The Gatalog
And Fuddbusters
present:

The Amigo Grande

A 3D Printable CETME C Receiver

Preface

The Amigo Grande is a 3D printable receiver for the CETME C rifle and its derivatives. It enables the use of cheap and (at the time of this writing) available CETME C (or PTR91/G3) parts kits. It should accept both CETME C and G3 magazines. The receiver boasts a full-length picatinny rail along its topside for mounting optics and accessories.

While the build requires pressing and pinning a new barrel into the parts kit trunnion (or a new trunnion), the following tutorial (and video instructions) are intended to help guide you through this process and complete a serviceable build.

Some outfits have shown interest in selling pre-pressed and pre-pinned parts kits, or pressing and pinning the customer's barrel as a service. Keep an eye out for this in the chats and social media if buying a press and performing the related work would pose a problem for you.

This build takes some time and patience, but by following these instructions, you can get it done. I believe in you.

You can watch the assembly process video series here:
https://odysee.com/@Ivan's_CAD_Streams:c/CETME-Build-Part-1
https://odysee.com/@Ivan's_CAD_Streams:c/CETME-Build-Part-2
https://odysee.com/@Ivan's_CAD_Streams:c/CETME-Build-Part-3

Make sure you refer to the README for basic info/print settings for this build!

I recommend you use this document to supplement the video, having text-based steps helps keep things organized, being able to see things in real time helps clear up confusing instructions.

Do not be intimidated by the length of the build video/tutorial. If you run into issues, the troubleshooting section at the end of this document should help you out.

If you have found this tutorial useful, consider sending me Bitcoin (or other funds) to further development of this sort of thing – there is much more to explore in 3D printed guns, DIY guns, DIY ammo, etc.

https://ctrlpew.com/donate-to-ivanthetroll/

For all my Amigos. Especially the Big ones.

Remember that it is our shared responsibility to be safe and smart with firearms and show the world there is a peaceful way to own guns – take the time to get training, to learn basic (and advanced) safety rules, and to share the hobby with everyone interested – those most scared of guns in the hands of the people are often the ones who have no experience with guns in the first place.

Table of Contents

Shopping List

This list covers the supplies needed to build an Amigo Grande. You will need some tools, including a set of feeler gauges (0.012", 0.015", and 0.020"), a metric drill bit set, an Allen wrench set (metric), a mallet, a drill, a benchtop vise, a Dremel tool with a cutting wheel, and a pair of needle-nosed pliers. If you are pressing and pinning your barrel yourself, you will need a hydraulic press (ideally a 10-ton or better standing press, as opposed to a benchtop press), a mill or drill press (with attached vise), and a 3/16" endmill.

If you have a benchtop grinder, it can be used in place of the Dremel tool in some instances to speed things up. If you've been looking for an excuse to get one, consider this a good excuse. If you lack the space or desire, though, the Dremel tool will suffice.

<u>CETME C Parts Kit + Barrel</u>

The heart of this build is a CETME C parts kit and barrel. At time of publication, CETME C kits cost around $150, and barrels run around $200. Please note setting, pressing, and pinning the barrel is somewhat labor intensive, so I expect pre-pinned kits to run a substantial premium. If you want to build on the cheap, you'll have to be willing to take on that labor yourself and weigh the cost of the necessary tools.

Your parts kit should contain the following:

- Original CETME C front receiver stub with cocking tube
    - You will need the trunnion and charging handle assembly from this stub – a process explained *infra*. You can buy a new PTR91/G3 trunnion if you don't want to extract the original one.
- CETME C barrel
    - You can use a PTR91/G3 barrel, but you won't be able to install a CETME front sight post (only useful if you want to use a bayonet on your build). Lengths shorter than standard will work.
- Original CETME C Bolt Carrier + Bolt assembly
- Original CETME C fire control group + grip + housing
    - You'll modify this a bit be doubly sure of NFA compliance–instructions are included in this document and in the tutorial video.
    - Note the receiver will not accept a full auto housing.
    - Use US-made fire control parts where 922(r) compliance is a concern.
- Original CETME C butt stock + recoil spring assembly

- Original CETME C magazine catch + magazine catch spring + magazine catch button & pin
- Some CETME kits do not include the original barrel pins – if your kit doesn't have this pin, you can order a G3 barrel pin online, or 5mm/0.197" steel stock. Oversize pins will work, sanding either the pin or reaming the trunnion hole to fit.

Certain Hardware Parts

Complete hardware kits can be found online, such as at MAF-arms.com. For those who wish to source hardware themselves, the list is as follows:

- 2x 7mm pins (cut to 2" long) – There is flexibility here. I cut some 7mm HSS drill rod. M7 bolts and nuts would work, but are rare. ¼" nuts and bolts are an easy option, but are slightly undersized.
    - Pins stock to rear receiver.
- 10x M4x35mm bolts – partial thread preferred.
    - Mates front and rear receiver sections.
- 3x M4x60mm bolts – partial thread.
    - Secures bottom of the barrel mount.
- 4x M4x16mm bolts – all-thread preferred.
    - Secures top of the barrel mount.
- 13x M4 nuts.
- 8x M5x30mm bolts – partial thread preferred.
    - Mounts handguard/cocking tube to front receiver section.
- 8x M5 nuts.
- 2x 1ft long 1/4-20 threaded rod - cut down to 7.75" – OR 1/4-20 x 8" bolts.
    - Strengthens and reinforces handguard/cocking tube.
- 4x 1/4-20 nuts.
    - If you use 1/4-20 x 8" bolts, you only need 2!
- 1x 3/8-24 x 1.5" hex-head bolt.
    - Adjusts spacing for charging handle cam.
- 1x 3/8-24 nylon locking nut.
    - Sets spacing for charging handle cam.
- 1x 3/8-24 Standard hex nut
    - Secures charging handle cam spacer.

Tooling

You will need a set of feeler gauges (0.012", 0.015", and 0.020" at minimum), metric drill bits (4, 5, and 7mm at minimum, 6mm may be required), a 3/8" drill bit, a Dremel tool with a cutting wheel (have some spare wheels), a metric Allen wrench set, a mallet, a drill, a benchtop vise, and a sturdy pair of pliers. You will also need a 7/16", 3/8", and 9/16" wrench, if you don't already have them.

If you plan on pressing and pinning your own barrel, you will need a hydraulic press (a 10-ton standing press from harbor freight is about $150) and a mill or sturdy drill press (with a vise).

922(r) Compliance

Some people will choose to count their imported parts against a magical list, and if approaching 10, purchase a US-made magazine or fire control components.

Build Tutorial

I recommend reading this section in its entirety, then watching the build video while you build your Amigo Grande. With a little patience and determination, you'll birth a slick little 308-spitter.

This document is split into two major parts – the "metalwork", which covers harvesting necessary components from your kit, and "plasticwork", which covers cleaning and assembling your printed parts. If you buy a parts kit that has already been pressed and pinned, then you can skip most of the Metalwork section – you ought need only neuter your fire control group and move on to the plasticwork.

Note that the video doesn't line up perfectly this printed tutorial – the videos would have been too long if split into only two parts, so they had to be subdivided.

Before we start off, if you aren't familiar with how roller delayed guns and would like to learn more, this video highlights the technical details in an easy to see manner: https://www.youtube.com/watch?v=MFESb8TK7ZA

REFER TO THE README FOR BASIC PRINT INFORMATION

Which Barrel Mounts Should I Print?

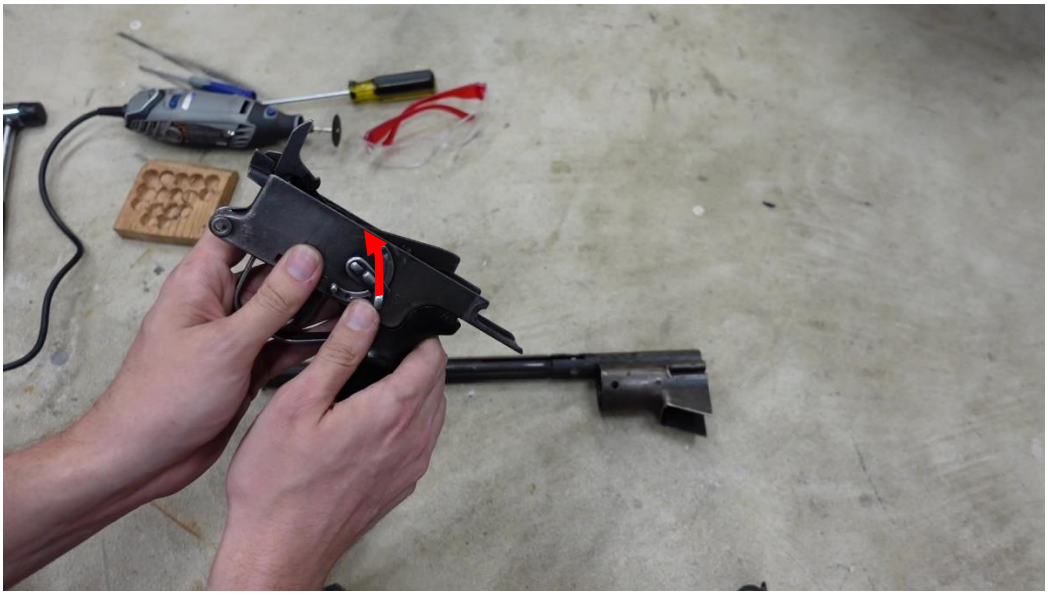
If your trunnion looks like the trunnion on the left (has a longer shank), print the long shank barrel mounts. If it looks like the one on the right, print the standard mounts.

Part 1: Metalwork

The metalwork on this build is broken into two parts – demiling the fire control group parts, and demiling the original receiver stub. If you have a trunnion that is already pressed and pinned, then you don't need to demil your original receiver stub any further, unless you still need to extract your charging handle assembly. Remember to check with the build tutorial video if you get stuck or are unsure!

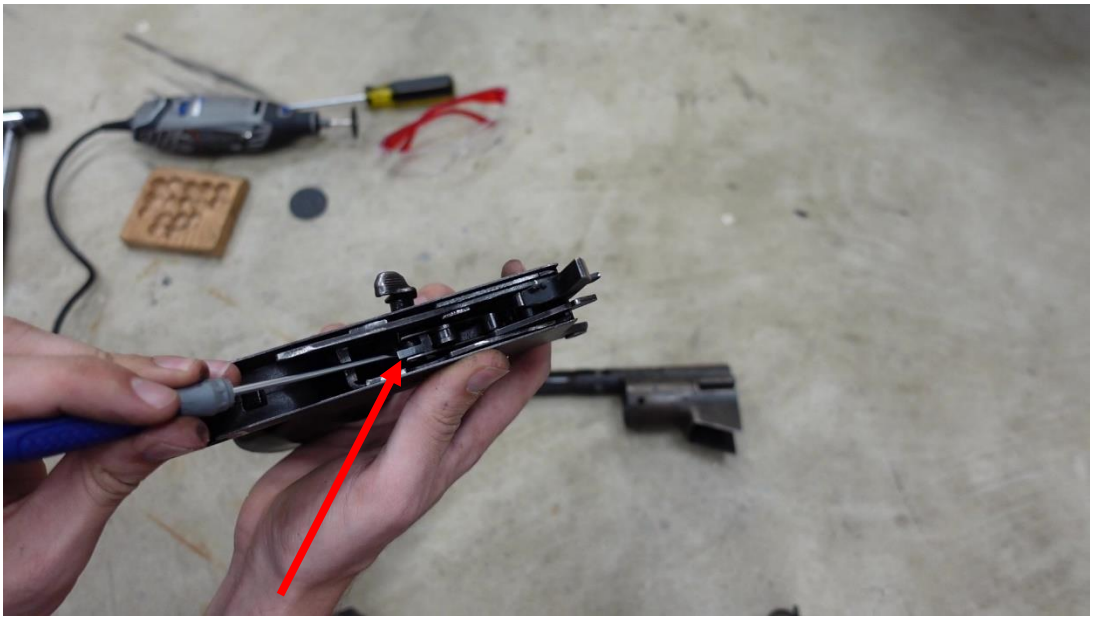
Demiling the Fire Control Group

To start things off, find your trigger housing/grip assembly from your parts kit. Remove the fire control unit from the grip assembly. To do this, you will have to rotate the safety selector straight up, then push it out of the grip assembly. You may have to lift up on the tail of the disconnector to get it to come out.

