Not only ugly, but prone to breaking/cracking
- Over-Lubing: Your gears and O-Rings don't need to be caked in lube.
- Low TPA Motors: Motors under 16 TPA are inefficient. They are often labeled as "high speed" as they will have a greater maximum RPM compared to higher TPA motors. A low TPA motor is often paired with high ratio gears, this is inferior to a high TPA motor

and low ratio gears in semi-auto focused builds as shown by the larger amount of power it draws from the battery, the heat produced, and the acceleration time of the motor. (This is somewhat controversial in the teching community, see videos testing and proving this)

- https://www.youtube.com/watch?v=99gn3jXZYJI&t=
- https://www.youtube.com/watch?v=_h8fLasWTIA&t=1s

Brands to avoid

- Lancer Tactical
- Angel Custom parts
- Some G&G parts
- Some KWA parts

Conclusion- So now you know the inside and out of your gearbox! Congratulations on your first adventure in the fun, expensive, and sometimes frustrating world of teching.

Note- A lot of information in this guide can be used for other gearbox versions, with minor differences between each version.