



GUNCAD EVOLVED - THE 3D PRINTED AUG

The Simplified Guide

A passion for advancing 3D printed firearms engineering and iterative design revisions efforts have resulted in a groundbreaking hybrid material firearm known as the NylAUG. Part surplus kit, equal parts innovative 3D printed design with a healthy addition of light metal fabrication, the end result is an improved semi-automatic bullpup rifle that costs less and delivers more than the original weapon.

Designed to be printed with ease (minimal supports), an emphasis on cutting edge 3d printing technologies(heat resistant nylon filament), and some spacey lines sure to turn heads at the range.

The NylAUG reliably fires the original 5.56 rifle cartridge, and includes a bevy of exciting printed accessories including extended mag release, shell deflector, hand guards, even a robust 3D printed magazine. Join us as we push the envelope of GunCAD with the NylAUG program.

LEGAL NOTE (FROM ANDYOU MAYCALLMEV):

Welcome to the Nylaug build. This build has been two years in the making and we are excited to share it with you all. A good portion of the last few years has been determining a way to make this build as legal and safe as possible, and many hundreds of hours from multiple individuals have been poured into this.

Whenever building a semi-auto gun from surplus parts kits it is important to be aware of ATF opinions and rules regarding these builds. I am not your lawyer, I am not licensed to practice law, and I am not an ATF agent. At this time the ATF has not issued any opinions that directly relate to the surplus Aug kits or builds regarding denials.

When importing the Aug, Steyr created several denials, the most important being the receiver latch denial and the FCG denials. In doing so, the semi auto factory Aug receivers have a narrow latch opening preventing installation in a surplus stock. Traditionally the Aug community has considered this to be the most important denial as an Automatic FCG can drop into a surplus stock. As of this writing the ATF has not published an opinion concurring with this. Several SOTs in the development group have conferred with their IOIs and received guidance that it appears this is one denial, but not the only possible denial. As such it is up to the user to make sure they do **DO NOT POSSESS A FA FCG UNIT** that can drop into their build. Possession of a semi auto Nylaug receiver, a surplus stock without denials, and a FA FCG effectively makes the FCG housing into a Drop In Auto Sear and subject to NFA rules. This is not an official published opinion but guidance given both verbally and in writing from the IOIs. This aligns with how the ATF treats Glock frames (despite the existence of the Glock Switch), M14s (their stocks can all accept FA FCGs), the M1 (despite the existence of the M2 carbine drop in FA parts and stock), and countless others.

If you find that you would rather purchase a semi-auto stock from Steyr instead of denying a surplus stock, the team has created a receiver variant that fits that stock.

In order to prevent you from building a machine gun accidentally, the Nylaug team has created a number of denials that, if completed, render the gun unable to function in FA. Unless you are an SOT, it is recommended that you pay very

serious attention to these denials and do not begin printing a receiver until you have completed these in full.

I wish you the best of luck in your Nylaug journey and cannot wait to see pics of your completed builds!

ANDYOU MAYCALLMEV
3DPrintFreedom.com

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1. Hardware List

1.1 The Off the Shelf Build

Part	Count	McMaster	Notes
3DPrintFreedom Barrel	1		Available at 3DPrintFreedom.com
OPTIONAL: KAK Gas Block	1		Available at 3DPrintFreedom.com and KAK Industry
OPTIONAL: Parts Kit	1		Available at shops.tituservers.com
2.5mm drill bit	2 (always have an extra bit handy)	5058N56	Method A rear stock denial for threaded portions
3mm drill bit	2	5058N57	Method A and B rear stock denial
#51 drill bit	2	2901A226	Method A and B rear stock denial pilot hole, any tiny drill bit will do
3/8" drill bit	2	2901A133	Method A and B rear stock denial countersinking holes; any large bit will do
1/2" piece 3/16 key stock	1-3	98870A120	Method A and C rear stock denial, for front stock denial
3" piece of 3/16 key stock	1-2	98870A192	Method A and C rear stock denial, for front stock denial
M3 tap	1	8305A12	method A rear stock denial
8mm M3 flathead machine screw	4	91294A128	Method A and B rear stock denial
16mm M3 flathead machine screw	2	91294A134	Handguard and top rail
300mm M3 thread rod	3-5	90024A218	Receiver assembly
M3 jam nuts	20	91828A211	Receiver assembly, handguard, top rail
M3 nylock nuts (alternative to jam nuts)	20	90576A102	Receiver assembly, handguard, top rail
M3 washers	12	98689A112	Receiver assembly
M3 Heat Inserts	2	94459A434	Receiver assembly
M4 heat inserts	3	94459A150	Top rail
16mm M4 sockethead screws	3	91290A154	Top rail
M4 nuts	1	90592A090	Top rail
M4 washer	4	98269A430	Top rail
1/2" steel tubing	10.7" length	9220K361	Op rod bushing
1/2" reamer	1	2995A74	Optional op rod bushing reamer. Or use drill bit
JB Weld Original	1	7605A4	Stock denials

You will also need:

- Minimum 75 Grams High Temp Filament (Most successful: Coex Nylex CF/GF, Matterhackers NylonX, Sainsmart ePA-CF)
- Minimum 250 Grams PLA+
- 3D printer with hot end capable of 260C+ (typically an all metal hotend)
- Vise
- Drill
- Dremel
- Hammer
- Punches
- Hacksaw
- File
- Sandpaper
- Soldering iron

Nice to have:

- Drill press
- Bench grinder
- Center punches
- T handle for taps
- 7mm Nut driver for tightening the nuts onto the receiver threaded rods

If you intend to press your stub out on your own:

- Hydraulic press, 12 ton minimum, 20 ton recommended
- Mallet
- Homemade pressing jig or 3/4" washer
- OR if you are both poor and a mad lad, rent a ball joint press from the local auto repair shop