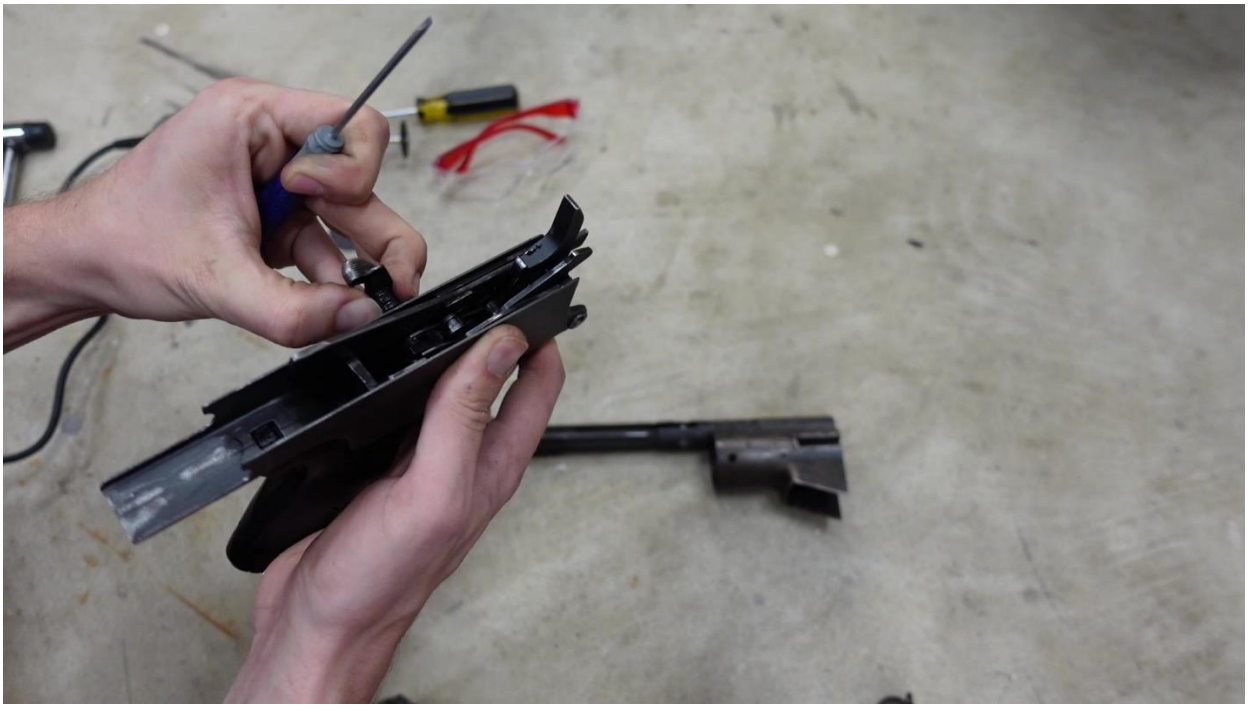


Rotate the selector upwards

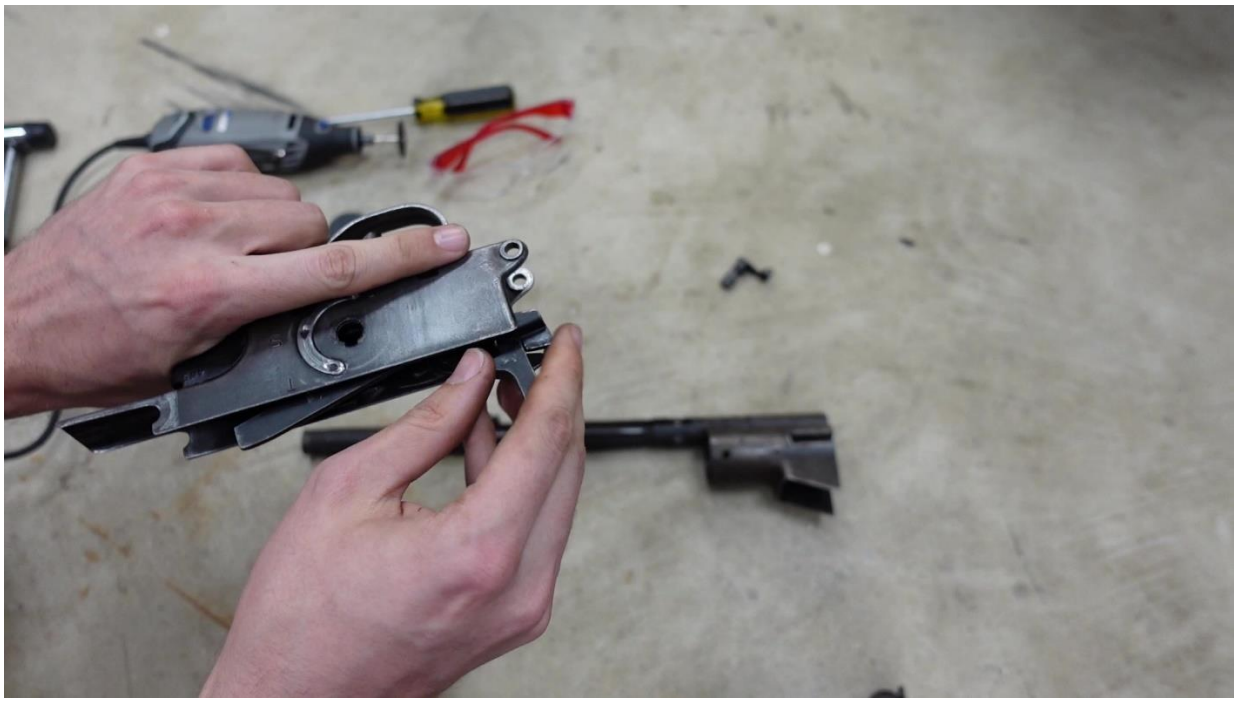
to the vertical position.



You may have to lift up on this part of the disconnector.



Pull selector out, paying attention if the selector is stuck on the tail of the disconnector (seen above).



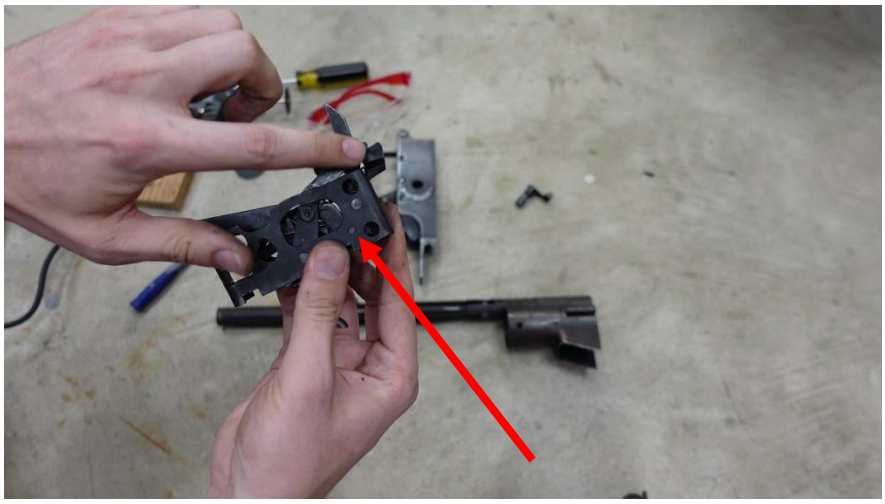
Pull the fire control unit out of the trigger housing by the hammer. You may have to wiggle it out.

Some trigger housings are soaked in grease – smart to clean it off at this point, I chose not to be smart.

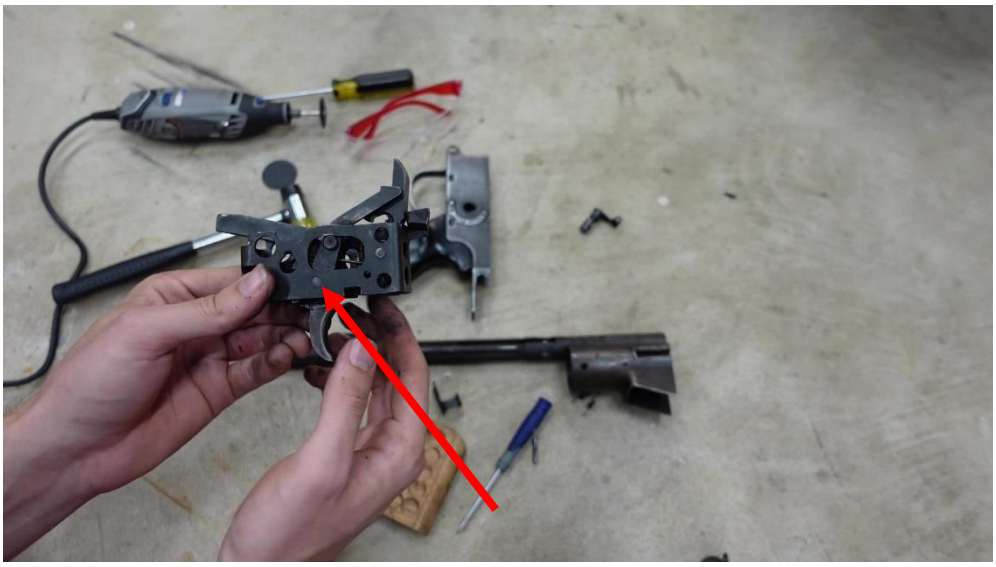
Now that you have the trigger housing removed from the grip assembly, you will need to make a few changes.

Because of an awful, No-Fun Act known colloquially as the NFA, the Amigo Grande receiver **cannot** accept trigger packs with an auto-sear installed. You will have to remove the auto-sear, the auto-sear trip, the safety sear arm, and cut on the disconnector to alleviate those concerns.

In order to remove the auto-sear, auto-sear trip, and safety sear arm (plus a spring belonging to the auto-sear mechanism), remove the pin at the bottom front of the fire control group. Sometimes these are tight, sometimes they glide out. If you need help identifying the auto-sear, auto-sear trip, and the safety sear arm, refer to the tutorial video, as it shows them clearly.



Punch out this pin, then remove auto-sear and auto-sear spring from the bottom of the trigger housing.



Next, remove this pin. The auto-sear trip, safety sear arm, trigger, disconnector, and disconnector chassis will come out from the bottom of the housing.

Now, set your auto-sear, auto-sear trip, and safety sear arm aside. If you prefer a neurotic level of legal paranoia, I suggest cutting the auto-sear and auto-sear trip in half, waving above them some burning sage, and then casting them into a pit of boiling tar. Remember the Amigo Grande receiver prevents the installation of a trigger housing that is equipped with parts that would make automatic fire possible, so if you lack access to boiling tar, moving on to the next step should be sufficient.

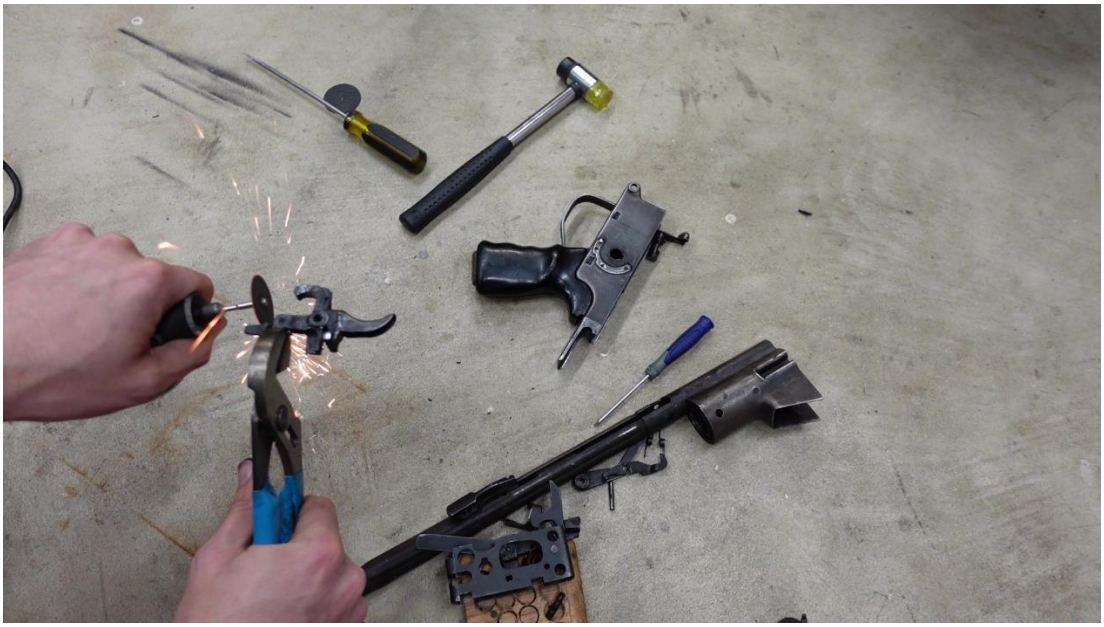
Since your trigger and disconnector chassis are now out of the gun, you can take them and cut the disconnector. Completing this step will ensure that the gun will not 'hammer follow' when set to what was once the "Rápido" (down) position. Completing the following modification will cause your gun to function in

semiautomatic when the selector is set to either “Tiro” (up) or “Rápido” (down) position. “Seguro,” (middle) though, remains safe and comforting.

