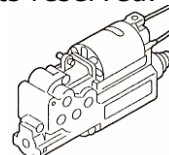
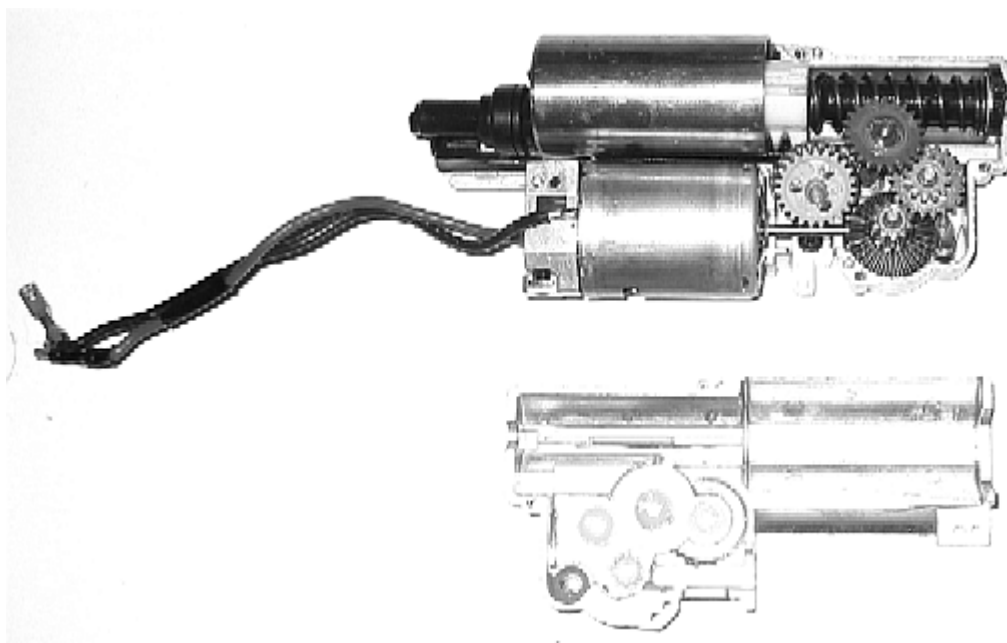
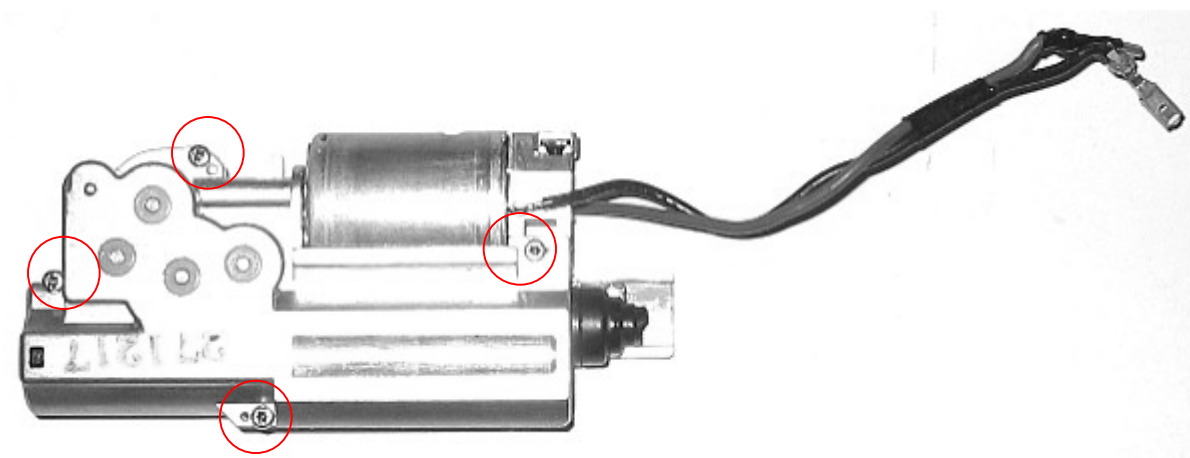
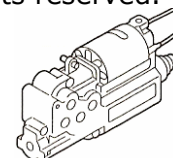
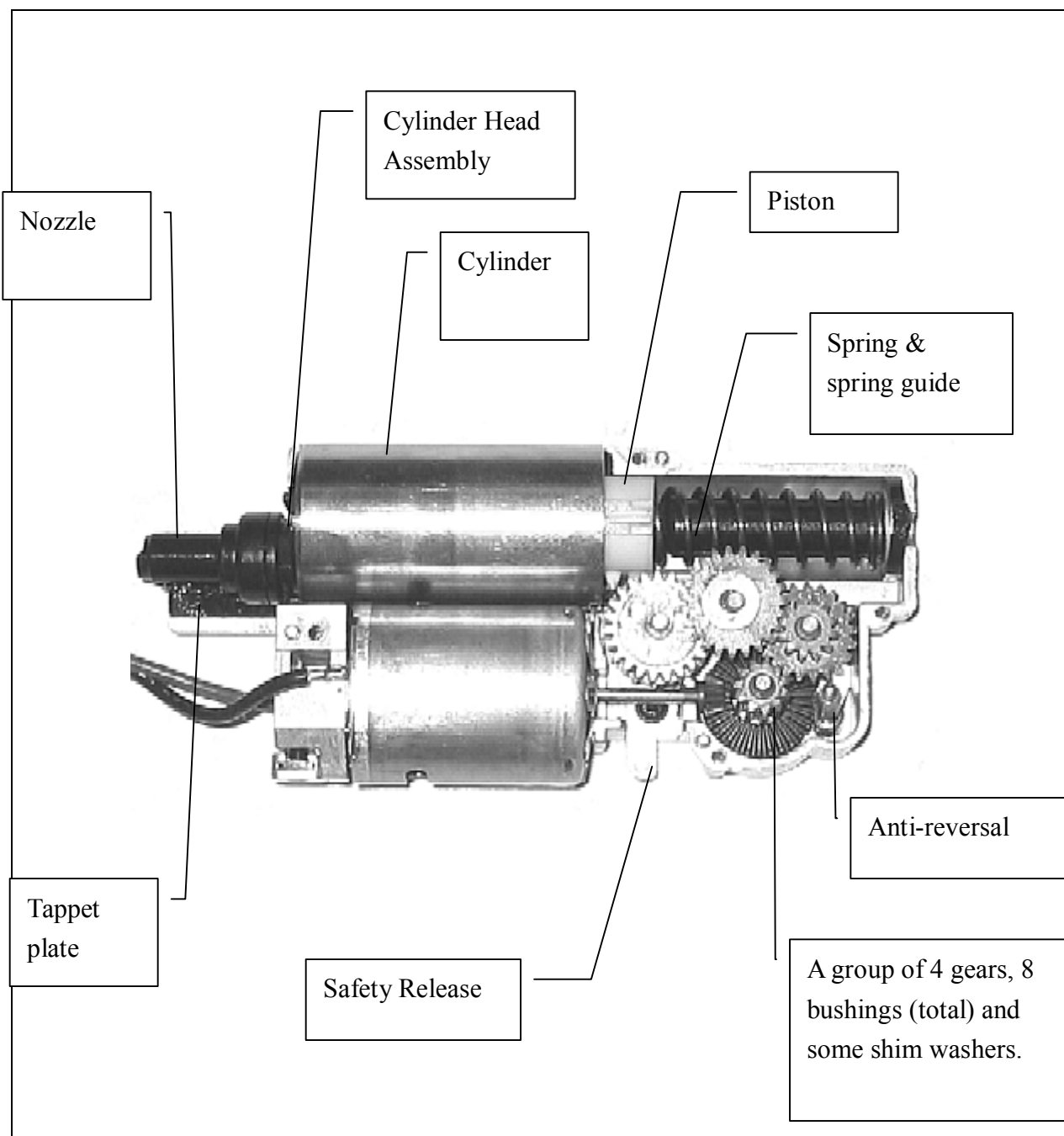