2. Trigger Pack Semi-Auto Conversion

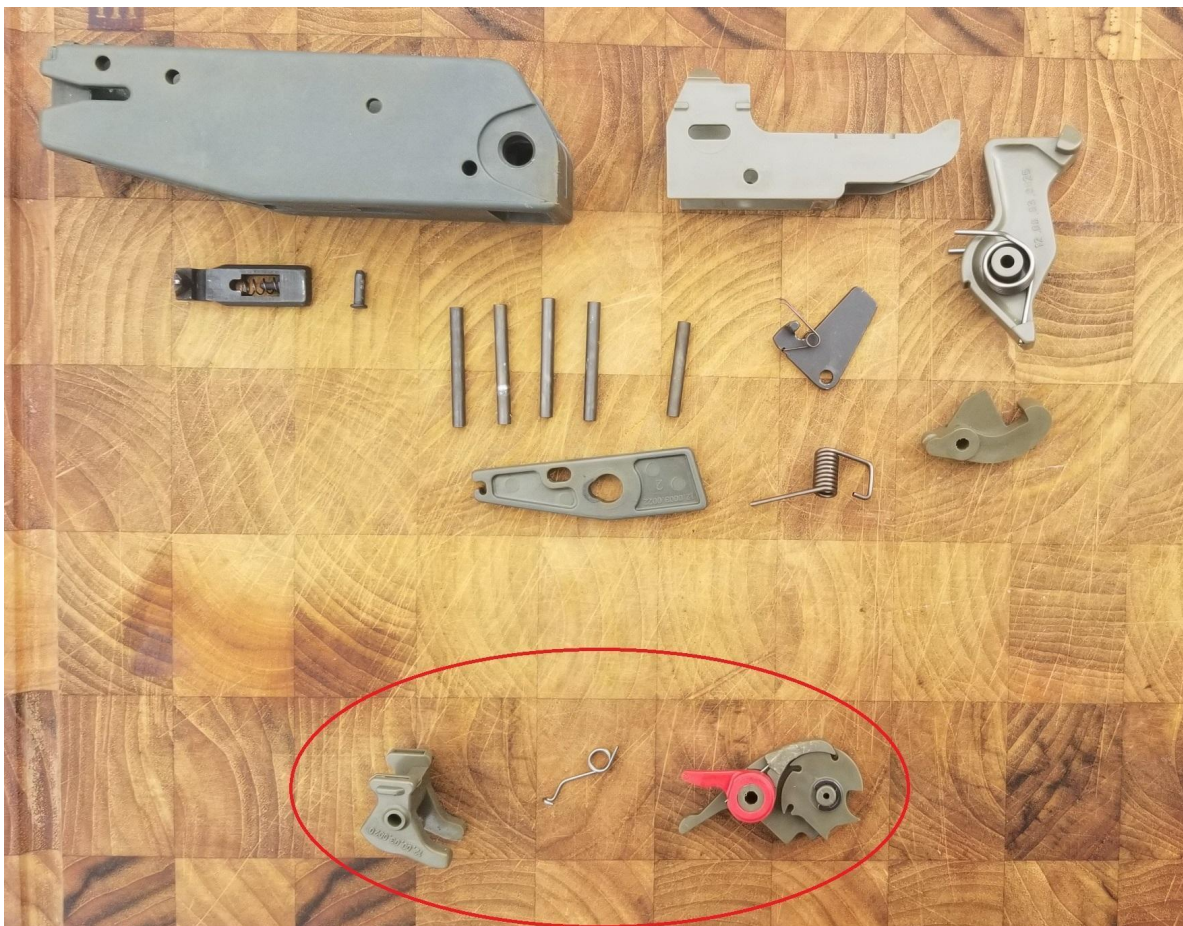
2.1 Tools and Parts

1. Dremel
2. Hammer
3. Punch
4. TriggerPackSpacer.STL
5. TriggerPackClearanceCutJig.STL
6. Sear Denial.STL

OPTIONAL: PrintedHousing.stl (under Accessories) This is a printed FCG housing with integrated denials. This means you will not need to cut up the factory FCG housing

2.2 Parts Removal and Conversion

The first thing to do when converting the trigger pack to semi-auto only is to disassemble it. Remove the rear two roll pins first, and dump out the contents. (Watch out for the small spring on the drop safety flag/lever). Then pop the auto sear out BUT take caution, as it WILL want to fly out. Remove the hammer pin last (HAMMER PIN IS THE ONLY SOLID PIN). Be aware of the hammer when disassembling, as it has a habit of launching out of the trigger pack as soon as you remove the pin. Once you have the pack completely disassembled you can throw away the auto sear and burst fire mechanism (circled in the image below).



Next, you should remove the flat plastic area on the disconnecter. If you don't do this, there is a possibility for hammer follow when using the full auto safety and pulling the trigger all the way back like you would in full auto. If you don't do this step it is important to print a semi-auto safety to ensure the trigger cannot be pulled all the way back.



Finally, if you want to be extremely judicious in your trigger pack conversion, cut off the auto sear notch in the hammer.

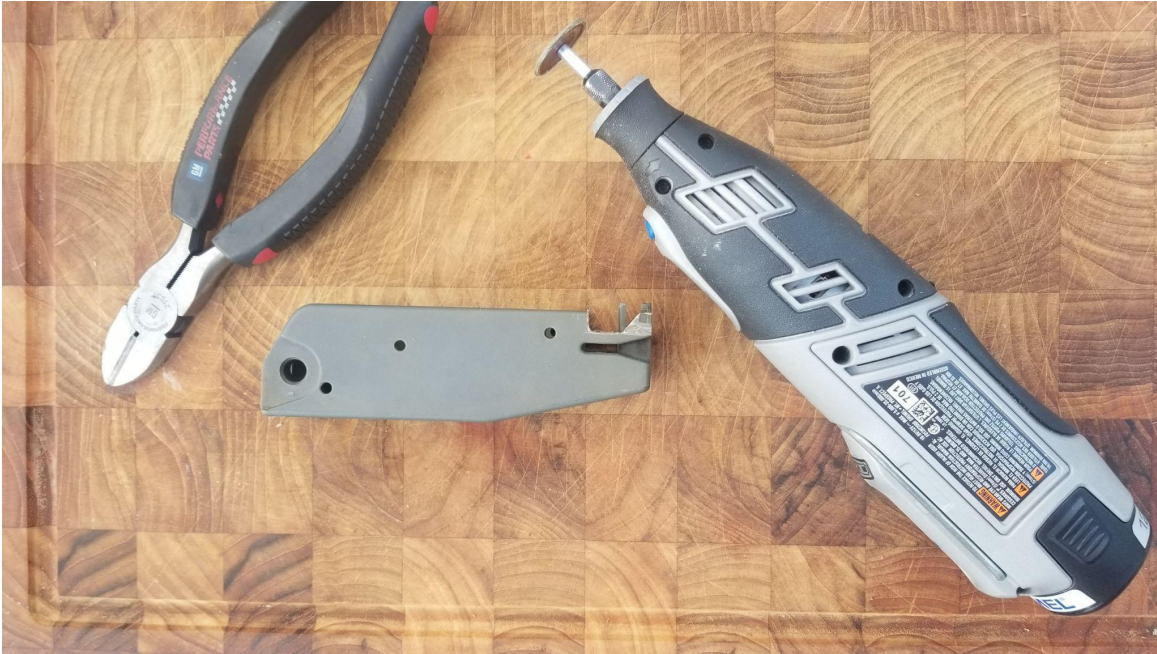


2.3 Sear Hole Removal

To remove the sear hole, first remove the bolt catch. Then, install the trigger pack clearance jig on the front of your housing and scribe where the cuts need to be made.



Lastly, remove the jig and cut out the area you marked



2.4 Sear Replacement/Hammer Spring Retaining Block

Since we will no longer have the auto sear to retain the hammer spring legs, we will epoxy in a block to do the job. The position of the block should be flush with the top of the trigger housing and butted up against the front of the housing. The side pictured should be facing the hammer.

Sand or file all faces of your sear block and trigger housing that will be JB welded together. Apply JB weld to the sear block, trigger housing, or both, and insert the sear block into the housing. Once placed where you want it, clamp the block and housing together, similar to the below pictures. Let cure for specified time on the JB weld package before reassembling with the hammer and hammer springs.