Collect your trigger housing and disconnector chassis as well as your Dremel tool. You will next grind off the tail on the end of your disconnector.

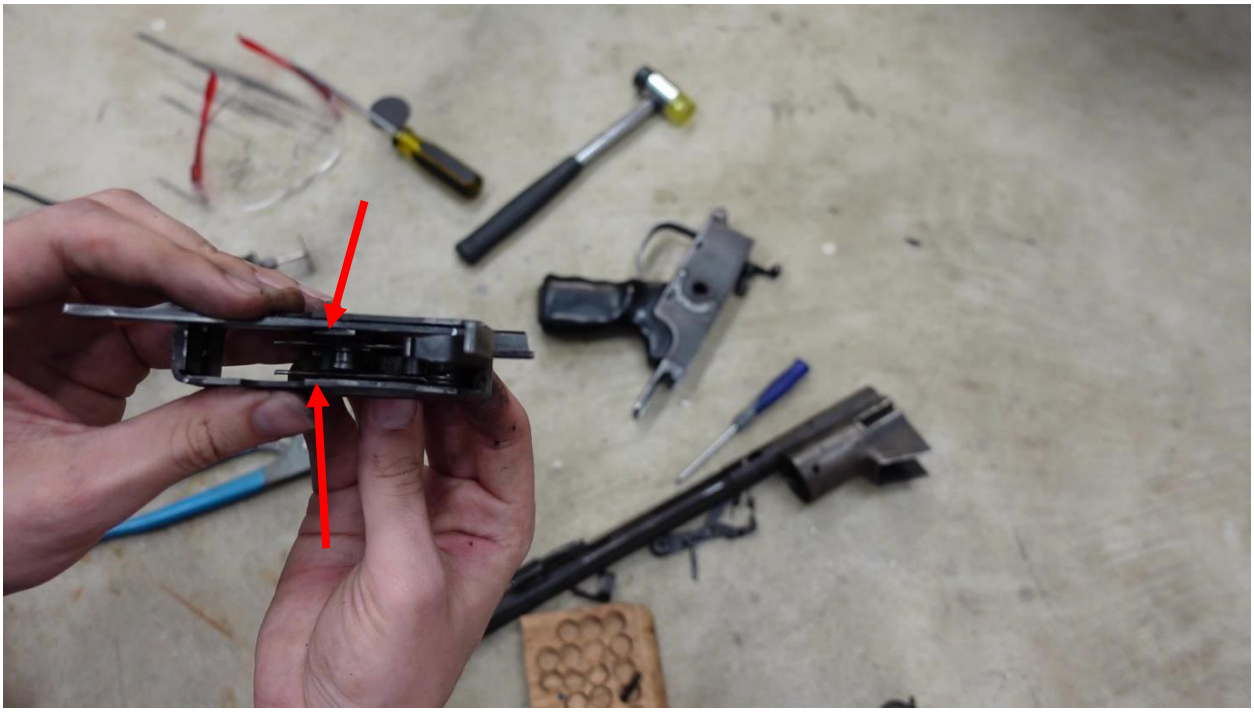
Take your trigger and disconnector chassis.

Trim off the tail shown here using your Dremel.



I recommend you hold things in a vise, but I used pliers to hold the disconnector while I cut the tail off.

Now that the disconnector tail is cut, you can let things cool off, then re-install the trigger and disconnector chassis into the housing.



While re-installing the trigger and disconnector, make sure the hammer spring legs are resting on the disconnector's lil' humps. Line up the pin holes and re-install the trigger pin.

Push the trigger pin through, making sure that you retain the trigger and disconnector chassis with the pin. Line up all the pin holes!

Now that the auto-sear is removed, the trigger will rotate further than it normally would under spring pressure. This is fine, as the grip assembly will still hold the trigger in the proper location. At this point you are ready to re-install the trigger housing into the grip assembly.

While guiding the trigger into the slot in the grip assembly, re-insert the trigger housing.

Set the trigger housing back into the grip assembly.

Re-install the safety selector – remember, it re-installs when point straight up. Rotate it back down once you have pushed it in.

After re-installing the selector, you are ready to do a basic function check.

One important note: the CETME trigger housing is not capable of cocking the hammer while the selector is set to safe. This applies when you are charging the gun too – you cannot lock the bolt back if the hammer has been released and the selector is set to safe! Forcing the bolt could cause problems, including breaking your printed receiver if you try hard enough. Always ensure the selector is set to fire (which is either the upwards or downwards position) before cocking the gun. The middle position is safe. Seguro.

To complete your function check, set the selector to the upwards position. Cock the hammer. Pull the trigger, but catch the hammer so that it doesn't slam against the front of the housing. While still holding the trigger down, re-cock the hammer. Release the trigger slowly and ensure that the hammer resets and that it does not try to release the hammer again – if it tries to fire again, ensure that you installed everything correctly and that both legs of the hammer spring are on top of the disconnector.

Repeat the above procedure with the selector in the downward position. Finish your function check by cocking the hammer, rotating the selector to the middle position, and verifying that the trigger cannot be pulled enough to drop the hammer. At this point, your trigger housing is demiled. I'm so proud of you.

If you run into any issues – the trigger won't reset, the trigger acts as a binary trigger, etc, refer to the "Why is my trigger pack doing dumb things" section of the FAQ at the bottom of this document.

Demiling the Original Receiver Stub

If you are pressing and pinning your barrel yourself, you will have to remove your trunnion from the original receiver stub – unless you bought a loose trunnion, in which case you only need to remove the charging handle from the kit's receiver stub. Removing the charging handle is covered at the end of this section.

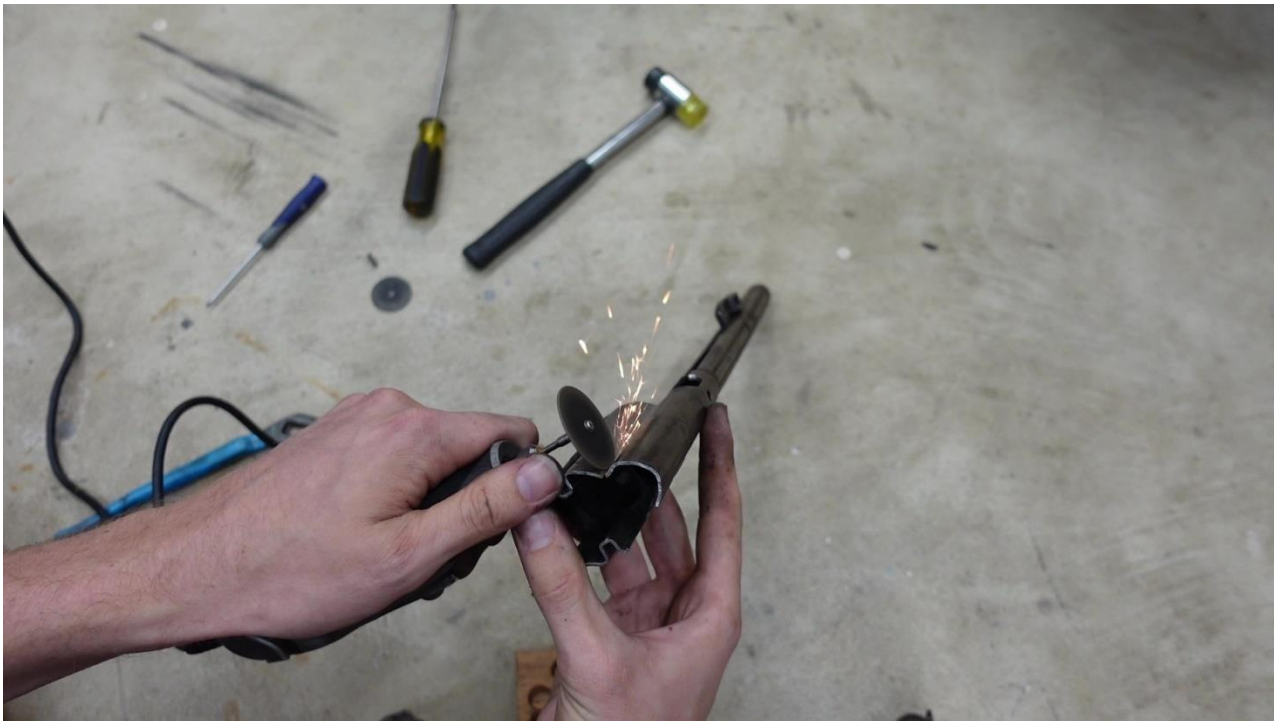
Removing the Trunnion

Removing the trunnion can take a little bit of patience, but it's not hard. You need your Dremel tool with a fresh cutting wheel, your original front receiver stub, and a benchtop vise.

To start off, cut the cocking tube off of the receiver stub. This can be done easily using the Dremel tool – grind along the crease between the upper round tube and lower round tube on the original stub. You don't have to grind all the way through the sheet metal – just try and grind through most of the way, and try not to grind so deep that you end up cutting on the trunnion.

If you do nick the trunnion, that's ok, just try harder to control your Dremel tool. Some people use jewelers saws for this task, but I like my Dremel. It's never let me down, except for when it has.

Cut along this line (the crease between the two tubes) using your Dremel tool. Make your cuts on both sides. You don't have to cut all the way through the metal along the whole line on both sides – you just need to cut enough that the metal is weakened and the cocking tube can be peeled off.



Cutting on the left side of the tube.

Cutting on the right side of the tube.

After you've ground down most of the metal along the lines, go over to your vise. The above picture shows about how much cutting is needed – I cut all the way through on about 30% of the length, but there's still some metal I didn't cut through.

Clamp the receiver stub in your vise. You can clamp really tight, since you don't care about deforming the old sheet metal – it is going to be removed anyway.

Wiggle the cocking tube up and down, left and right. If it doesn't move at all, you may have to cut a little deeper with your Dremel tool. If you can feel the cocking tube moving, keep wiggling and pulling – you can fatigue the metal until the cocking tube rips off.

With a little elbow grease and Dremel work, the tube should pop off. Set the tube to the side, as you will remove the charging handle from it later.

With the cocking tube removed, you are ready to remove the trunnion from what remains of the receiver stub. You will have to grind down some spot welds and peel the old sheet metal from the trunnion itself.

Using your Dremel tool, grind out several spot welds – there are spot welds at the front of the stub (which you can find by looking for discolored spots on the sheet metal), small tack welds close to the rear of the stub (which you can find by noticing the little divots in the sheet metal), as well as two weld beads at the rear end of the trunnion, where it butts up against the receiver rails. Grind down all the weld material. Refer to the video for help on techniques to do this.

Try not to grind too deep, as you only want to grind away the spot weld/sheet metal, not the trunnion itself. If you dig into the trunnion a little, that's ok – just try to be more careful.

After grinding out the spot welds, take your receiver stub and put it back in the vise. Take a pair of pliers and begin peeling the original receiver off of the trunnion. The spot welds may still be stuck down, you can either twist the metal of around them with pliers or hit these spots with the Dremel tool again. I won't include screenshots showing these steps, because it's hard to communicate these things and the video shows them clearly. In general, you should just use the tools at your disposal to dig the trunnion out of the sheet metal without damaging the trunnion.

After grinding around the spot welds, peel the receiver stub off the trunnion with pliers.

Keep working the metal to get it off the trunnion.

After you divorce the receiver husk from the trunnion, use your Dremel tool to grind any remaining weld material flush with the body of the trunnion. If you have a bench grinder, it can cleanly and easily remove residual welds. Otherwise, a Dremel tool and/or a flat metal file can clean things up.

Clean up all spot weld material until the trunnion is smooth and round.

After cleaning up the trunnion, you are ready to install the barrel into the trunnion. Congrats!

Pressing the Barrel

Pressing the barrel into the trunnion, then pinning it in place are the most challenging parts of this build. It may seem daunting, but if you have access to a 10+ ton standing press and a sturdy drill press (with a vise) or mill, then you can pull this off. I believe in you.