Step 1: Opening up the mechbox

With a small flat head driver or a Torx driver of the correct size, remove the 4 Torx screws.

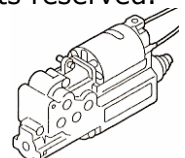




In case you need to re-route the wires for external battery connection:

We strongly suggest that you first get all the necessary soldering works and wire connections done before assembling the mechbox. Depending on the gun model and the planned location of your battery, you'll need to plan the length of the wires for battery connection carefully. You must also plan the length of the motor wires – remember, the wires need to be properly routed inside the gun frame before reaching the motor (to avoid getting in the way of any moving parts along the assembly process), therefore it is always preferable to keep the motor wires a little longer than required. Due to the small room inside the gun frame and the relatively low power requirement, you don't really have to use thick wires. AWG 18 wires are fine.

Warning: don't mix up the pos / neg wires. Use red wire for pos(+) connection and black wire for neg (-) connection. At the cap of the motor you should see the pos side painted in red.

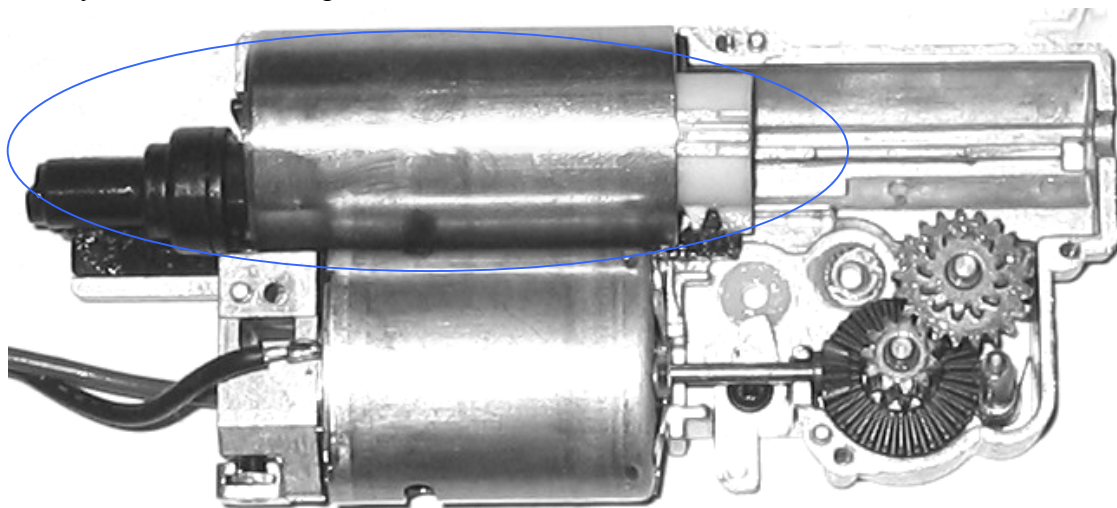


Advanced SMG Mechbox Guide FULL VERSION

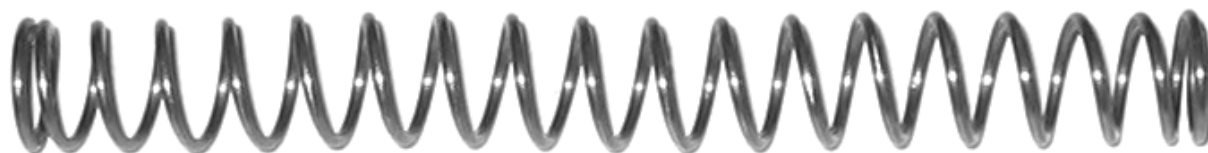


Cylinder, piston, air nozzle, spring guide and spring:

The cylinder set and the piston:

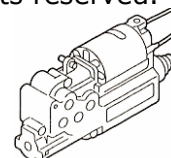


The stock spring:



Note that by using the Nine Ball power upgrade spring you may accelerate damage to the inner side of the cylinder head.

Spring guide and washer:

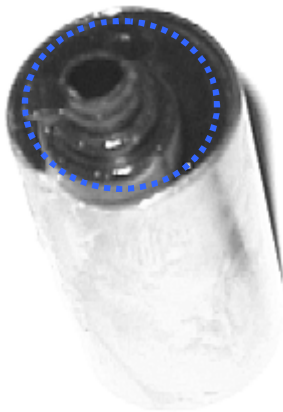


You need to pay particular attention to several issues here:

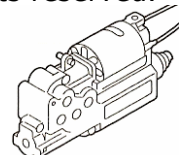
1, Does the air nozzle have a dimension that allows a smooth fit with the cylinder head nozzle? A loose fitting will fail to seal air, while a tight fitting may lead to air nozzle breakage or jamming. Keep in mind that the SMG/MP7 mechbox is different from the regular AEG mechbox in that its air nozzle goes **INSIDE** the cylinder head nozzle. Therefore, the outside surface of the air nozzle is directly in touch with the inner side of the cylinder head nozzle. Improper lubrication coupled with extended use can lead to wear and tear on both (as both are made with plastic).