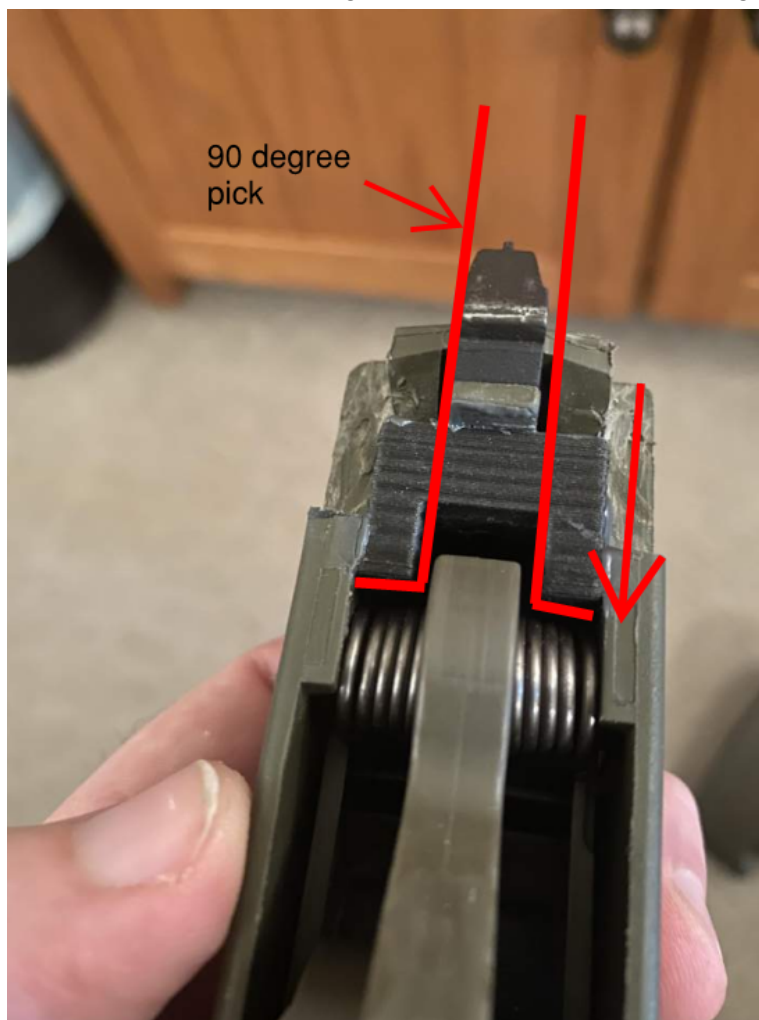


2.5 Reassembly

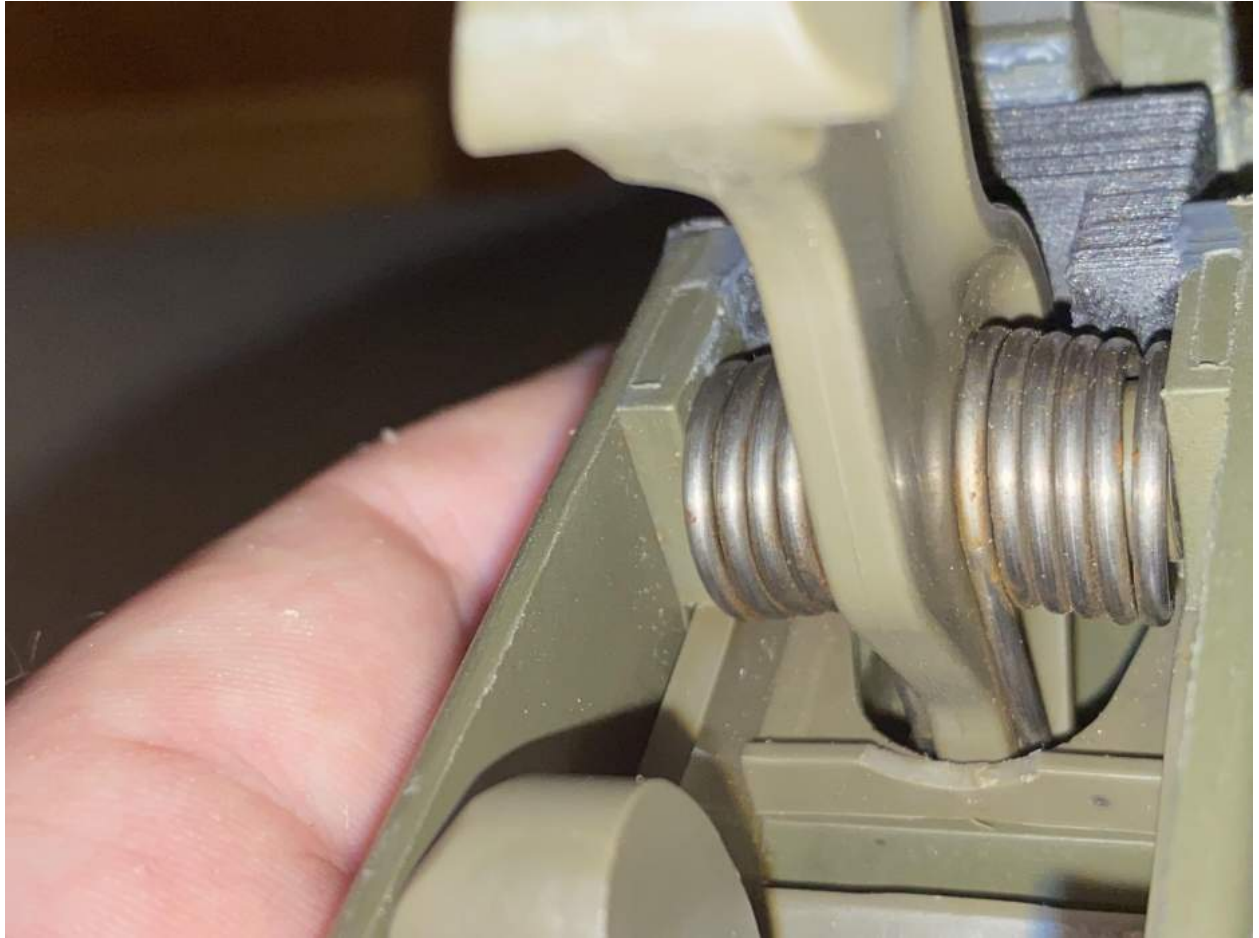
Now you are ready to re-assemble your semi-auto trigger pack. Install the hammer first as it doesn't affect any other piece and is the most difficult. Next put the disconnecter inside the trigger slider (Picture 3), use the printed trigger pack spacer to replace where the burst mechanism used to be. Then put the drop safety (weird black thing with funny spring) in the housing and install the pin only half-way leaving room for the disassembly lever (Pictures, 4-5). The spring is free-standing and rests forward of the drop safety pressing it up from the bottom.

Insert your trigger slider and disconnecter combo and make sure the drop safety fits into the little slot in the back of the slider. Insert the trigger pin and spring, ensure the straight leg of the spring is pushing on your disconnecter. Finally insert the disassembly lever, use it to hook the bent part of the trigger spring, then move it into place and push the pin the rest of the way in.

In order to set the hammer springs, use a 90 degree pick and alternate pushing the springs down as shown below (Picture 1) while also holding the hammer in place. You may have to use the pick or other picks/tools to push the spring arm into the sear block spring channel.



(Picture 1, above)



(Picture 2, above - Picture 3, below)

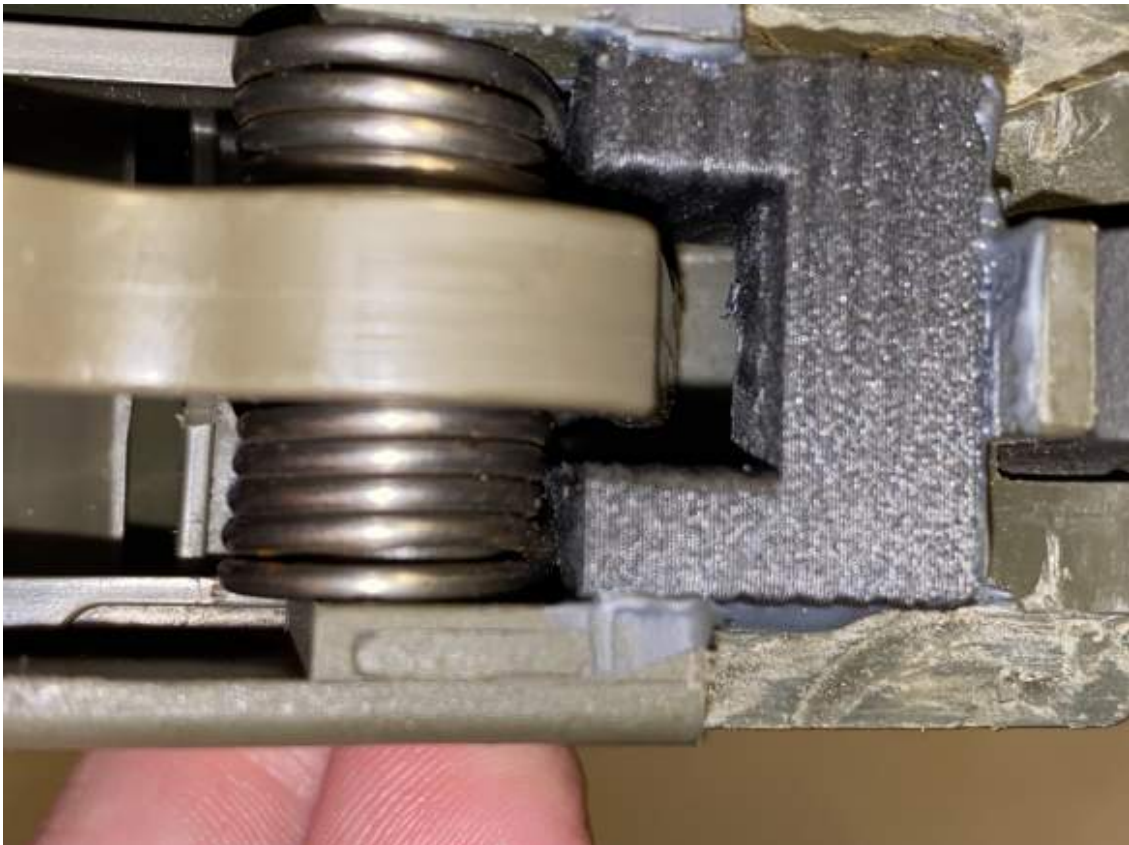
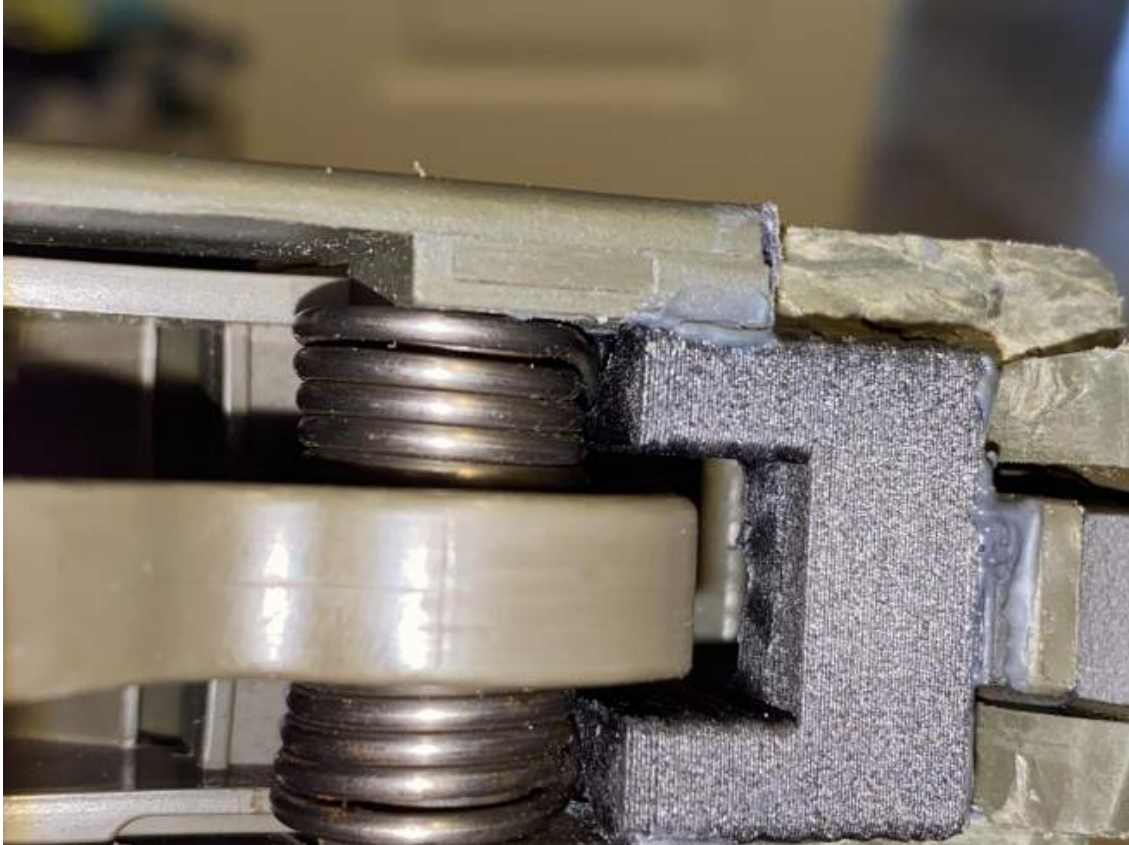