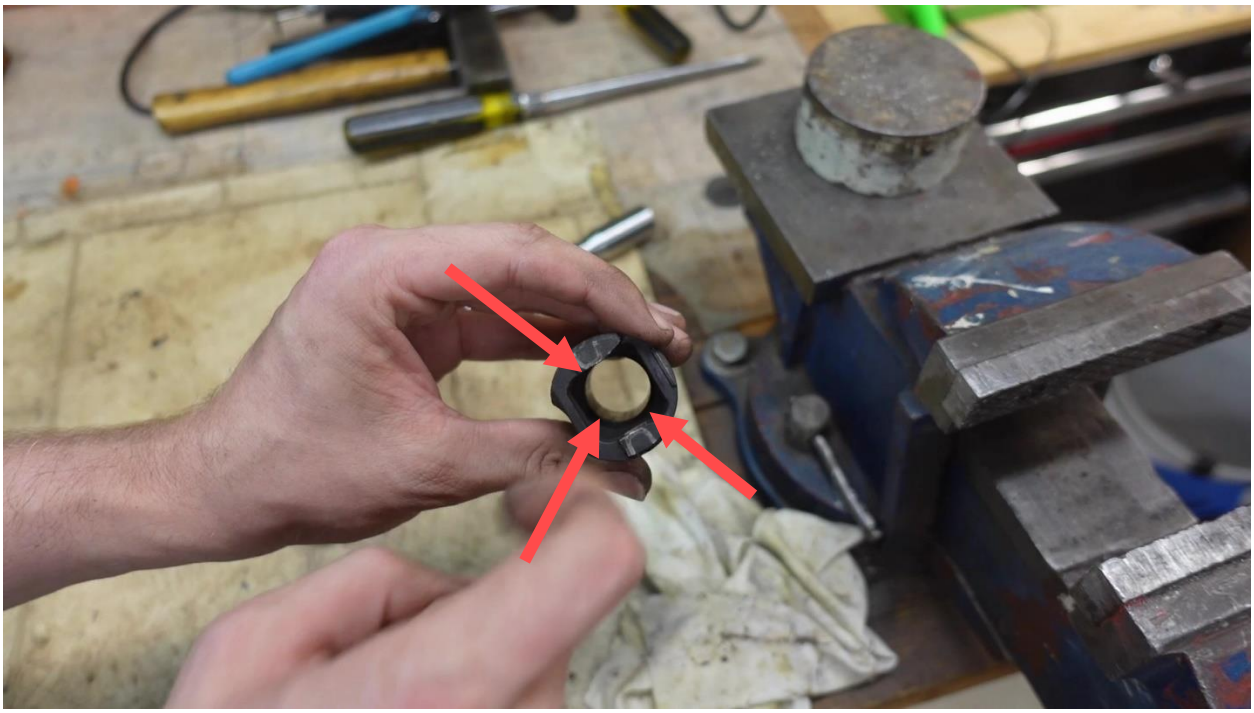
Now – there's an argument to be heard for replacing the rollers in your bolt before you press your barrel in. For the unaware, the rollers in the bolts for these guns are wear items – they will shrink in diameter over use, which will change the bolt gap. The bolt head and locking piece in the bolt itself will wear somewhat as well, which also adds to this change in bolt gap over use. I have never seen one of these kits where the wear on the rollers was so bad that they *needed* to be replaced – most of them seem to be worn down by about 0.01mm (which is significant for these rollers, even though that's a very small number). At 0.02mm of wear, rollers should be replaced. To counter the effects of this wear, over- and under-sized rollers are sold that will hold the bolt gap where it needs to be. These rollers come in 0.02mm size increments – so original rollers that have worn down 0.02mm should be replaced, in

my opinion. There's a lot of debate about all this online, but that's my 2 cents. Or 0.02mm. Or whatever.

Anyway, this video covers how to remove and replace the rollers in your bolt, as well as how to measure your rollers and how to make sense of the sizing (and how it effects bolt gap): https://odysee.com/@Ivan's_CAD_Streams:c/Roller-Video:2. The only thing besides this you should note is that when compared to the bolt gap as measured with +0 (standard) rollers, BIGGER rollers (+2, +4, +6, +8, etc) will result in BIGGER bolt gap, while SMALLER rollers (-2, -4, -6, -8) will result in SMALLER bolt gap.

Prepare your trunnion and barrel for pressing. I recommend freezing your barrel prior to pressing – as metal contracts when cold, your barrel will press in a little easier if you freeze it first. This isn't necessary, but helps. To prepare your trunnion for pressing, use your finger and feel if there is any lip edge, burr, or rough spots inside of the barrel channel.

When these guns had their original barrels removed, it seems common that external forces marked the channel as the barrel was pressed out. If you can feel any sharp edge or burr inside of the channel, take some fine grit sandpaper (I use Emery cloth) and rub out any sharp edges. Ensure that the trunnion's barrel channel is smooth along the entire journal the barrel occupies, paying special attention to the trunnion's barrel channel entrance.



Ensure that the barrel hole is free of burrs and sharp edges. Pay close attention to the top edge (shown by the arrows)!

Even if a spot in the hole only feels a little rough, smooth it out. I prefer to sand radially (around the hole) rather than sanding in and out of the hole.

At this point, you are ready to begin pressing the barrel into your trunnion. It is strongly recommended that you buy some moly grease or anti-seize to reduce the friction generated when pressing in the barrel. I personally prefer anti-seize, as it won't burn off like grease will – so it provides some level of rust protection should you ever have to replace your barrel in the future.

Liberally grease the barrel channel and chamber journal.

Now, take the bolt, bolt carrier assembly, trunnion, barrel, feeler gauges, grease, press, pliers, a rubber hammer, and 10-20 pennies (or similar valueless article of soft metal). Set your trunnion up on your press so that the rear end of the trunnion (the side with recess for the bolt) is facing upwards. Add a little grease to the barrel channel and evenly apply it using your finger or a brush. Take your barrel and slide it into the trunnion – the muzzle end of the barrel should go into the rear of the trunnion. After placing the barrel into the trunnion, place the trunnion and barrel onto the press.

Put two pennies on the breech face of the barrel – these will protect the barrel from getting scratched by the press ram. You can stack pennies between the press ram and barrel if your press ram needs a little more reach.

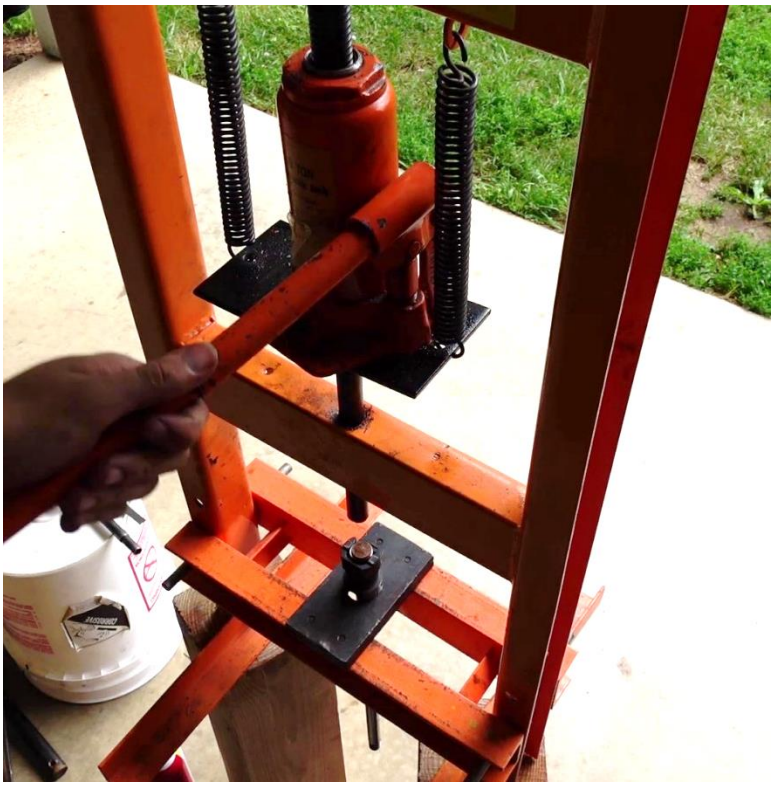
LEGAL NOTE: Many people freak out about destroying currency. It's only illegal if you do it with the express intent of removing the currency from circulation. So for a fun party trick, shout "curse the federal reserve and these specific instruments thereof!" before pressing, while actually intending to finish your build.

Position the trunnion like shown for pressing – the rear end of the trunnion should face up!

Apply a little grease to the barrel channel in the trunnion.

Place the barrel into the trunnion, muzzle first, from the rear end of the trunnion.

Place the barrel and trunnion together under the press ram.



Place two pennies on top of the barrel to protect the breech face.

NB: The 20 ton press' ram is too thicc & juicy to enter the trunnion channel from the rear. For the 20 ton, using a lawnmower spark plug socket and a useless soft metal item, such as a quarter, will work.

After getting the barrel and trunnion prepared for pressing, ensure everything is lined up – the barrel, pennies, and press ram should be lined up as close to concentric as you can get them. Start lowereing the press ram – depening on how your press works, there are different ways to do this. Most presses like the cheap one I used have a shutoff valve. The valve is closed, then a jack is pumped to lower the press ram. To raise the ram, the valve is opened. If you have never used a press before, become familiar with lowering and raising the ram before pressing your barrel in – see your press instructions.

Finally, you can begin pressing in the barrel. Press the barrel in to the point that it sits nearly flush with the seat inside the trunnion – this "seat" is where the top of the barrel hole meets with the cutout in the trunnion that the bolt fits into. HOWEVER, you SHOULD NOT just press your barrel flush to this seat and call it good – your barrel will end up needing to be close to flush, but some builds will need the barrel to be proud, or flush to attain proper bolt gap.

IMPORTANT NOTE: Your barrel should never be pressed such that it it past flush with the seat in the trunnion. Refer to this video to see a cross-section of how these part fit together: https://www.youtube.com/watch?v=MFESb8TK7ZA

When it comes to the final position your barrel will need to be pressed to, your barrel will usually be close to flush with the seat in the trunnion indicated by the red arrow. Sometimes, your barrel will be sticking up (towards the camera in this perspective) out past the seat. Your barrel WILL NEVER have to be pushed past flush with the seat (like this picture shows). If you believe you have reached proper bolt gap, but your barrel is sub-flush with the seat (like shown in this picture), you have done something wrong, and should attempt to press the barrel again.

Proper Bolt Gap

Roller delayed guns have a measurement known as "bolt gap" essential to safe and reliable operation. Without going too deep into the details, "bolt gap" is a measure of exactly how much delay (in terms of time and mechanical disadvantage) the rollers will provide when the gun fires. More bolt gap equates to less delay – so bolt gap measuring 0.100" would have much less delay than a bolt gap of 0.020". 0.020" is the maximum recommended bolt gap, while 0.012" is the minimum. Less bolt gap equates to more delay, but zero bolt gap may indicate that the cartridge isn't fully chambered when the bolt is in battery. This means the cartridge is not supported—a dangerous condition. While the casing will expand *some* to seal into the chamber upon firing, if too much of the cartridge is unsupported, a catastropic failure can result. Put simply: improper bolt gap can be very dangerous.

When installing barrels on these guns, pushing the barrel in further (towards the muzzle) will decrease bolt gap. Luckily, it is very easy to measure bolt gap – simply take a feeler gauge (a flat metal bar ground to a specific width) and stick it between the bolt and bolt carrier while the bolt and bolt carrier are locked into the trunnion.

Where to measure bolt gap – between the bolt carrier body and the bolt head

This brings us to the topic of locking your bolt into the trunnion – when you get your bolt and bolt carrier from your parts kit, your bolt may be locked back against the bolt carrier. Free it by twisting the bolt, then pulling the bolt forward some, then twisting the bolt back. There are several videos online that show how to do this, I learned from this video:

https://gunstreamer.com/watch/unlocking-the-rollers-on-a-g3-bolt_l2AS1wZ96d42Tu8.html

So, to lock your bolt into your trunnion, first press the barrel in far enough for the bolt to fit into the recess in the trunnion. Identify which direction is the top of your trunnion – this is the side of the trunnion that has a semi-circular cutout along its length – the operating rod (the long tube on the top of the bolt carrier) will go along the top of this cutout.

If your bolt won't fit in far enough and the rollers can't extend, press your barrel in further toward what would be the front of the gun. **IMPORTANT NOTE:** sometimes, pressing the barrel into the trunnion will shave off just a little material from the barrel. This is normal, and isn't necessarily a bad thing – these barrels are made with slightly oversized journals to ensure a good fit can be attained with the variety of CETME C/G3/PTR trunnions out there. You will have to clear out any metal chips before you lock your bolt into your trunnion. I recommend using a screwdriver to scrape out any metal chips, then use a rag to dab up any small flakes remaining – wiping with a rag can be dangerous if there are any sharp flakes, so wear gloves if you can't get all the metal out by just dabbing with a rag.