Having one of them replaced with metallic part may not be desirable as it will accelerate the wear and tear of the plastic part.

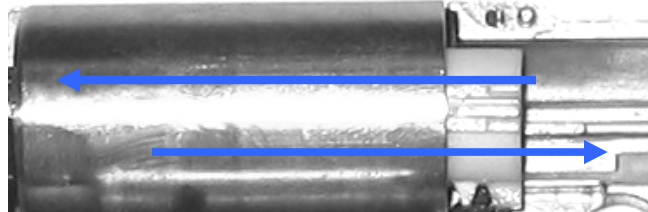
2, Does the cylinder head nozzle wobble (it can happen due to damage in the cylinder head). If it does, fix it (instant cement will do for tiny damage) or get a replacement before moving on.



3, Test fit the piston with the cylinder. When you move the piston inside the cylinder you should feel a certain level of resistance. If there is no resistance at all, the piston O'ring is no good (it is allowing too much air leakage, which can result in real serious performance drop). On the other hand, if there is too much resistance, the spring will have a hard time pushing the piston and will lead to



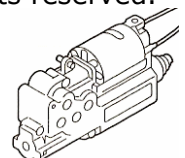
both FPS drop and ROF drop. Based on our experience, the stock TM piston is one of the best in terms of air sealing. However, wear and tear is unavoidable and the O ring has to be replaced on a regular basis (per every 30000-shot as a recommendation).

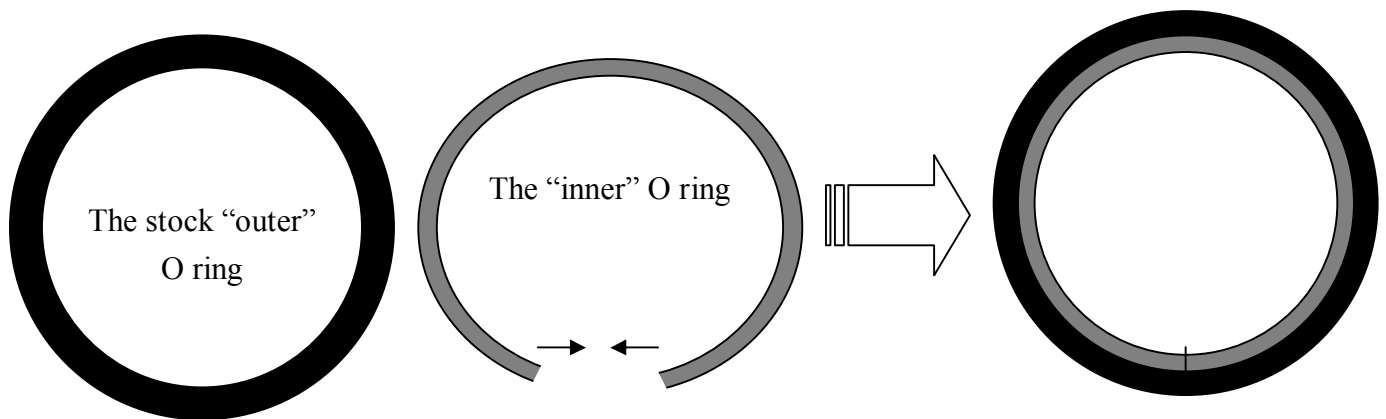


When buying a new piston O ring, by all means take your current cylinder / piston set with you to the hardware store and try things out on the spot. You want an O ring large enough for a slightly tighter fit with the cylinder (so you can improve compression), but at the same time you don't want an O ring that is too large. An over-sized O ring will make it very hard for the piston to move inside the cylinder and will increase the load of the motor and the battery quite significantly.

** Remember to also check the inner diameter of your replacement O ring. If it is too large (an inner diameter almost as large as the overall diameter of your piston head is way too large), it may fail to sit inside the "channel" of the piston head during rapid piston movement. If part of it comes off, your mechbox will immediately jam.*

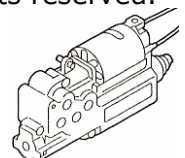
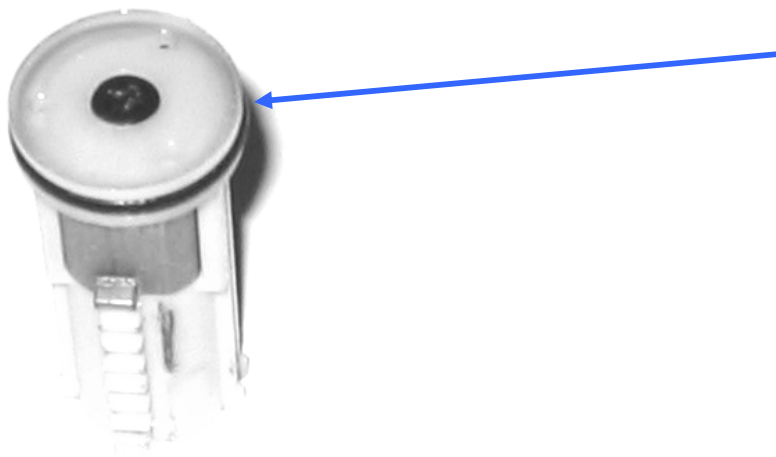
What if you can't buy a piston head O ring of a suitable size? One little trick is to buy a smaller and thinner O ring, then cut it short a little bit to make it just long enough to wrap around the inside of the piston head.





Put it in first, then put your stock O ring back in (so your stock O ring can wrap around the thinner O ring). This way you can slightly increase the effective dimension of the “outer” O ring (for better compression) and at the same time retain some “flexibilities” without introducing too much friction along piston movement (an oversized O ring can produce too much friction and lead to fast wear and tear on the O ring rubber as well as serious FPS drop).