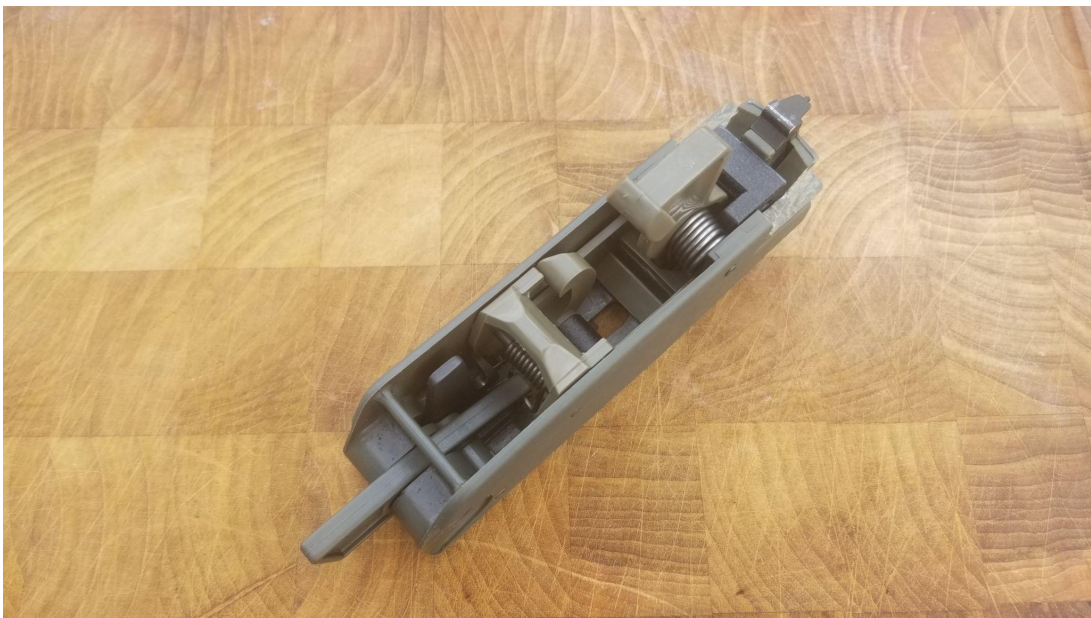
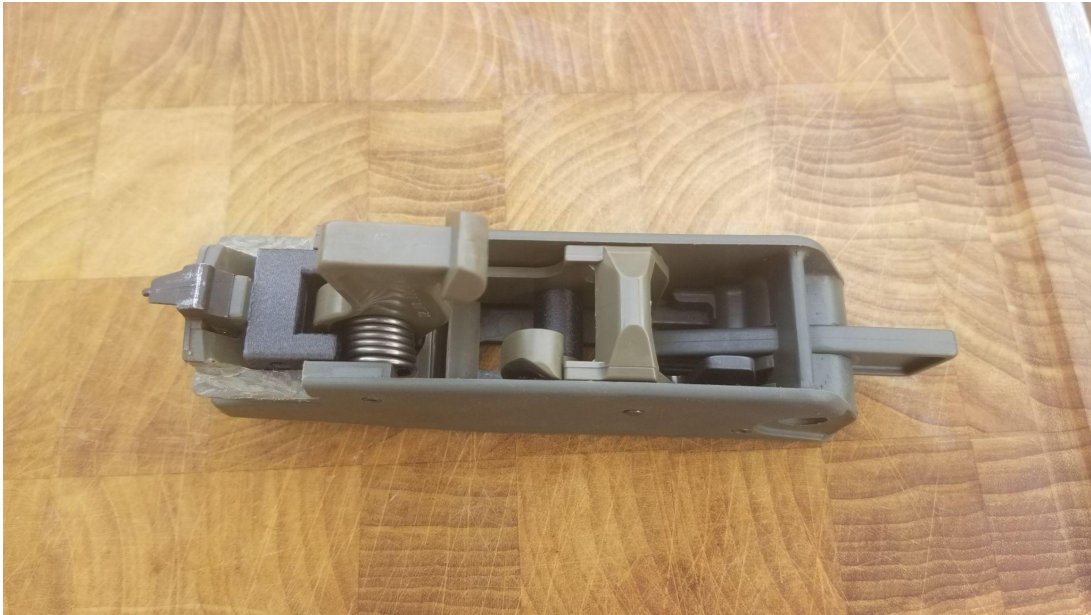


(Picture 4, above - Picture 5, below)









3. Stock Denials



3.1 Rear

ATTENTION. It is important that you complete the rear stock denial before cutting the receiver slot in the front of the stock. If you cut the front slot first, it is possible to use an unmodified full auto trigger pack with the NylAUG receiver and you have created a machine gun.

3.1.1 Method A: Epoxy and tap key stock from the outside

3.1.1.1 Tools and Parts

1. 2.5mm drill bit
2. 3mm drill bit
3. Larger drill bit
4. Tiny drill bit, I used #51
5. M3 tap
6. Hacksaw
7. Drill press
8. Hand drill
9. Center punches
10. Hammer
11. File, sandpaper
12. JB Weld or other epoxy that is **not acetone soluble**
13. 3" long piece of 3/16 key stock 98870A193
14. 2x M3 flat head machine screws
15. TriggerPackDenialMain.3MF
16. TriggerPackDenialArms.3MF
17. Trigger pack denial bar tap jig.3MF

Printing Notes:



If you have trouble printing the trigger pack denial jig torso, it's recommended to use a raft or brim with glue stick on the print bed. This will help prevent it from falling over while printing.

When assembling the rear stock denial jig, the parts and holes should be aligned, as shown below.



This is where the denial screw hole should be, relative to the main jig frame. The hole should be centered vertically in the jig notch.