*Try pushing your bolt and carrier forward into the trunnion as shown. If your bolt isn't able to go far enough forward for the rollers to stick out (there will be an audible *click* when they snap into place), you will need to press the barrel further forward.*

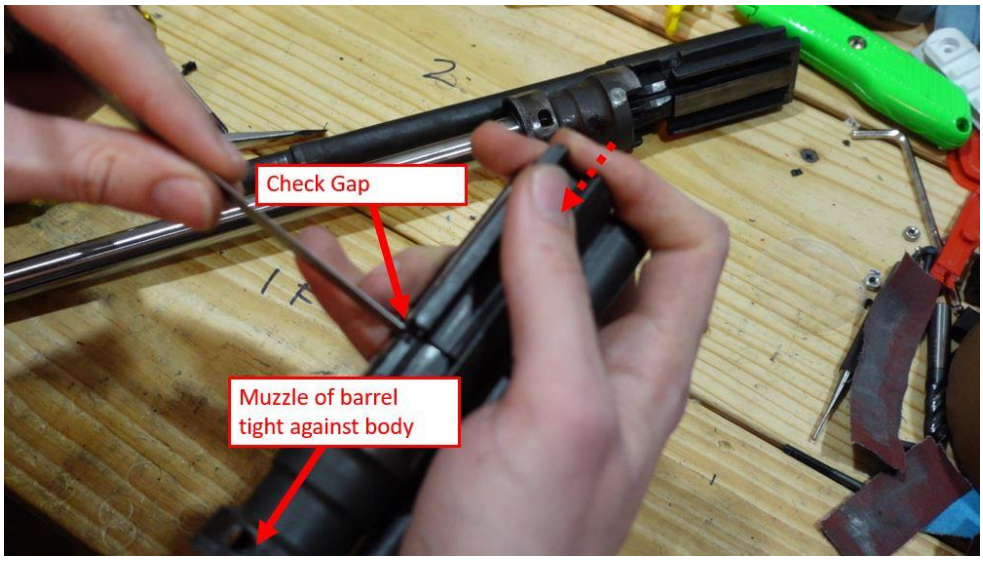
Once your bolt can lock into the trunnion (snaps into place with a "click"), you can measure bolt gap. First, ensure you can't pull the bolt and trunnion apart easily—once the rollers lock out, you should be able to pick up the trunnion and barrel assembly using the bolt carrier.

There are two schools of thought when it comes to measuring bolt gap – measuring in tension (with the weight of the barrel hanging from the bolt carrier) and in compression (with the barrel and bolt carrier being pushed towards each other). While I found measuring in tension to be more intuitive, having gone through this process 30+ times, I now prefer measuring in compression. I also believe that measuring in compression will be easier for newcomers to understand – so while instructions for both methods are present in the video and written documentation, I think measuring in compression is the best tactic.

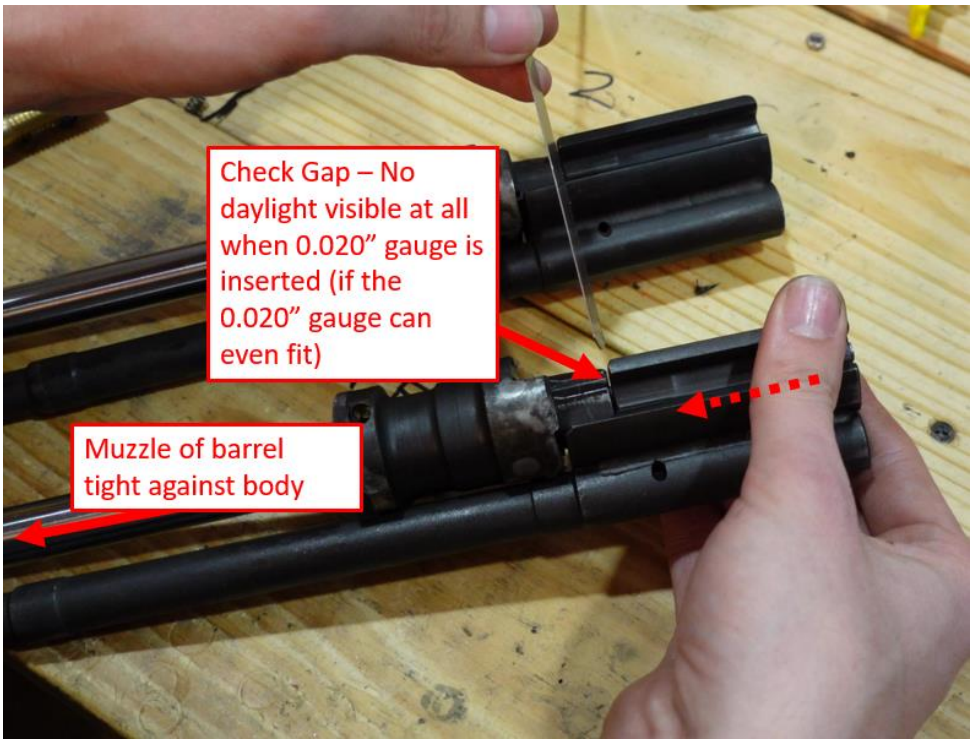
Option 1: Measuring in Compression

After locking the bolt assembly into the trunnion, take the muzzle of the barrel and place it against your chest/abdomen. Use one hand to pull the bolt carrier towards your body – you should hold these parts fairly tight and may feel a little discomfort in your abdomen where the barrel is poking it. With your other hand, use your feeler gauges to measure the bolt gap. When measuring in compression, the 0.020" gauge should either not fit at all or fit tight enough that no light is visible between the stackup of the bolt head, 0.020" gauge, and bolt carrier. The 0.012" gauge should fit with little to no drag. Another check you can do when measuring in compression is to lock the bolt assembly into the trunnion, place your gauge between the bolt head and bolt carrier, then compress the bolt/barrel unit by pulling it into your body as described above. When you do this test, it should feel significant drag if you try to remove the 0.020" gauge (while still compressing the parts against your body), while the 0.012" gauge should be able to slip out freely or with minimal resistance.

Pull the bolt carrier tight to your body, with the muzzle of the barrel pressing against your chest.



While still pulling the parts tight to your body, use your other hand to check the bolt gap.



If, while still holding the parts tight to your body, the 0.020" gauge can fit between the bolt and bolt carrier, it should be a tight fit and no light should be able to make it through between the bolt head, feeler gauge, and bolt body. If you are able to fit the 0.020" gauge easily when holding the parts tight and there is any light visible between the bolt-gauge-carrier stackup, you need to decrease your bolt gap.

Option 2: Measuring in Tension

Dangle the assembly straight down by holding the rear end of the bolt carrier with one hand. Because these guns are built with loose tolerances, there may be substantial wiggle between the bolt carrier, bolt, rollers, and trunnion – so when we measure bolt gap, we must make sure that everything is as close to aligned as possible.

Hold the bolt carrier and trunnion assembly straight up and down before you measure bolt gap

Now, with everything dangling, you can measure bolt gap. I recommend you get a 0.020" and 0.012" gauge (which represent the maximum and minimum bolt gaps, respectively), though you can just use a 0.015" gauge if you know what you are doing. You want the 0.020" gauge to be very tight (or not fit at all), and the 0.012" gauge to fit freely. The 0.015" gauge should have just a little bit of drag, feeling like a "perfect" fit.

A **VERY IMPORTANT** note about checking bolt gap in *tension* (parts dangling down): as I mentioned above, these guns are built to loose tolerances. There substantial slop between how these parts fit. It is possible to fit a 0.020" gauge in a gun that has zero bolt gap if you force the bolt carrier and trunnion to rotate different directions. Just because you can force a certain size gauge into place does **not** mean that's what your bolt gap is! No forcing of gauges is acceptable when measuring in tension.

Your bolt gap should only be measured by holding the parts in alignment, and you should not have to force things to fit. If your 0.020" gauge doesn't fit, your 0.015" gauge is very tight, and your 0.012" has to be forced hard into place, you have pressed the barrel too far into the trunnion and will have to re-adjust and try again.

Measuring bolt gap in tension. Note that the parts are held straight up and down and that the gauge only takes one hand to slide between the bolt and carrier – nothing has to be forced for the 0.015" gauge to fit, but there is a little resistance.

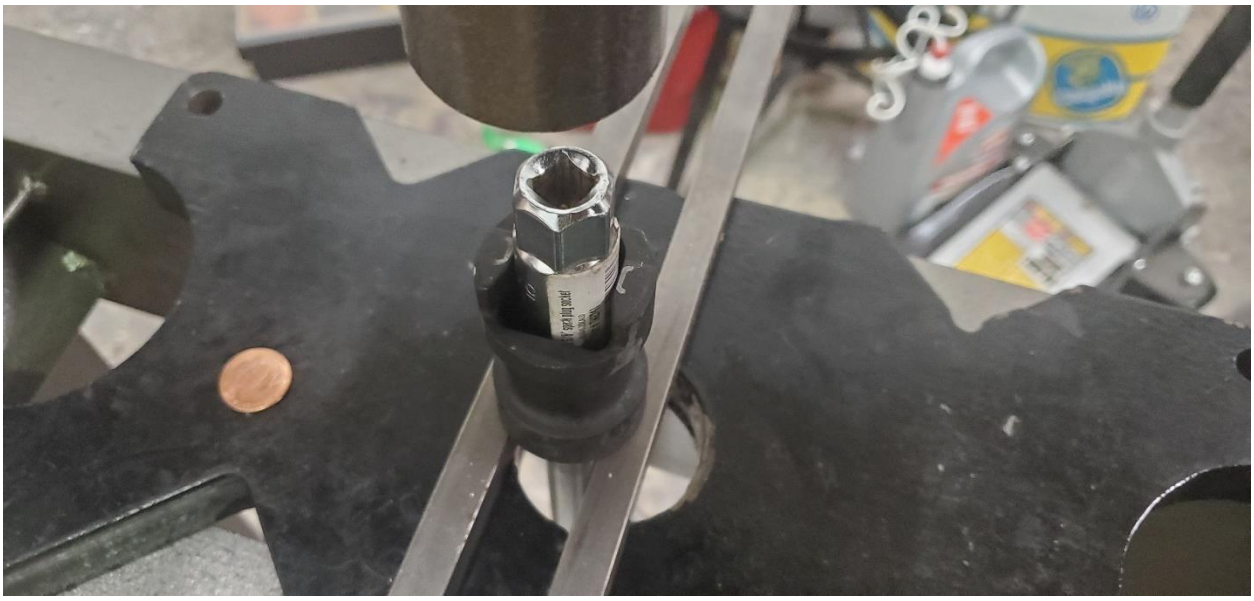
If you get your bolt gap set correctly on your first attempt, you can move on to the next section, and should probably buy a lottery ticket on your way there. However, it's pretty common that you overshoot (press the barrel in too far) on your first attempt. This is ok!

It can be stressful messing with this stuff for the first time, but the CETME is forgiving if you miss the sweet spot the first time around. There are two ways to correct a barrel that's been pressed too far: attempting to re-adjust the barrel or pushing the barrel all the way out and trying again.

Option 1: Re-Adjusting the Barrel

Now that you know what your bolt gap is, you know which direction the barrel needs to be nudged. If your bolt gap is too large, the barrel needs to go towards what would be the front of the gun, and if the gap is too small, the barrel needs to go towards what would be the buttstock.

An option should you need more bolt gap.



An option should you need less bolt gap.

When pressing your barrel in, you may have experienced the barrel "jumping," making clicking noises as it jumped a millimeter or so each time. Oftentimes simply running the press gingerly will do the job, but when fine-tuning for bolt-gap, we sometimes need a way to move the barrel only so much.

One method for fine tuning is by "pre-loading" the barrel in the direction you need it to go, pumping down with light pressure against the part, then striking the press' cross-beam with a hammer. This often sees the barrel move in smaller increments than simply pumping up the jack.

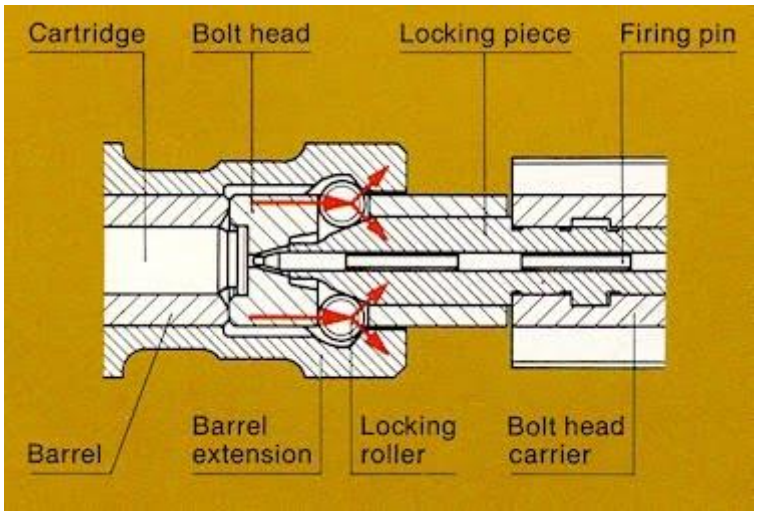
Option 2: Trying Again

Some prefer to simply push the barrel all the way out and try again. For this. take the barrel back to your press, stack up some pennies, and press the barrel down until it pops out of the bottom of the trunnion – be sure and keep a hand on the barrel so that it doesn't shoot out and hit the floor as you're pressing it out. After the barrel is out, thoroughly clean the barrel and trunnion again. Finally, check again for sharp edges or burrs in the barrel channel, and smooth them out should they exist. Apply fresh grease to the inside of the barrel channel on the trunnion, put the barrel back in the trunnion, stack up the pennies, and press the barrel back in. Don't get frustrated and remember to take breaks if you start getting annoyed – my first build took me *eight* tries to get the barrel pressed in just right.