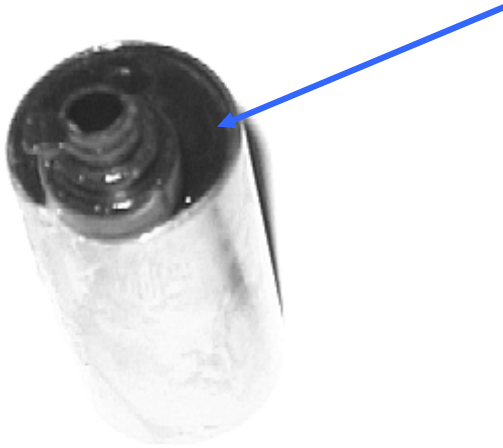
Applying grease around the piston head O ring is a measure primarily for ensuring smoother movement – with proper lubing the O ring can have less wear and tear (and can last longer). Most of the time you should not need to replace the O ring unless FPS drop becomes apparent. Do keep in mind, an O ring that fits with the cylinder tightly WILL wear faster due to more friction imposed on it during piston movement.



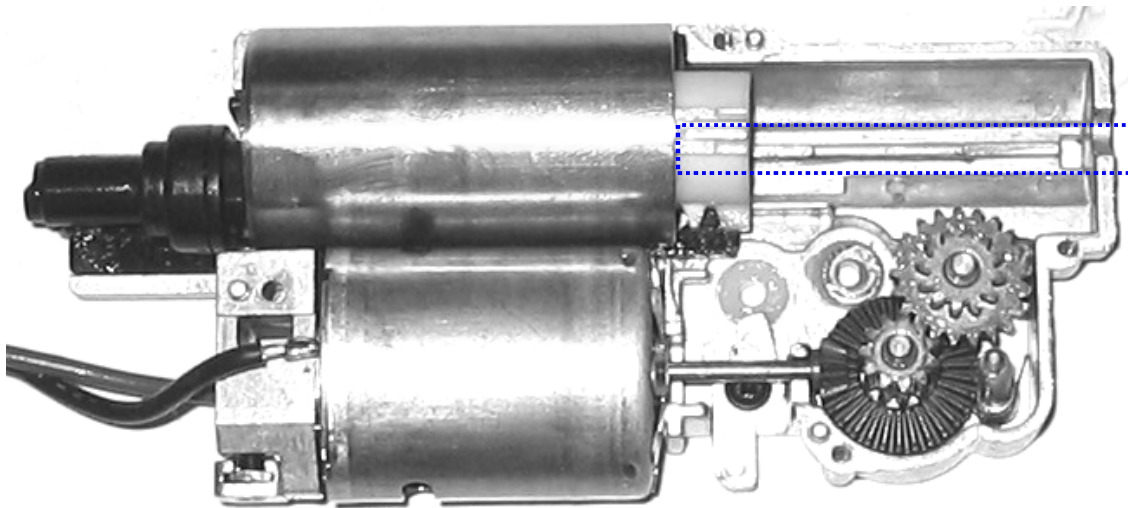
Advanced SMG Mechbox Guide FULL VERSION



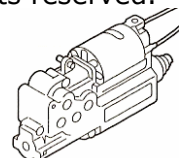
You may also apply grease around the cylinder head for better air sealing. Since the cylinder head does not move, in theory its O ring should not wear out by itself. Still, you may want to regularly check and reapply grease around it if necessary during your regular maintenance effort.



Also pay attention to the side stripes of the piston. Perform test fitting prior to formal assembly. You must be able to get the two halves of the mechbox shell perfectly closed and at the same time allow the piston to slide smoothly. Proper lubrication along the side rail is critical here.



4, If you are using a custom made spring (don't get me wrong, I have nothing against custom made spring), before installation you need to test fit it both sides



with the spring guide. This is because along spring compression most part of the spring will eventually be in touch with the spring guide and if any part of the spring does not fit with the spring guide your mechbox will get locked up eventually. **Remember, a good fit should allow all parts of the spring to freely rotate along the spring guide (especially when the spring is fully compressed).**

5, After about 20000~25000 shots, check the spring for use by the anti-reversal. You may need a replacement.

Gears:

The SMG/MP7 mechbox uses 4 gears (there are 2 spur gears).

If you are replacing some or all of the stock gears with third party gears, always try to mesh the gears by hand and see if they fit together well. In fact it is always suggested that you buy all four gears from the same manufacturer to ensure the best possible fitting.

Metal bushings / bearings:

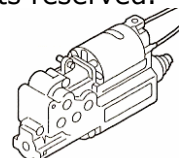
The SMG/MP7 mechbox uses 8 plastic bushings by default (two for each gear).

Not all bushings / bearings are of exactly identical dimension. Therefore, you have 2 issues to deal with here:

1, Compatibility with the gears: test fit the gears with the bushings/bearings and make sure that the bushings/bearings can comfortably accommodate the gear axles without much "play". This is especially necessary if you are buying ball bearings from the local bearing shop.