3.1.1.2 Mark stock holes

First, remove the trigger shoe, then push out the trigger bars. They will come out the back of the stock. These need to be removed for the denial jig to fit. Next, Combine the torso and arms of the trigger pack denial jig. Ensure the holes are directly below the cheek weld bulge in the stock. If not, bend them until the holes in the jig arms are centered vertically in the notch of the jig base. Insert the jig into the back of your stock, making sure that the jig labs lock into the takedown pin hole, and mark where the holes should be drilled with a center punch.



3.1.1.3 Drill stock holes

Drill pilot holes with a tiny drill bit where marked. Insert the shank of the bit and confirm visually and with the jig that they are in the correct spot. The rear hole should be coming out of the little hump that lines up with the auto sear pin in the trigger pack or just above it.



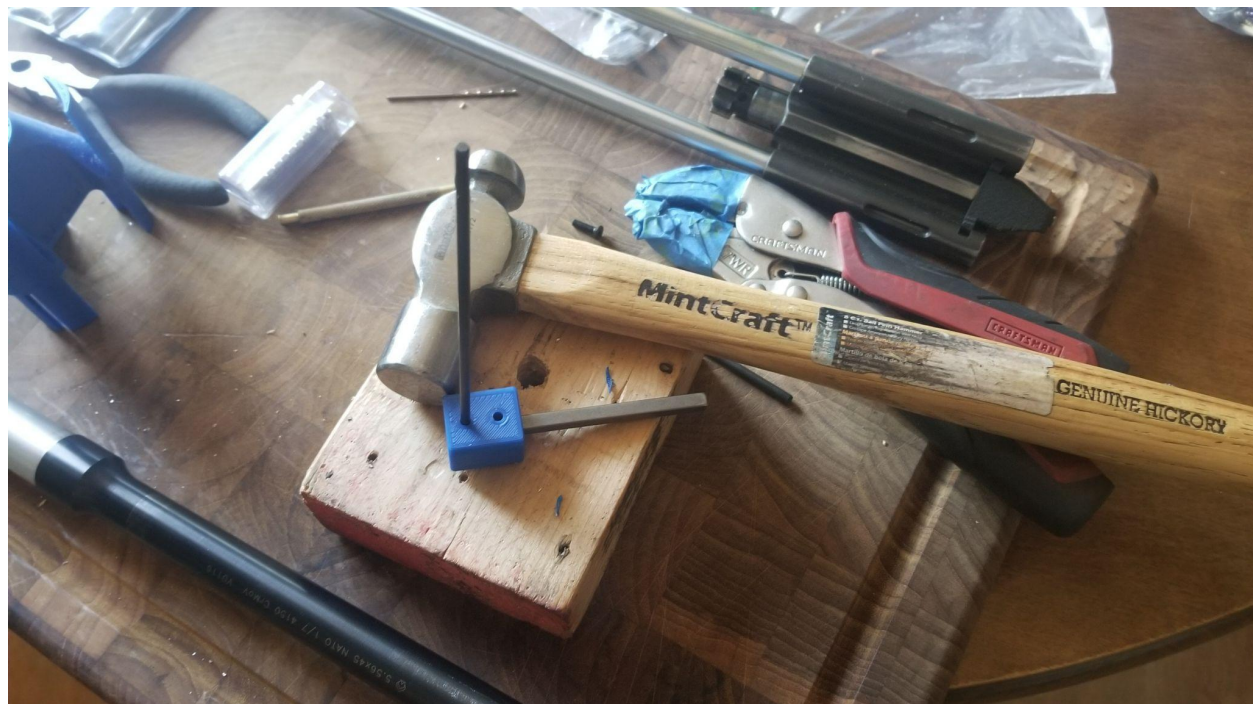
3.1.1.4 Countersink stock holes

Adjust and drill new holes if they are off. Once you know exactly where to drill, drill the real hole with the 3mm bit. Next use the larger drill bit to VERY CAREFULLY drill a little into the stock until the head of your M3 flathead machine screw is just below flush. Use a bit that is just slightly larger than the screw head. If you have a habit of drilling too fast, countersink the holes by hand (with vise grips & drill bit) so that you don't countersink too deep. Depth should be 1-1.5mm.



3.1.1.5 Mark key stock holes

Insert the key stock into the denial bar tap jig and mark where the holes should be with a center punch.



3.1.1.6 Drill key stock holes

Remove and drill where indicated with the 2.5mm bit.



3.1.1.7 Tap key stock holes

Use the M3 tap to thread the holes you have drilled



3.1.1.8 Cut key stock & key stock screws

Use a hacksaw or dremel with a cutoff wheel to shorten the pieces of drilled bar stock off past the holes, and smooth the cut end with a file. The key stock should be about 15.2mm long. The screws needed for the keystack are a little long, so they need to be cut with a dremel or other method. The length of the M3 screws needs to be shortened to about 10.4mm. This will allow the screw head to sit flush in the AUG stock and the tip to sit flush at the key stock.



3.1.1.9 Install key stock

Test fit the jig with the key stock installed. Use a long pair of pliers to hold them, and screw them in place with the machine screws. Next, test fit with your modified & denied trigger pack. Once satisfied and the dry assembly works, sand/file the key stock mating surface to improve JB weld bonding. Then, apply JB weld to the side of ONE of the key stocks as well as the threads of both key stocks. Lather the screws with JB weld as well. Finally, hold the key stock inside the stock with pliers, thread the screws into your countersunk hole from the outside, and tighten. Lean the stock up against something so that the stock is parallel to the ground (magwell down, cheek weld area up). Let JB weld cure for 24 hours. After 24 hours, cover one of the screw heads and let the JB weld cure for 24 hours. Make sure the stock is laying flat so the JB weld does not run down the side of your stock. Repeat for the other screw head and cure for 24 hours.



3.1.1.10 JB weld denial

Confirm fitment with your modified trigger pack. You may need to file some on the bars or on the trigger pack housing until they fit nicely. Finally, slather the bars in JB weld. JB weld the threads of the M3 screws before threading into the key stock. JB weld over the top of your machine screws. These bars will *never ever* come out. After it dries, sandpaper what's on top of your screws flush with the stock for a clean look.



3.1.2 Method B: Epoxy in screws alone (Gh0stmed edition)

FULL DISCLOSURE: THIS METHOD USES LESS TOOLING AND MATERIAL, BUT IS NOT AS DEFINITIVE OF A DENIAL AS THE KEY STOCK VERSION. IT IS CERTAINLY STILL A DENIAL, BUT IF YOU LIVE IN AN AREA WHERE YOU MAY BE UNDER SCRUTINY FOR A HOMEMADE FIREARM, YOU MAY WANT TO GO WITH THE MOST SIGNIFICANT DENIAL AVAILABLE.

3.1.2.1 Tools and Parts

1. 4x M3 screws 5-10mm in length for custom fit. Flathead machine screws preferred, other heads work but aren't as pretty.
2. 3mm drill bit
3. 6mm drill bit
4. Dremel w/ diamond rod
5. JB Weld or other epoxy that is **not acetone soluble**
6. TriggerPackDenialMain.3MF
7. TriggerPackDenialArms.3MF

3.1.2.2 Mark stock holes

Follow the same process of the Key Stock Version to mark out your holes using the denial jig. If you get these wrong, it will cause undue difficulty and/or make your stock a cheese grater.

Personally, I waited to cut my trigger pack until after I could dry fit the screw denials in my stock to be certain their planned placements would indeed prevent insertion of an unmodified pack.

This isn't very essential, but is a way of being unequivocally certain that your denials are denying.

3.1.2.3 Drill stock holes

Once you mark out where your holes should be (I used a drill bit through the jig and twisted it by hand to scratch marks into the plastic), you can remove the jig and take your 3mm drill bit and drill through all 4 spots. The stock material is only ~2.5mm thick, so it should be extremely easy.



3.1.2.4 Countersink stock holes

Next, you'll want to take your 6mm bit, center it on your new 3mm holes and **VERY CAREFULLY AND VERY SLOWLY** drill into the surface. The idea here is to make a small countersink for the head of the screw to sit in. I only got about 2 rotations of the bit before I decided it was deep enough. That left two strands of plastic where the bit was digging. I cut those as short as possible with some side cutters/snips, carved a bit more of them away with a knife, and did the rest in the next step.