The best strategy I have found is pressing the barrel in until it feels like you are getting close, then measuring the gap, then pressing just a tiny amount, then measuring, and repeating until the barrel is right where it needs to be.

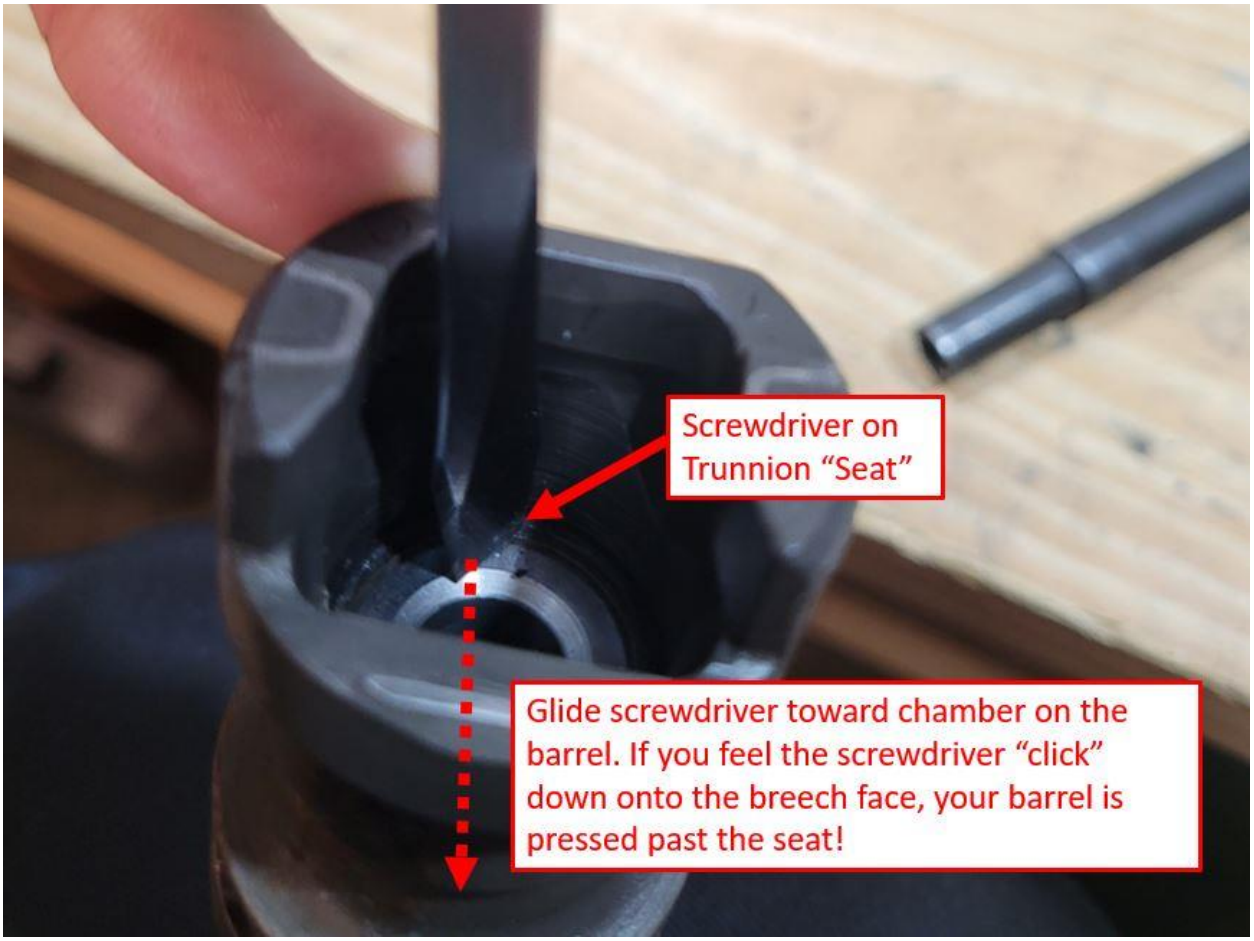
If you do have to take a lot of attempts to get things lined up, you may have to use a little emery cloth to polish the part of the barrel that gets pressed into the trunnion – sharp edges can form on the barrel after a couple attempts, these must be smoothed out before another attempt.

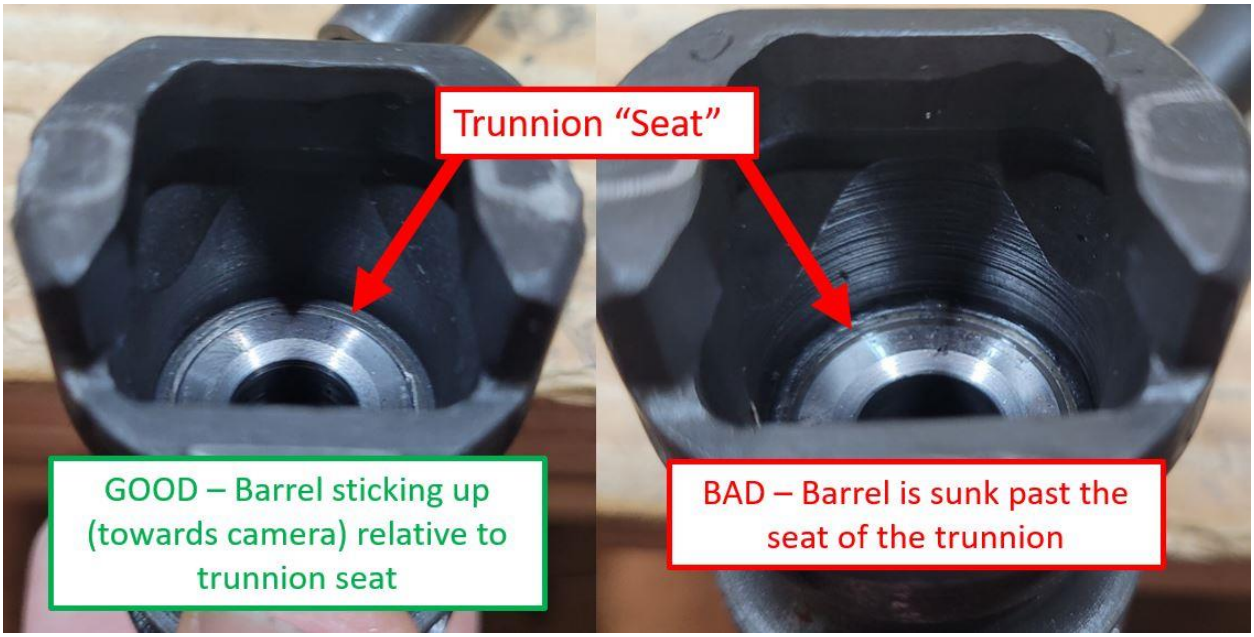
An important final check before you move on to the next step is visually verifying that your barrel isn't pressed too deep into the trunnion. When you look at the barrel/trunnion assembly from the *rear* (the side that you've been putting the bolt head into to check the bolt gap), you should notice that the bolt head itself cannot fit into the hole that the barrel is pressed into. As such, the barrel *should not* be pressed such that the barrel sits below the face of that hole in the rear of the trunnion.



Correct positioning of the barrel relative to the inside of the trunnion (cutaway view). The breech end of the barrel should be flush with or sticking slightly into the rear cavity on the trunnion. The barrel should NOT be pushed so deep into the trunnion that the bolt head cannot touch the breech end of the barrel.

An easy way to check to make sure that your barrel's breech face isn't pressed past the seat in the trunnion is to use a screwdriver to feel for the seat in the trunnion. Take a large flathead screwdriver and try to place the screwdriver on the seat of the trunnion (as show in the picture below). Glide the screwdriver towards the middle of the barrel. If you feel the screwdriver "click" down onto the breech face of the barrel, then your barrel is pressed too far and your barrel needs to be pressed into the proper position.





After you have things pressed in just right, proceed to the pinning section below

Pinning the Barrel

The barrel is right where you want it. Now you need to make sure it stays that way. If you skip this step, firing your gun will move the barrel out, which will cause the gun to become unsafe to shoot. You **MUST** pin your barrel after pressing it in, the press fit is not tight enough to trust.

To pin these barrels, you must drill a hole that lines up with the existing hole in the trunnion. This hole is now obscured in part by your new barrel. This is where things get tricky – some of these original trunnions were not drilled straight from the factory, and drilling onto the round side of the barrel is impossible with a standard drill bit – a drill bit will endeavor to roll off the side of the barrel, so pilot the hole using an endmill.

An endmill, for those that don't know, is similar to a drill bit, but is more rigid and has a flat bottom. For my builds, I used a 3/16" carbide endmill that I got from Travers Tool – endmills can be hard to find in person, you usually have to get them online.

If you aren't familiar with setting up a drilling operation, refer to the video tutorial. In general: clamp the trunnion in a vise so that the pin hole in the trunnion is facing upwards. Take a 5mm drill bit, clamp it in your drill press/mill's chuck *upside down*, use the upside-down drill bit to line up the drill chuck perfectly with the hole.

Next, swap the drill bit for your 3/16" endmill. Using plenty of cutting fluid, use the endmill to cut through the round part of your barrel obscuring the pin hole. This will leave a clean pilot hole for the drill bit to follow. After drilling with the endmill, switch back to the 5mm drill bit and drill the hole again – remember that too much cutting fluid isn't a real thing, and that too much is always better than not enough. It's not expensive and it won't ruin anything but your shoes. After drilling with the 5mm drill bit, you are ready to stick a pin into the hole.

IMPORTANT NOTE: If your kit had a trunnion that was originally drilled crooked, you may end up cracking your endmill once you have finished drilling through the barrel because the endmill will nick the trunnion on the other side. I have had this happen once, and feel it should be mentioned since crooked pin holes are not uncommon – though the kit that broke my endmill was very crooked, much more than any other kit I have seen. Luckily carbide endmills come in relatively inexpensive 5-packs.

Drilling out the pin hole – refer to the video to see how to set this up if the instructions are unclear!

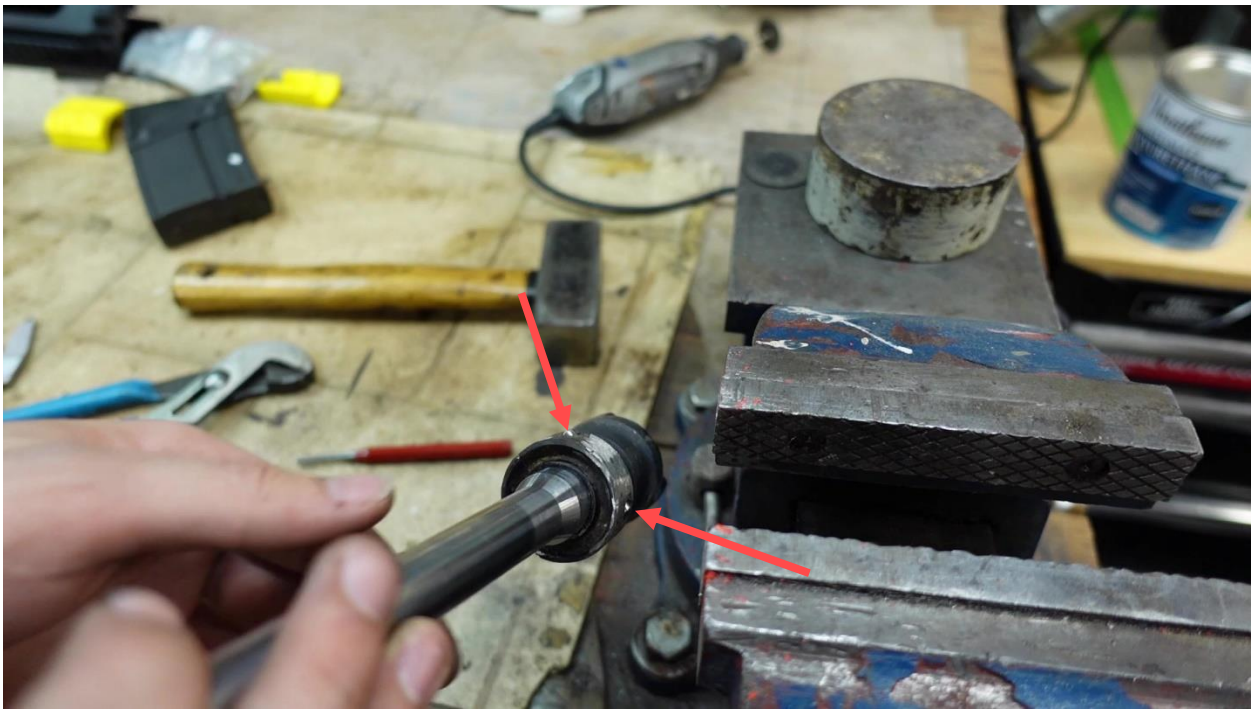
When it comes to installing the barrel pin, some kits do not have their original 5mm pin – for these kits, you will have to make or buy a new pin. Don't worry, as this is actually very easy. I opted to use 0.197" steel rod to make the new pins, so that they are snug but not extremely tight. If you want to use a press-fit pin, you can order 0.199 or 0.200" rod to make a pin out of.