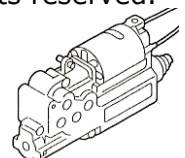
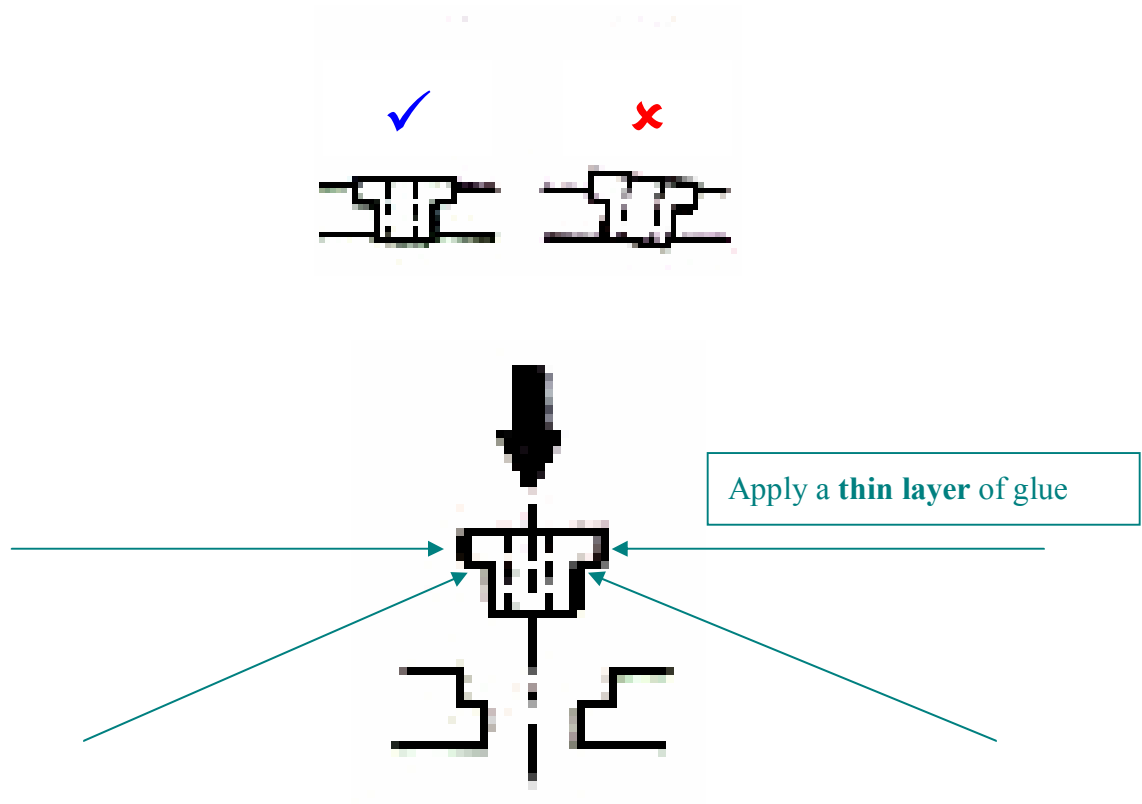
2, External compatibility: test fit the bushings/bearings with the mechbox shell. They should NOT be allowed to easily spin on the place holders.

If the bushings/bearings are OK, then let's follow the advice presented in our **Practical AEG Upgrade** and have them firmly inserted into the mechbox



shells:

When installing new bushings, make sure you have them properly aligned with the place holders. Additionally, we recommend that you glue them in place, or otherwise they may go loose and spin together with the gears after prolonged use.



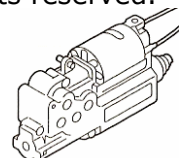
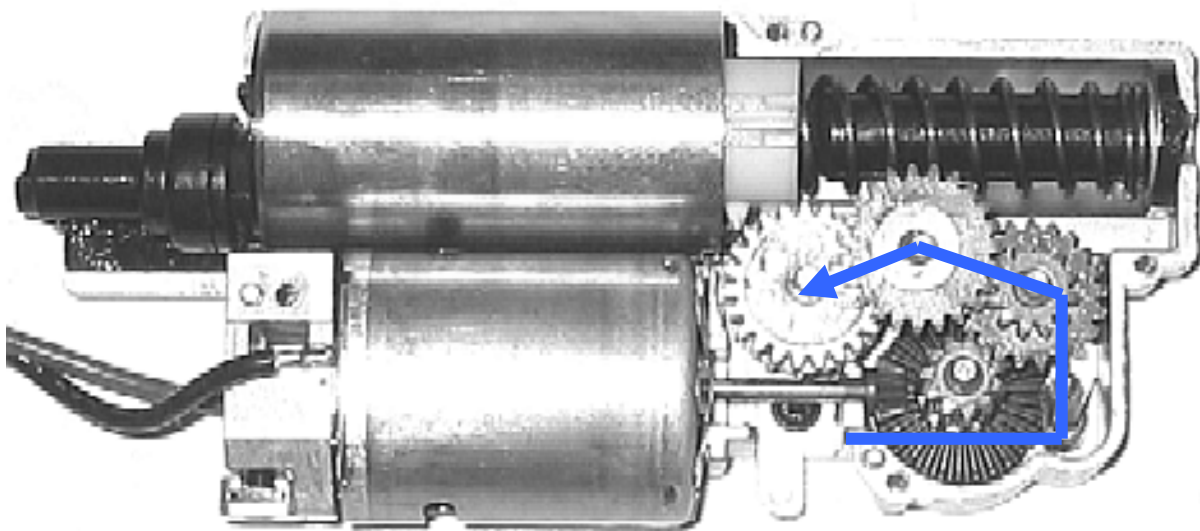
Step 2: Shimming

Start by removing everything on the mechbox shell except for the bushings and the safety release. By removing almost everything on the mechbox shell you can focus solely on the insertion and shimming of the 4 gears (and the anti-reversal). An almost empty shell gives you a clearer view of the gears in action.

The reason why you need to carefully shim is that different makes of bushings and gears all have small variations in "thickness". Some gears may require a 0.1mm shim washer on one side while some others may require totally no washer on the top at all.