Depending on your specific screws, you may be done here. If they sit in your newly made countersink holes pretty flush and you're happy with it, skip this step. If they don't, and you're cursing the Canine Kill Crew for damning you to this timeline of Military Relic Mutilation, follow along. Take your dremel (or if you're a monster, use hand files) and diamond rod to the edges/circumference of the holes and chamfer it out a bit. Go little by little, test fitting your screws to find the sweet spot of painfully pretty flushness. Be careful not to go too deep and doom yourself to having to upgrade the diameter of these screws and carve out extra material from your trigger pack.



3.1.2.5 Epoxy screws

Once you're happy with your inset screws, try to insert your trigger pack. If you've already demilled it, make sure it fits well. I ended up having to touch mine up with a diamond rod to fit the rearmost screws. If they're too long, use shorter screws or cut them with whatever tools you have to do that kind of thing. It's not like we're trying to protect the threads here. After you confirm the fitment of all components involved, remove the trigger pack, and mix up a bit of that epoxy you've got lying around. Take a little dab of it and put it on each hole, then insert the screws. After they're all in place with epoxy under them, rub some over the top. I specifically like GorillaWeld for this because it is particularly thick, so you can do all 4 at once with the stock vertical and you don't have to worry about the epoxy running all over the place. Leave those for 5-6 hours and then come back to it and take a look at everything. Add more.



On my second epoxy coat, I made sure to fill every socket head to be certain an allen wrench can't be inserted to potentially back these screws out, and I was certain to get epoxy over the edges of the button head to prevent it from being able to be easily pushed outward. Let it all dry.



3.1.3 Method C: Epoxy in key stock alone

3.1.3.1 Tools and Parts

1. 2x 1/2" long pieces of 3/16 key stock 98870A120
2. JB Weld or other epoxy that is **not acetone soluble**

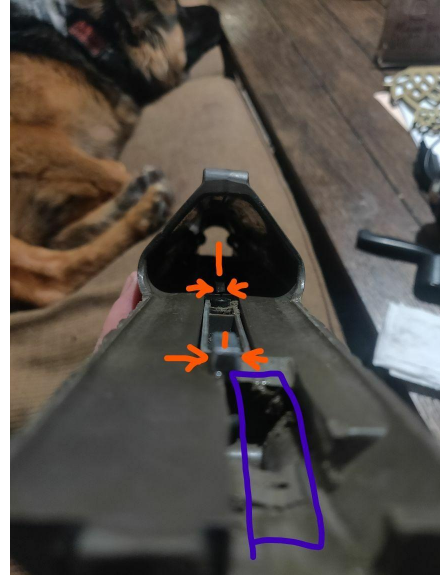
3.1.3.2 Procedure

Slather the key stock in JB Weld and place them where they belong inside the stock with long pliers. Wait for one side to dry before placing the other so you can use gravity to keep it in place.

3.2 Front

3.2.1 Tools and Parts

1. Mr. Dremel
2. JB Weld or other epoxy that is **not acetone soluble**
3. 1/2" long piece of 3/16 key stock 98870A120
4. 3" long piece of 3/16 key stock 98870A193
5. ReceiverDenialGuide.STL



3.2.2 Procedure

There are two steps in front of stock denial. The first is to epoxy in bars of key stock to prevent the insertion of a factory full auto receiver, and the second is to cut a slot so the stock is compatible with the NylAUG receiver. Once you have printed the receiver denial guide, insert it into the front of the stock until it clicks in place. Scribe where you need to cut the receiver slot. Remove the jig, cut out the receiver slot with a dremel or other tool, then put the jig back in the stock. Mix up your JB Weld and apply it to one side of the pieces of key stock. Put the pieces of key stock in the jig (while it is inserted into the stock) and wait until the epoxy becomes tacky, but not solid. You can test this by messing with the initial batch you mixed up. Remove the jig, leaving the pieces of key stock in place to dry. Optionally, before epoxying the key stock, you can scribe where they go and cut a shallow groove for them to sit in for better adhesion. Sanding the area where they will be epoxied, as well as the keystock, can also help adhesion. Let cure for 24 hours before moving on. Make sure the key stock is facing up when the stock is curing. Do not lay the stock on its side.



4. Bolt Guide Cage Modification & Bolt Carrier Tail

4.1 Tools

1. Mr. Dremel

4.2 Bolt Disassembly

Start by disassembling the bolt carrier. At the back of the bolt carrier, turn the firing pin counterclockwise and remove it. Do not push or pull as you turn it. This will unlock the carrier and allow the bolt, bolt cage, and carrier tail to be removed. After removing the firing pin, push the cam pin down until it clears the carrier. Then, pull the bolt and bolt cage out. Flip the carrier over and remove the carrier tail by pulling it up.

At this point it is important to clean the pieces as much as you can. Kits (especially the Malaysian kits) are often incredibly gummed up and will have issues with function. While not strictly necessary, it is often helpful to disassemble the bolt all the way down to the recoil springs. The guide rod caps are Loctited on and will need heat and support from a vise for removal.

4.3 Bolt Guide Cage Mod. Procedure

I was asked by a member to clarify where I modified the guide to smooth the operation of the bolt when using an AR extension. I circled the area I milled.

Aeroscout



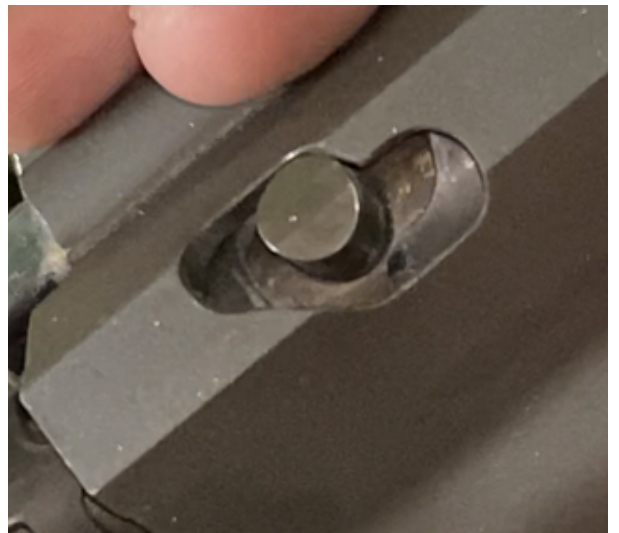
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The bolt will lock into an AR-15 extension without this mod but doing it definitely makes it smoother and improves operation. All that needs to be done is to cut out a small portion of the

area the bolt cam pin rests in, and round off the sharp tip. Dremel out a little bit at a time, reassemble the bolt carrier group, and manually operate the carrier group into your barreled receiver (once finished) until the bolt rotates fully and the operation is smooth.

Before (left)

After (right)