I got my rod stock from McMaster (https://www.mcmaster.com/8893K183/) and cut it to length with a hacksaw. I then beveled the ends of the pin using a Dremel tool and hammered the pin into place. I then used the Dremel tool to cut away any pin sticking out past the body of the trunnion.

Cut your drill rod to length – these pins should be about 1” long.

Adding a chamfer to the ends of the pin is a good idea.

Install the pin into the trunnion. If you use 0.197" rod, you will need a punch and hammer to seat the pin. If you use larger rod, you will need a press or to squeeze the pin using a vise to seat it.



If any of the pin sticks out past the body of the trunnion, grind it down.

Congrats! You have finished the hard part of this build: your barrel and bolt should be properly set up to cycle 308 reliably and safely.

Removing the Charging Handle

Locate your cocking tube (the part that you cut off the receiver stub at the beginning of this section). You will be removing the charging handle assembly from this tube. There are two ways to do this – one way involves simply cutting the cocking tube in half and taking the charging handle out – this is stupid and not recommended, because if you ever end up wanting to do a steel build for your kit, you will have just destroyed one of the most expensive parts.

Option 1: Doing it right.

The proper method to remove your charging handle is to punch out the pin that holds the charging handle to its guide. To do this, pull the charging handle back and rotate it slightly so that you can see the pin indicated in the picture below.

Position the charging handle so that this pin lines up with the hole.

Using a vise to hold the cocking tube, take a hammer and a punch and drive the pin out. These pins are very tight, so it will take some patience.

Punch the pin out using a punch

After removing the pin, carefully remove your punch while holding onto the charging handle – the spring on the charging handle can try to fly out. Remove the charging handle carefully (paying close attention to the spring), then remove the charging handle guide from the rear end of the tube.

Take all three parts (charging handle, spring, guide), as well as your pin – you need to reassemble your charging handle assembly now that all of the parts are out of the cocking tube. Orient your parts as seen the picture below – the charging handle should have the side with the recess for the spring facing up.

NB: I recommend buying an HK-21 style charging handle – it is much larger than the small CETME handle and makes these guns much easier to charge. It isn't required, but your hands will thank you if you get the HK-21 style handle.

Correct orientation for reassembling your parts

Place the charging handle spring into the matching recess, as seen in the picture below. One leg of the spring should sit inside the slot on the charging handle, the other leg goes inside the charging handle guide's slot.

While holding the spring in place, push the charging handle into the guide and line up the pin hole. Place the pin back into the hole, the pin's un-knurled end going first. Use a vise (or pliers, or a hammer) to push the pin back into the guide, retaining the charging handle.

Correct orientation of the spring on the charging handle.

Correct position for the upper leg of the spring when installing the charging handle to the guide.

Line up the pin hole

Re-install the pin – I used a vise to press the pin back into place. Make sure the pin hole is lined up!

Make sure the charging handle moves freely and that the spring resists "opening" the charging handle.

Option 2: Doing it wrong.

In the event you are some kind of neandertal who somehow got this far while also considering a hammer a tool of precision and finesse, you can simply chop the old charging handle tube in half to extract its delicious nectar (the charging handle assembly). This is not recommended and people who do this are stupid.

Option 2: Cut the cocking tube at the line shown in the above picture like a petulant child and pull the charging handle assembly out of the front of the tube.

With the charging handle removed and reassembled, you are now ready to begin putting together your printed parts!

Part 2: Plasticwork

This part of the build is much easier than the metalwork part of the build. The assembly process is split into three parts – the front receiver, rear receiver, and handguard/cocking tube. Remember to watch the video for this process if you need help!

The Front Receiver

Start by removing all supports from the front receiver. Take a 5mm drill bit and drill out the eight holes on the front flange of this receiver – these are the holes that surround the channel the barrel will go into. Next, take a 4mm drill bit and drill out the 10 holes on the rear flange of the front receiver. Do not drill any other holes at this time.

Take the magazine catch, magazine catch button, magazine catch spring, and magazine catch button pin. These parts will install at the rear of the mag well. Begin by ensuring all these parts fit correctly. Insert the magazine catch into the receiver. It should fit with minimal drag. If it fits tight, you may have to ream out the hole the large leg goes through with a 6mm drill bit.

Check how the magazine catch fits. It should make you feel something like: "Nice, that fits!"

You may need to use a 6mm drill bit (spun by hand) to clean out the hole if the magazine catch feels tight

Next, take the magazine catch spring and seat it in the recess on the ejection port side of the receiver. It should fit tight; this ensures it won't pop out of the receiver while installing install the magazine catch button. If the fit is so tight that you can't get the spring to fit, you can use a drill bit slightly larger than the spring to open up that hole.

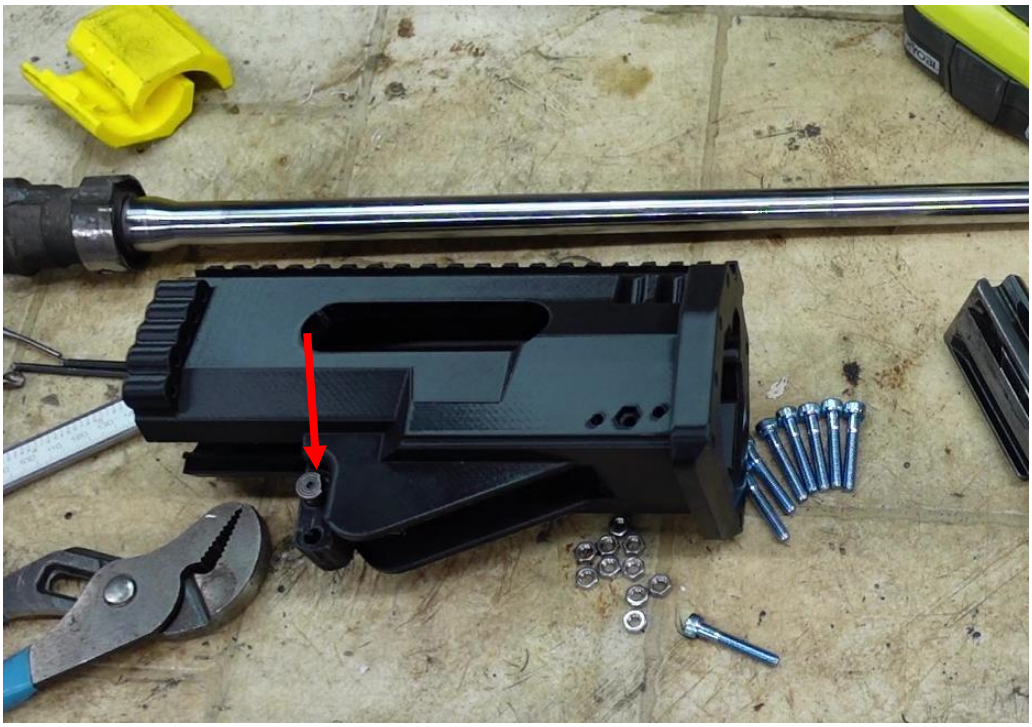
Magazine catch spring seated fully in its hole.

Finally, take your magazine catch button and button pin. You can make the button's install easier by sticking the pin slightly into the button first. The button has a flat edge on it – this edge will face towards the mag well when installed.

A view from the bottom of the receiver, showing how the button (on the left side) fits

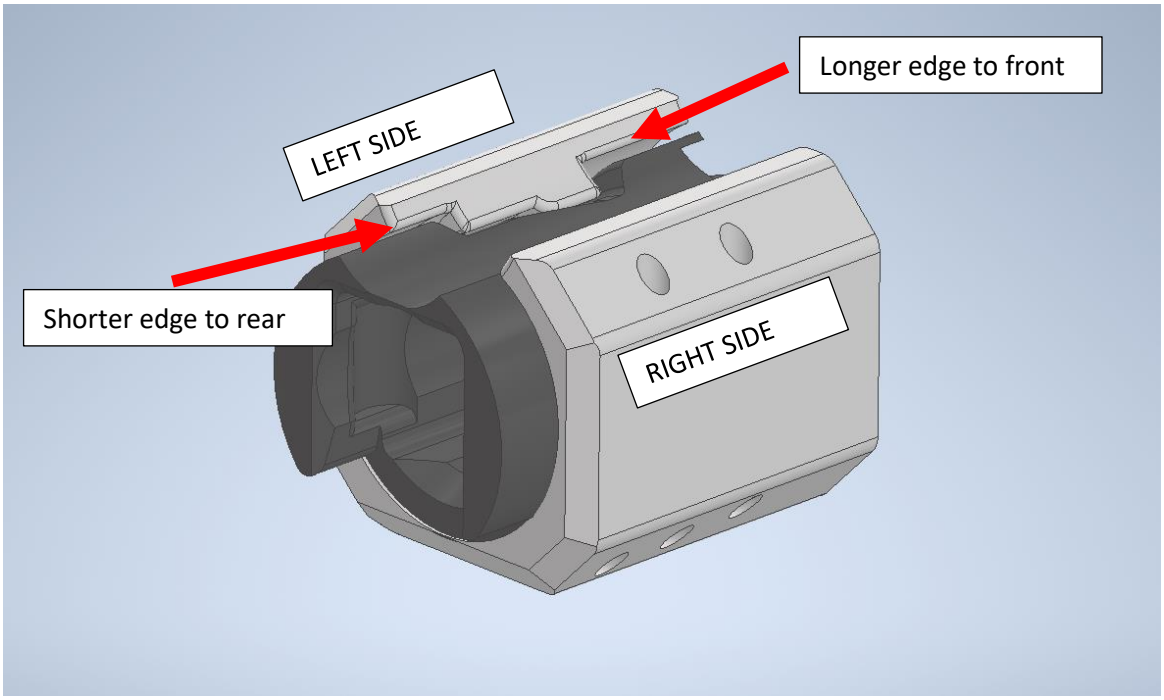
To install the button, pliers can be used – ensure the flat side of the button is facing the mag well, that the pin is straight up and down (relative to the rear flange on the receiver), then squeeze the pliers to drive the pin home.

Make your setup look like this and squeeze with a pair of pliers to install the pin.



View of the installed button. Note that the flat side of the button is facing the mag well.

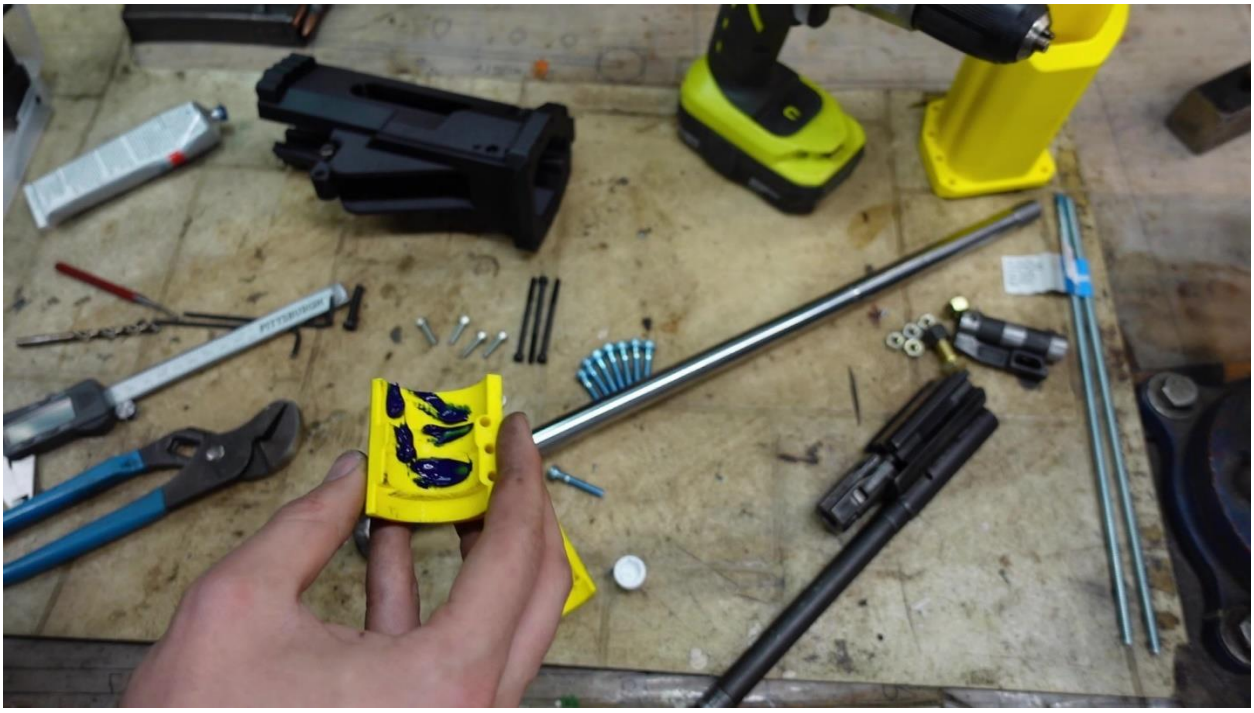
Next, take the barrel/trunnion assembly, the left and right side barrel mounts, and the front receiver. You will sandwich the trunnion between the barrel mounts. When looking at the mounts, bottom edge is the one with three holes. Refer to the picture below to help distinguish the left and right mounts. Place the mounts around the trunnion so that the two mounts meet at the bottom of the trunnion, as close to in the middle as you can get them.