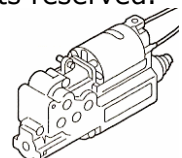
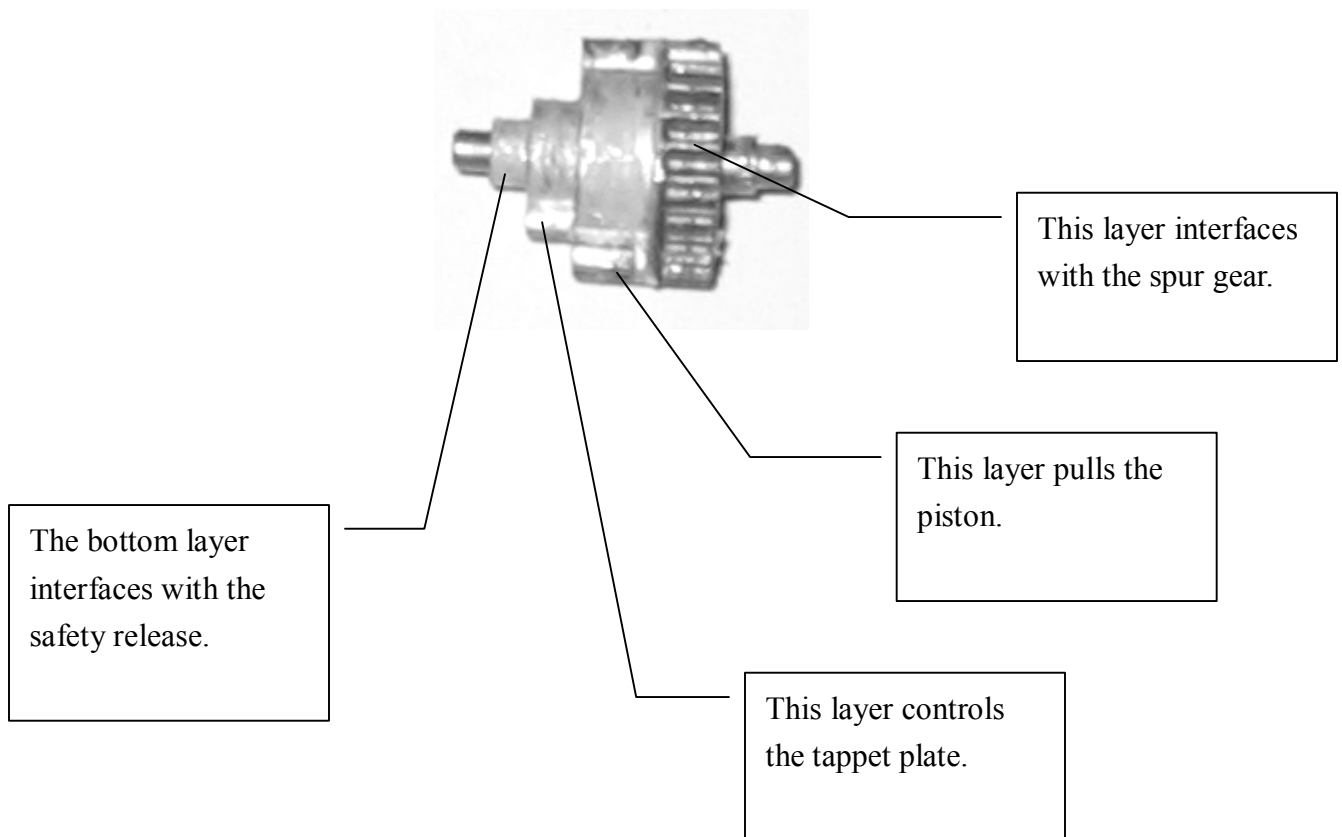
We recommend that you start shimming from the sector gear because it is the gear that interfaces with most other parts inside the mechbox. Below shows the gearing sequence (NOT the gear insertion order) of the MP7/SMG mechbox:

motor pinion -> bevel gear -> spur gear 1 -> spur gear 2 -> sector gear



The sector gear:

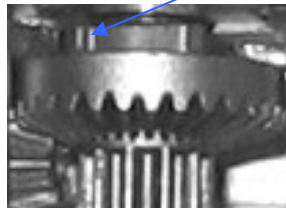
Note the special design of the sector gear (the gear directly in touch with the piston). It has 4 layers.



The bevel gear:

Be careful when shimming the bevel gear. You must ensure that the anti-reversal latch can maintain proper alignment with it. This issue is often ignored by beginners – a latch with improper alignment can damage or wear out real fast.

* The bevel gear interfaces with the anti-reversal right above the bushing / bearing:

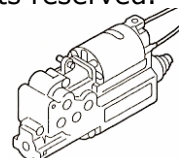


Another frequently ignored issue: when you shim the bevel gear pay attention to how many washers (and how thick these washers are) you put at its bottom. Remember, the motor pinion has to get in touch with it in order to turn the other gears. You cannot adjust the vertical alignment of the motor pinion, therefore if the bevel gear is shimmed too high the contact with the pinion may become too tight for the motor to turn.

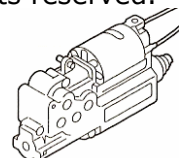
When shimming has been initially completed you need to determine if any of the gears have been over-shimmed. As said in our **Practical AEG Upgrade** guide:

If you have difficulties putting the two halves of the mechbox back together, chance is that you have put too many shims somewhere. One extra needless shim on either side of any one gear will usually make it impossible for the two halves to perfectly close.

Hold the 2 halves together tightly and see if the gears still have room to “play” from both sides of the shell. If they are okay initially, then tighten up the



mechbox with screws and retry. If they can spin smoothly without much “play”, write down the current setting on a piece of paper, remove the gears and washers and move on to the next step.

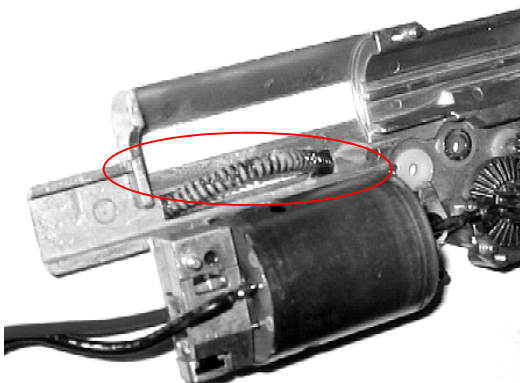


Step 3: Installing the tappet plate and the cylinder set

The nozzle is inserted directly into the cylinder head assembly. One side of the nozzle has a small plastic tab for “plugging” into the tappet plate.

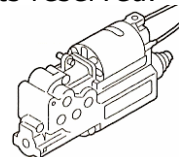


This knob interfaces with the tension spring which sits on the mechbox shell, right behind the tappet plate.



This is the contact point between the tappet plate and the sector gear.