4.3 Bolt Carrier Tail Procedure

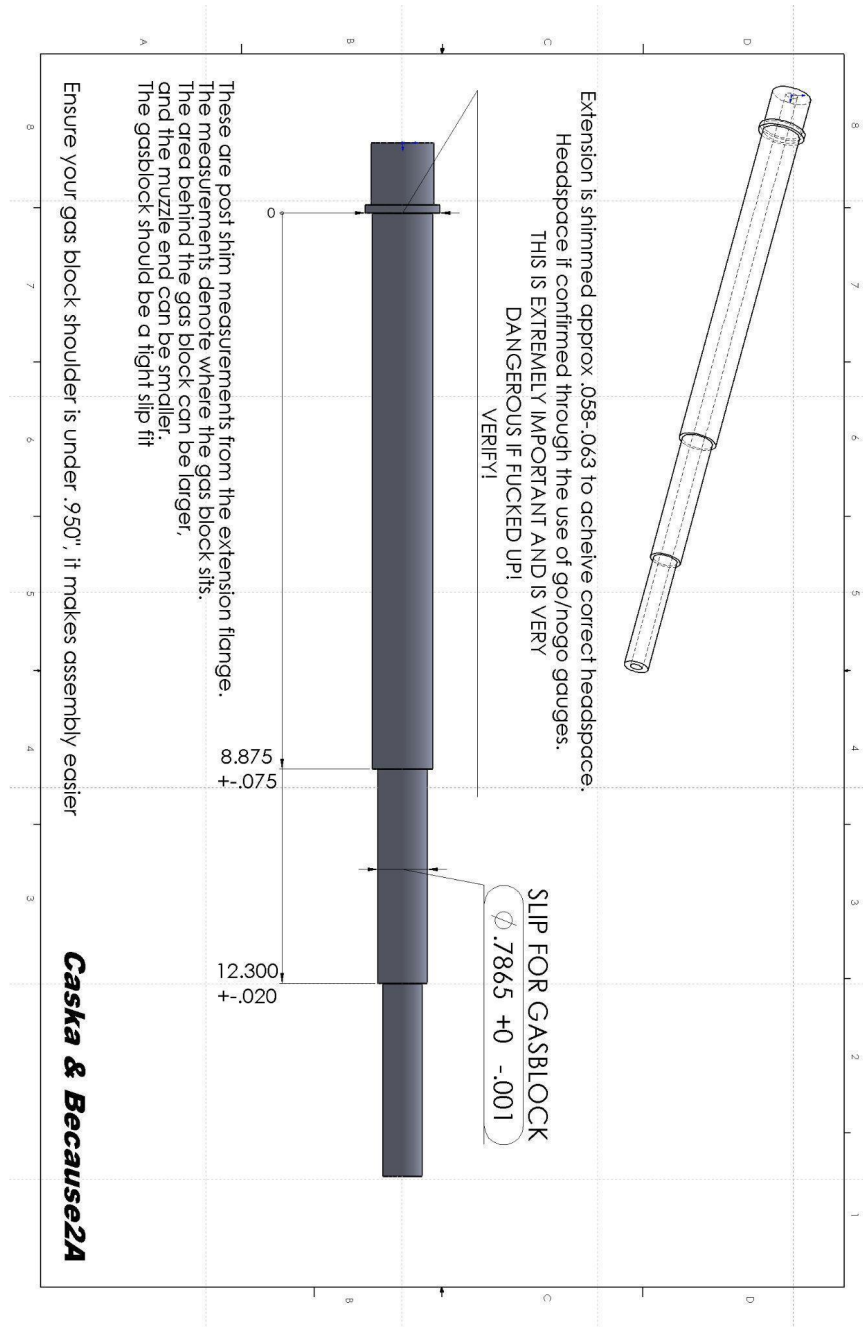
After disassembling the bolt carrier group, Install the printed semi auto bolt carrier tail that has no auto sear trip on your bolt carrier when re-assembling.



5. Barrel

The barrel can either be bought professionally profiled and headspaced from <https://3dprintfreedom.com/AUG-Barrel-Preorder-16-p464529333> or you can roll your own by modifying an AR-15 barrel (See the Full Monty Build Guide for details). **ALWAYS check headspace with GO/NO-GO gauges before assembling your build!**

5.1 Drawing



6. Stub Pressing

6.1 Tools

1. 12-ton Hydraulic Press, 20-ton recommended.
2. Bench grinder (potentially)
3. Mallet
4. Homemade pressing jig or 3/4" washer

6.2 Procedure

The first thing that needs to be done is to press the barrel stub out of the gas block. The interference fit with the gas block is very tight as this is the only way it is retained, it is not pinned to the barrel in any way. A 12-ton press will be maxed out. You may have to freeze the parts overnight before pressing and bonk the press with a mallet. Most of these parts kits have not had the barrel cut straight so be sure to grind the face flat before pressing. To support the gas block without worrying about damaging it, it is advisable to make a simple pressing jig by drilling a hole approximately 13/16" in a piece of scrap steel. A 3/4" washer will also work.

NOTE: If your press has questionable quality/old, fluid, it is recommended to replace it with new, quality fluid. This has restored press performance for many beta testers.



6.3 The other procedure



7. Gas Block Prep

7.1 Tools and Parts

1. 3.3mm drill bit (Cobalt or harder)
2. M4 tap
3. Drill press
4. 2x M4 set screws
5. KAKBarrelDimplingGuide.stl (PRINT!)

7.2 Procedure

On an AR-15, the pins or set screws on the gas block help pull it towards the gas port and prevent leakage. On an AUG, leakage is prevented by having an interference fit between the gas block and barrel and pressing it on with a hydraulic press. Since we are going with a slip fit like an AR-15 we will need to add a set screw on the gas block opposite the gas port.

Using the gas port as a guide, drill the opposite side of the gas block with a 3.3mm bit and thread the hole with an M4 tap. Using the KAK Barrel Dimpling Guide drill out the set screw holes in the Aug Gas Block and tap. You must use all three set screw holes for a total of 3 set screws for the gas block to remain secure. After assembling the receiver, the barrel will need to be dimpled where the set screws will be. Depth is important; the set screws need to be deep enough so that they resist shear loading, NOT friction. Measure the depth as you drill with your calipers. Not including the thickness of the gas block, the dimples need to be 0.1875" (3/16 or 5mm) deep. Dimpling the barrel is covered in a later section, titled "Receiver Assembly."

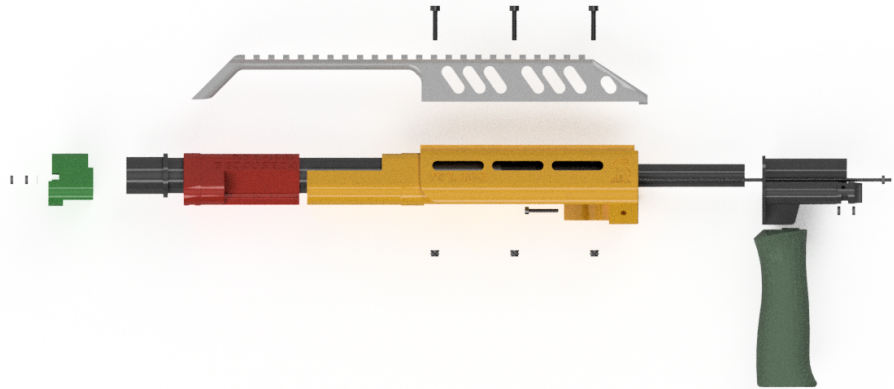




Alternatively, or in addition to set screws, is drilling and pinning the gas block to the barrel, similar to an AR-15 Front Sight Block. Common ways to do this are with a drill press/mill, standard FSB taper pins, and a FSB taper pin reamer. For a rock solid gas block, pinning is recommended. Another alternate method is to install a barrel sleeve between the gas block and muzzle device so that the torqued-to-spec muzzle device holds the gas block in place.



8. Receiver Assembly



8.1 Tools and Parts

1. 3x M4 Heat Inserts
2. 3x M4 Socket Head Screws
3. 4x M3 Threaded Rods
4. 2x M3 Heat Inserts
5. 10x M3 Nuts
6. 2x M3 Screws
7. 2-4x M3 Washers
8. 2x M4 Set Screws
9. Soldering Iron
10. 3mm Hex Key
11. 5.5mm Socket
12. 3/32" Drill Bit
13. 3mm Drill Bit
14. 1/2" Steel Tubing
15. 1/2" Reamer or Drill Bit
16. ExtensionAlignmentJig.STL
17. ExtensionAlignmentJigMale.3MF
18. ReceiverRear-HiTemp.3MF
19. ReceiverMid-HiTemp.3MF
20. ReceiverMain.3MF
21. Receiver Length Shims (maybe)
22. Rubber Mallet

8.2 Procedure

8.2.1 Heat Inserts

The first thing that must be done is to install the heat inserts in your main receiver. Turn on your soldering iron and wait a few minutes for it to heat up. A heatsert installation tool for the soldering iron is **HIGHLY** recommended. After it's hot, place a heat insert on the tip with the narrow diameter side up and carefully insert it through one of the large openings in the **BOTTOM** of the receiver. Heat inserts need to be inserted from the bottom so that they compress the receiver when tightened. If they are inserted from the top, they will most likely pull out of the receiver when the screws are tightened down.



8.2.2 Rear Trunnion

If you did not check headspace yet, do so now. Next put the part of the extension alignment jig that looks like a bolt face into the other part of the extension alignment jig. Place it so it is extended out as far as it can. Then place the rear trunnion piece inside the alignment jig. Using this entire arrangement, put the rear trunnion on your barrel extension using the jig to ensure the trunnion remains straight the entire time. It may be tight and require light tapping. Once the trunnion is installed, the alignment jig should be able to slide in and out freely with no hangups.



8.2.3 Thread Rods

Cut (4) threaded rods to 285mm in length. Slide your front trunnion piece/mid receiver piece over the barrel to meet the rear trunnion and put the thread rods through the upper 3mm holes. Don't forget to insert the charging handle and steel tubing bushing for the op rod before doing anything else. Steel tubing bushing may require reaming out the holes in all receiver/trunnion pieces, fit is extremely tight. Next install washers, nuts, and tighten until you feel like the thread rod is about to strip. You cannot damage the receiver by overtightening, the thread rods will strip first. You may use as many as two nuts in the rear and three in the front. For a much easier install, buy a 7mm nut driver, or print a 7mm nut driver socket to tighten the nuts. For the lower threaded rods, press the heat inserts into the bottom two holes of the trunnion, at the breech end. Thread the rods through the muzzle end of the receiver and into the inserts, then secure the threaded rod with nuts at the muzzle end of the receiver.



Once you have all threaded rods and nuts tight, check for fitment in your stock. You may need to go back and print receiver shims that will be installed between the mid and main receiver pieces to fit the latch properly. These should not be needed if your printer is calibrated properly, but there has been reports of needed shims after a couple weeks with Polymaker PA6-CF. You should also pay attention to the op rod, it should sit flush with the front of the receiver, or slightly recessed, when the bolt is locked. If it is too recessed (more than a mm or two, flush is preferred. Op Rod should never protrude), you may have short stroking. Make sure your printer is calibrated and is printing the parts to the correct dimensions. You should now cut and file your thread rods so they are flush with the front of the receiver and do not interfere with the bolt carrier in the rear.



Ensure your receiver is centered on the stock. If it's not, you may have to adjust the slot that was cut out of the stock, or file down the alignment tab on the front of the stock.



8.2.4 Op Rod Bushing

The op rod bushing goes in the holes on the right hand side of all three receiver/trunnion pieces. The fit may be tight, Typically, a 1/2" straight reamer or drill bit is used to widen the holes to spec. The bushing will most likely still be tight and require installation with a press or clamps. Also be careful when checking fitment with the bolt carrier, if the interior diameter is not in spec your bolt carrier may get stuck which will be frustrating. It should slide smoothly. Bushings should be inserted fully into the receiver. The bushing length required is 10.7".



8.2.5 Gas Block

8.2.5.1 Position gas block

Use an M3 thread rod to fix the gas block to the front of the receiver, you will need to cut some to length. Be sure to account for the part of the handguard it will go through if you intend to use this piece when finalized. Insert the bolt carrier group and use the tip of the op rod to align the piston hole in the gas block, tighten when satisfied you are centered. Now is the time to drill the holes for your set screws in the barrel. As mentioned in the Gas Block Prep section, depth is important; the set screws need to be deep enough so that they resist shear loading, NOT friction loading. Measure the depth as you drill with your calipers. Not including the thickness of the gas block, the dimples need to be 0.1875" (3/16 or 5mm) deep.

8.2.5.2 Drill gas port and set screw dimple

Hit it with a center punch through the dimple hole. Repeat on the opposite side for your gas port. Use a 3/32" bit to drill the gas port hole, & a 4mm bit to drill the holes for your set screws. When drilling for the set screws be sure you cut into the steel, an aluminum sleeve is not enough to hold the set screw in shear ~5mm deep. Be extremely careful when drilling the gas port as you have to go through the aluminum sleeve first, then barrel steel, and finally nitride or chrome. It is extremely easy to shatter your bit. Be careful not to crash into the rifling on the other side as well, look down the barrel as you start to break through. Finally, re-install your gas block with the set screws and thread rod.





8.2.6 Rails: (NOTE THIS IS OPTIONAL, BUT RETAINS THE CHARGING HANDLE)

8.2.6.1 Front Rail

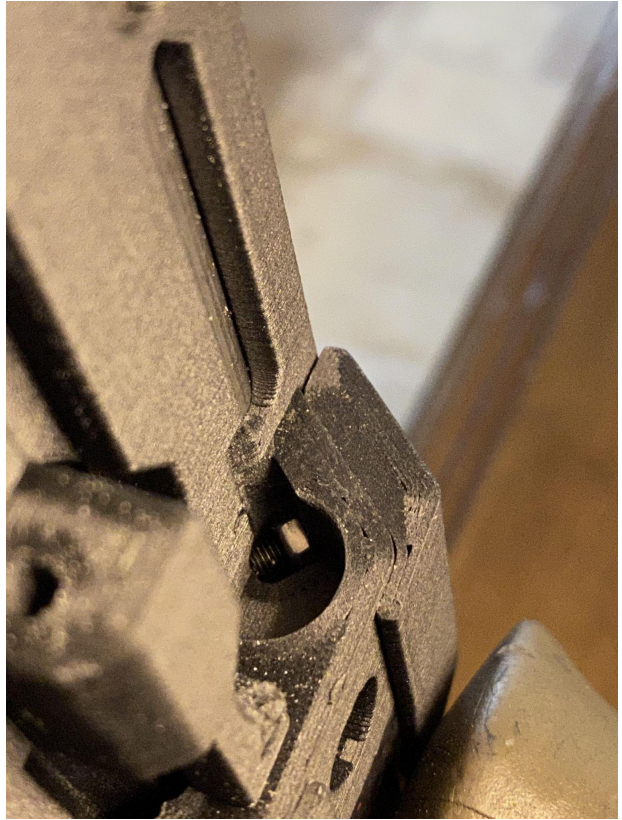
Once the gas block is installed and secure, remove the threaded rod retaining the gas block. Install the handguard over the front of the gas block. You may need to lightly persuade it in place with a rubber mallet. Reinstall the threaded rod through the handguard and tighten. It's important to ensure the gas block does not walk forward when firing. Install an M4 screw in the top and optionally two M3 screws and nuts in the bottom.



8.2.6.2 Top Rail

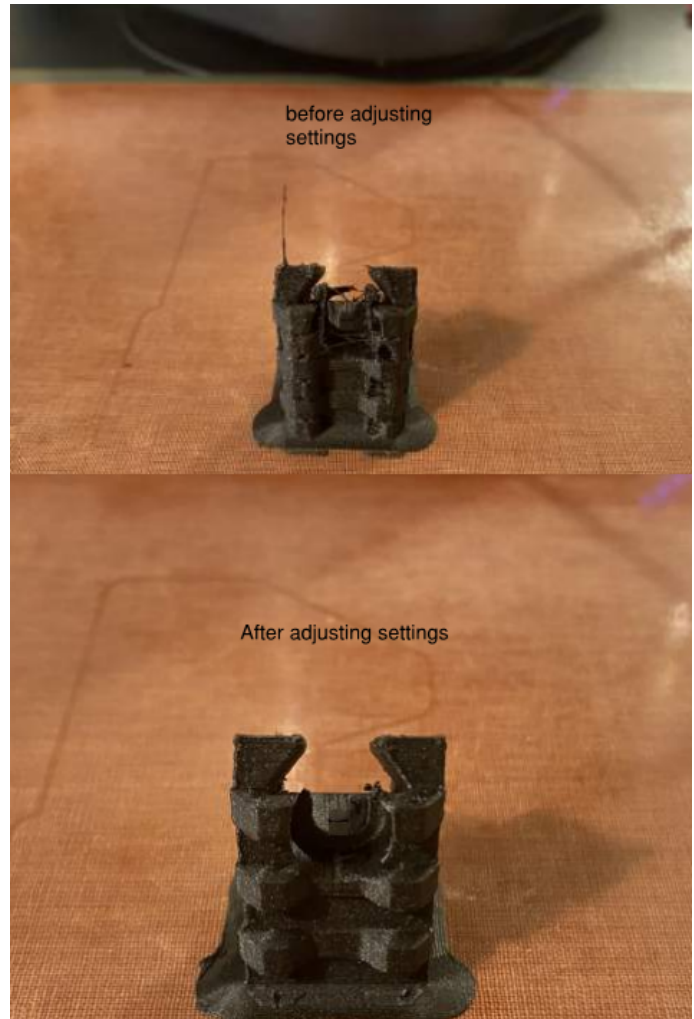
Install the top rail on the receiver and secure it in place with the remaining two M4 screws. Using the hole in the rail as a guide, drill a 3mm hole in the top of the stock. Insert the M3 screw from inside the stock, and the M3 nut into the rail.





Printing Notes:

The top rail does not need support, but if you have good support/print settings, it does make the rail look better. Also, be sure to adjust minimum layer time when printing the handguard. If it prints too fast at the tip, it'll come out looking crappy.



9. Tips

9.1 Re-installing the trigger bars

When re-installing the trigger bars, push them the last bit of the way in using the trigger pack and hold onto the trigger slider while pushing it so there is no pretension on it. Then tighten the screw to secure the trigger bars. This will ensure you have no forward slop in your trigger.

9.2 AUG Gas Settings