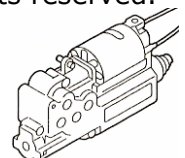
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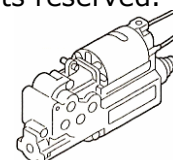
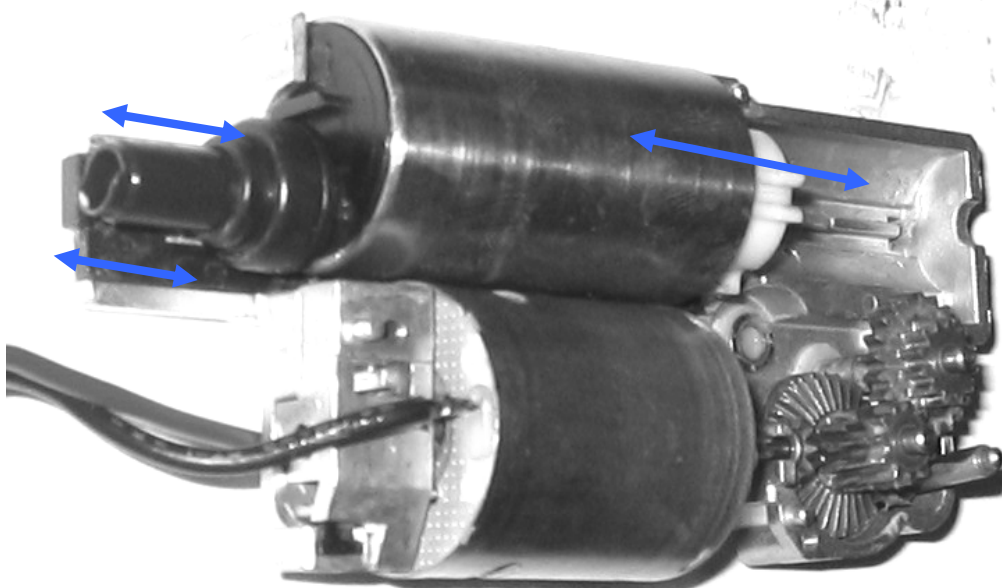
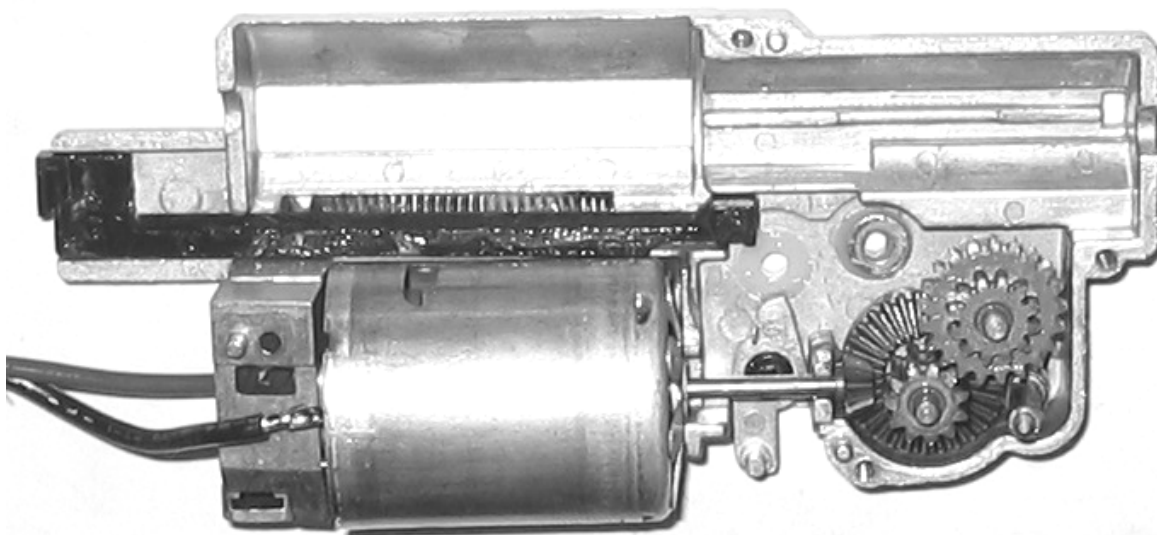


When you install the tappet plate you must also deal with the air nozzle and the tension spring (as you must have them installed together). Note that:

- the tension spring, after prolonged use in full auto mode, can eventually get weakened, which can affect ROF. A stiffer replacement can contribute positively to ROF as the tappet plate can move outward faster, but at the same time it has a slightly greater chance of breakage (the small plastic tab of the air nozzle may also break upon high impact). Don't use anything significantly stiffer here, and absolutely avoid using one that is softer than the stock one.
- you need to lube both sides of the tappet plate with grease.
- you need to lube the outer surface of the air nozzle with a very thin layer of grease as it has to constantly move within the cylinder head nozzle for every shot the gun makes. This thin layer of grease can also contribute to air sealing. However, don't apply too much grease, or some of the grease may get in the way of the air nozzle's opening.

You need to have the tappet plate, the cylinder set and the piston comfortably sit on the mechbox shell. Test moving the piston and the nozzle. Make sure they can slide smoothly. *The tappet plate should be able to move together with the nozzle.*



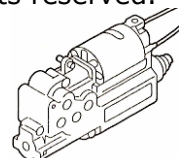


Step 4: Installing the gears

The suggested order of gear insertion (assuming you have to install every gear from scratch, and that you have already test-shimmed the gears so you know the proper amount of shim washers to use for each gear):

1. Bevel gear, anti reversal and the first spur gear (the spur gear right next to the anti-reversal)
2. Motor and motor pinion
3. Sector gear
4. the second spur gear

* You can't insert the sector gear without first installing the cylinder/tappet plate/piston.

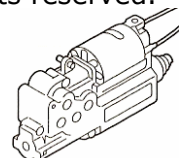
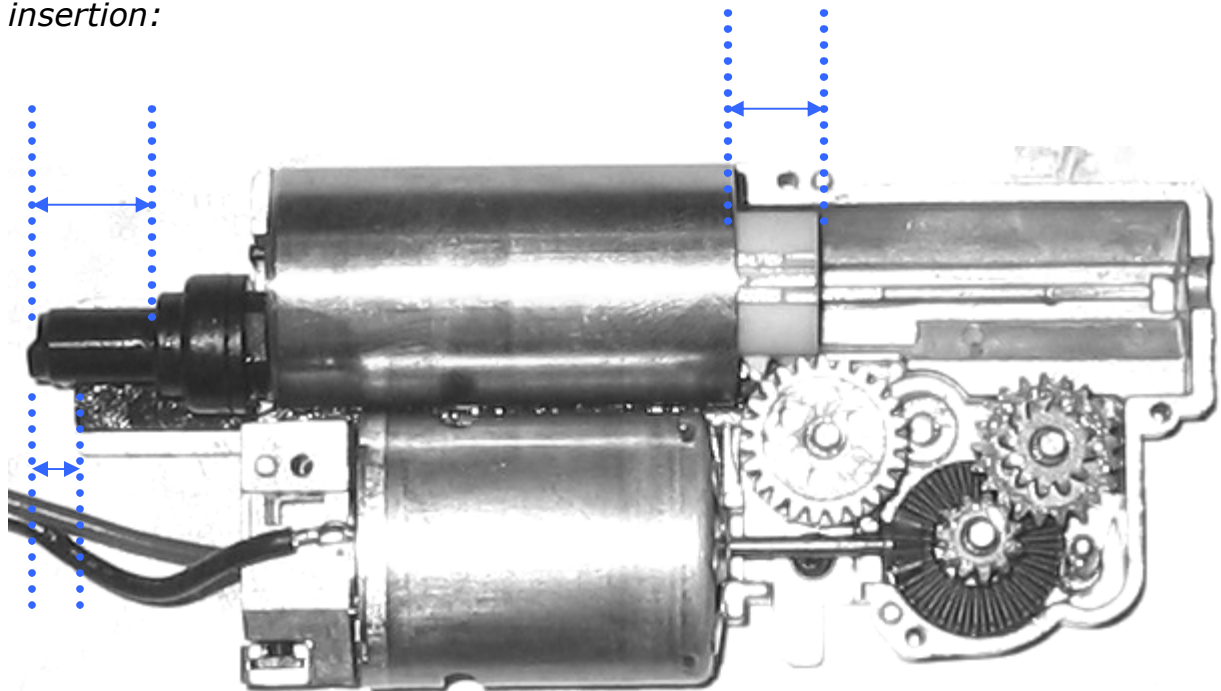


Step 5: Completing the installation process

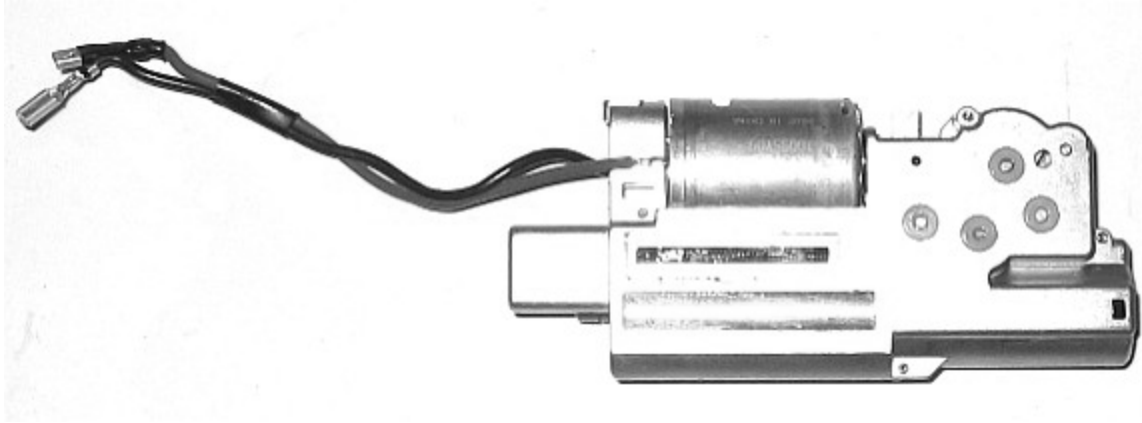
Once the gears are in place, you may put in the spring and the spring guide. Finally, close the mechbox. Our **Practical AEG Upgrade** guide covers in-depth the issue of spring, spring guide and piston fitting.

To minimize the chance of running into problems, when installing a long spring you should remove any spacer on the spring guide (OR inside the piston). While a ball bearing spring guide is a good idea, it itself is also a spacer with significant thickness.

Note that for the MP7/SMG mechbox the issue of “one O’clock gear timing” does not really exist. The reason is that at the time you put in the sector gear the first three layers of the sector gear must have interfaced with the safety release, the tappet plate and the piston correctly. You can’t go wrong with this. *The picture below shows the exact position of these components at the time of sector gear insertion:*



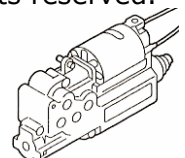
Step 6: Testing

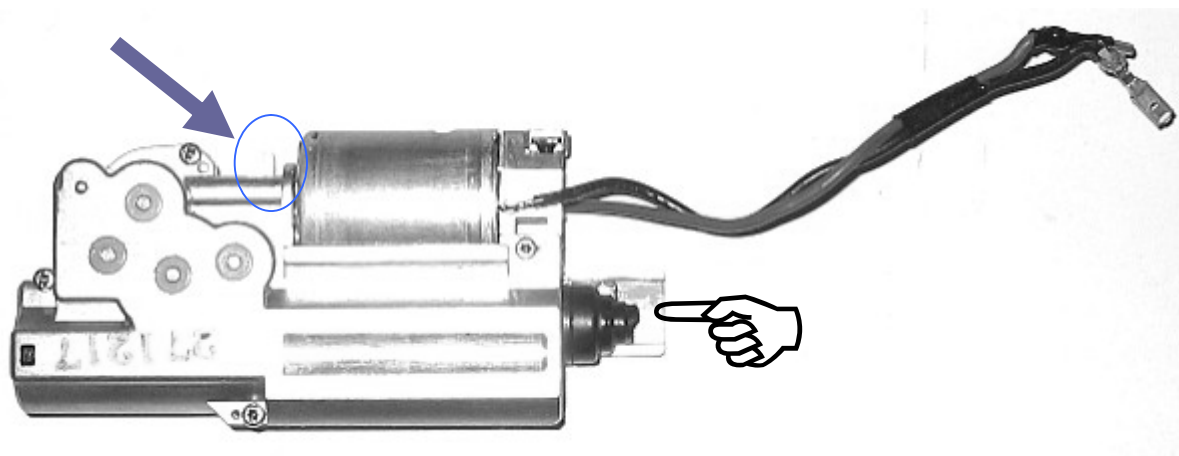


At this point, perform two tests manually to ensure that the mechbox has been properly assembled without glitches:

1, Use your finger to push the air nozzle inward. Can it move easily? And does it rebound by itself afterward? If it does not, that means something is wrong with the tappet plate or the tension spring behind it, or that something has gotten in the way of the tappet plate. You will need to open up the mechbox again to find out what has gone wrong.

2, Try to push the safety release. Can it move easily? And does it rebound by itself afterward? If it does not, that means something might have gotten stuck inside the mechbox.





If your mechbox can pass the above tests, you may initially conclude that the assembly process has been successfully completed. Further testing should be done with battery power connected after putting the mechbox back into the gun frame.