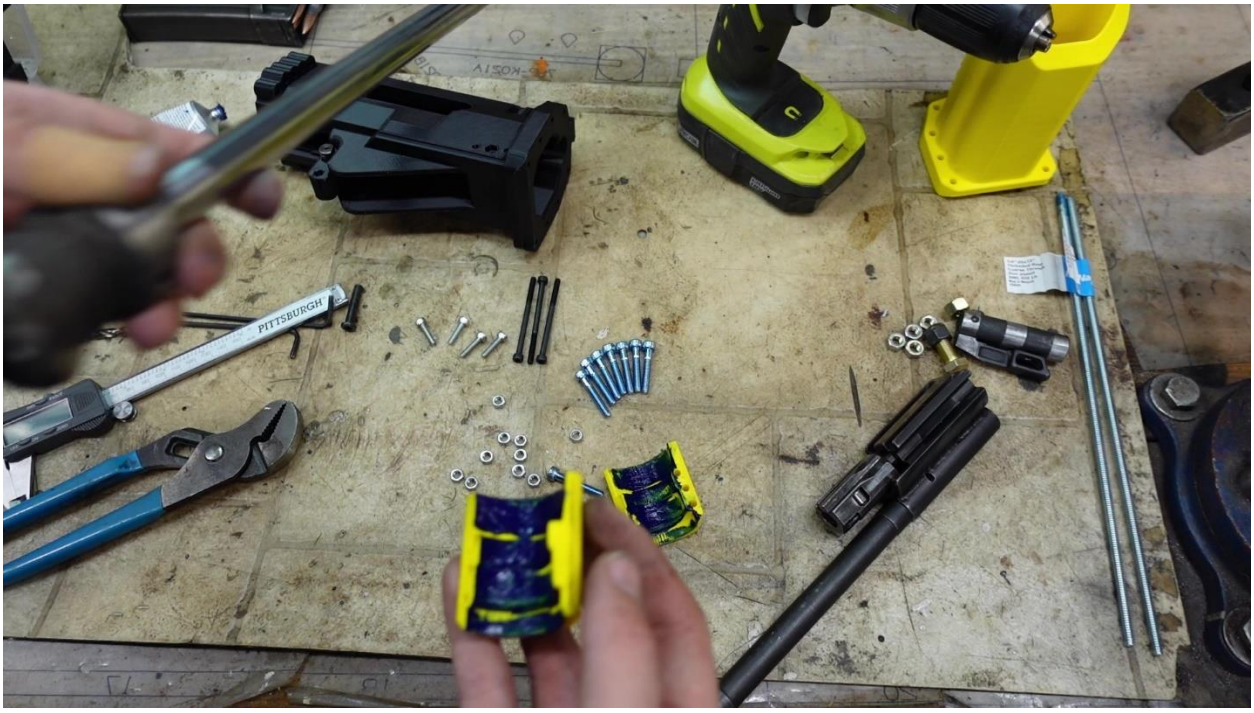
Align the seam where the two mounts meet at the bottom of the trunnion.

Once you understand how to put the trunnion between the two mounts, I recommend applying some RTV gasket maker (or other similar silicone material) to the inside of the mounts. This is optional but will extend the life of your barrel mount if you print in a material with low heat resistance, such as PLA. Don't worry about hurting your trunnion – RTV will peel off easily if you ever need to remove your barrel, and it will not stain or harm your parts in any way.

Example of suitable RTV – This is Loctite RTV Blue



Apply some RTV to the mount.



Use your finger or a rag to spread the RTV evenly across the inside surface of the mount. Your hands will smell weird.

Ensure that you get the mounts to line up correctly on the trunnion – the seam where the two mounts meet should still be directly at the bottom of the trunnion.

Now, you are ready to install the barrel into the receiver. A soft rubber hammer is recommended for this. The barrel mount is a tight fitting part—it should not slide in easily. To seat the barrel, I placed a block of wood on the ground, placed the muzzle of the barrel onto the block (barrel standing upright). I then took the receiver, and while pinching the barrel mounts together with one hand, guided the receiver down onto the mounts with the other hand. These parts may be wobbly at first, but with a little patience you can get the mount aligned to the receiver and start pushing the receiver down onto the mounts. You can hit the flange on the receiver with a soft hammer or your lovely soft palms to help drive the mount into the receiver. You should not have to use a heavy hammer to drive the barrel assembly in – if things are too tight, use a little sandpaper on the outside of the barrel mounts to ensure that everything goes together correctly. If you force a set of barrel mounts that printed slightly oversize into a receiver that printed a little undersize, you can crack your front receiver – wasting a lot of print time and filament. If things aren't fitting, take the time to sand a little on the mounts!

Place the barrel down onto a block of wood on the floor.

Get the mount started into the receiver – keep pressure on the two parts and tap on the rear of the receiver. In some cases, you can get the mount started just by pinching it tightly and pushing it into the receiver.

Once the barrel mount has started into the receiver, tap to keep it going. As the mount gets further and further into the receiver, strike harder to push the mount in further.

The mount is fully inserted when it is flush with the front of the receiver. You may be able to tell the difference in sound from when the mount is moving and when it is fully seated. To verify the mount is fully seated, look through the holes at the bottom of the receiver. You should see straight through.

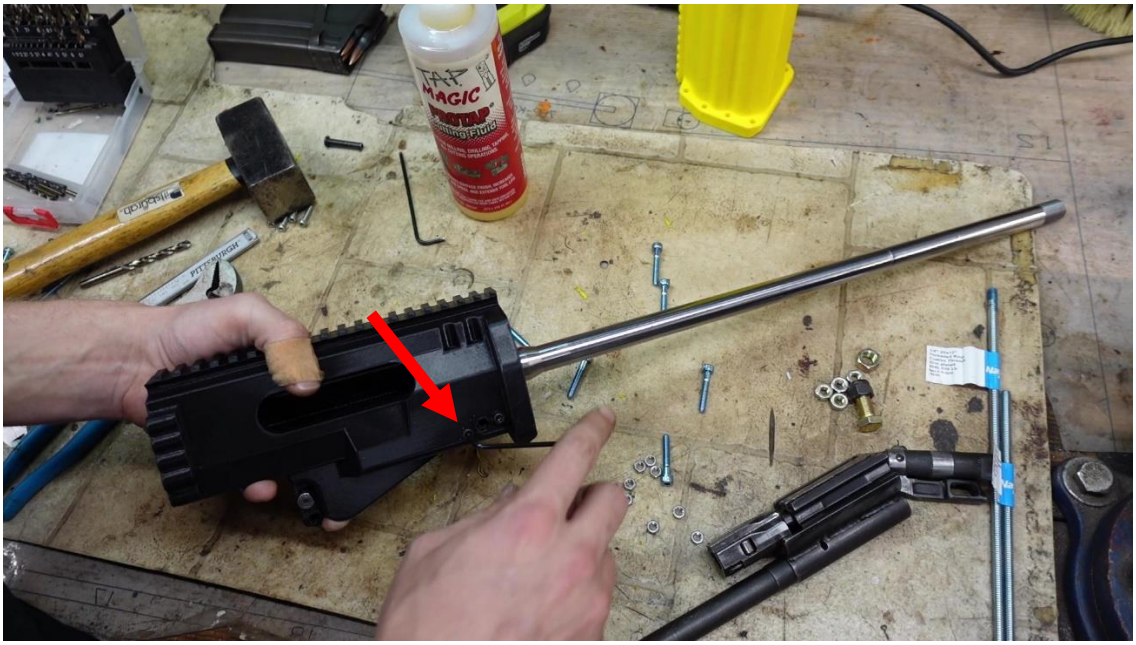
IMPORTANT NOTE: If your barrel/mount assembly installs easily (with little to no resistance) and you are able to spin the trunnion/barrel freely inside of the front receiver, you should reprint your barrel mounts and ensure you use correct settings when you print them. While the screws will help tension the mount somewhat, the barrel/trunnion should be tight and unable to rotate inside the mounts once it is installed in the front receiver. Double check layer height settings, especially the "first layer height" setting.

IMPORTANT NOTE: If you ever need to remove the barrel, it can be driven out using one of several methods: I prefer to use a long brass drift (essentially a foot-long punch) to punch the barrel/trunnion from the rear of the receiver. You can hold the receiver in a vise and easily strike the drift to get the barrel and mount to come out. The other method I have used is to thread a nut onto the muzzle threads, pinch the nut in a vise, the use a hammer to smack the receiver away from the barrel.

Now, with the barrel fully inserted, ready a 4mm drill bit and hand drill. Drill through the three holes on the bottom of the receiver. If the 4mm bit doesn't reach all the way through the holes, simply drill halfway through each hole from both sides.

Clean up all three holes at the bottom of the receiver.

After the three lower holes are cleaned up, take three M4x60mm bolts and three M4 nuts. Place the nuts inside of the recesses in the receiver – one side has one nut recess, the other side has two recesses. These nuts will fit tight into the receiver recesses, so you may need the aid of a hammer to get them seated. Next, take the aforementioned bolts and thread them into the three holes, tightening against the nuts. Get these bolts nice and tight, as they will provide extra compression to the barrel mount in addition to the compression from the press fit. After installing the three bolts at the bottom, take 4 M4x16mm bolts and screw them into the four holes at the top of the receiver – these will help keep the barrel mount from flexing independent of the receiver. These four bolts do not have to be tightened excessively, just get them snug enough so they won't come loose.



Installing one of the three M4x60mm bolts. Make sure you have a nut on the other side before you tighten your bolt down!

Installing one of the four M4x16mm bolts that come in from the top – try not to overtighten these bolts, they just need to be snug.

Congratulations! You have assembled the front receiver section and are ready to move on to the rear receiver. If you would like, you can test how magazines fit at this point – they should have a little wiggle, are sort of a rock-and-lock insertion (like an AK or M14, but not as extreme of a rocking angle), and usually will not drop free.

Rear Receiver Section

The rear receiver section will introduce you to the concept of "mate-drilling." When these rifles were originally built, some of the parts were fit by having holes drilled through two parts as they were held together. Rather than the parts being pre-drilled, some holes were made at the time of assembly.

What this means for you as the builder is this: some of the holes on CETME rifles are not drilled in the same exact place from one gun to the next. As a result, you may have to use a drill to help make holes line up – when done carefully, this isn't a big deal. But if you have a kit with seriously misaligned holes, you might either have to use a small round file or risk shaving some metal off of your parts – it's not a big deal to shave a little metal, but this warning is here so that you're aware and to minimize it.

As usual, begin by removing all supports from the part.

To assemble the rear receiver section, start by taking a 4mm drill bit and drilling out the 10 holes on the front flange of the rear receiver. After that, ensure that all support material is removed from the rear end of the rear receiver (the pocket the stock will sit inside). Use a screwdriver/pointy tool, be patient, and ensure that you get as much support material removed as practicable. Then, take the stock/recoil spring assembly and try installing it on the rear receiver. It should be tight – Having the stock fit tight into the receiver helps ensure minimal stock wobble (which is very annoying on these guns).

If you are having trouble getting your stock to fit, first make sure that you have inserted the stock as far as it will go by hand – wiggle the stock left and right, up and down while pushing it on. After it is inserted as far as possible by hand, you can use a hammer to gently tap it on or place the buttstock against your chest and pull the receiver onto the buttstock by wrapping your hands around the flange on the rear receiver and pulling towards you. It is also an option to hold the rear receiver section and smack the rubber buttpad against the ground to drive the stock home.

NB: Some of these kits have stocks that are loose on the recoil spring assembly, which people confuse with the recoil spring assembly/stock being a loose fit on the receiver. If your stock feels loose once installed, please ensure that your stock is tightened to the recoil spring assembly (you must remove the buttplate to access the screw which secures this assembly).

Remove all supports! If you leave some supports behind, your stock may not fit on all the way.

Wiggle the stock on as far as you can by hand – it will be tight, but a little wiggling should let it slide on enough to get started.

Once the stock is wiggled on as far as it will go, you can use a hammer or the technique shown above to seat the stock – placing the buttstock against your chest and pulling the receiver towards you works well.

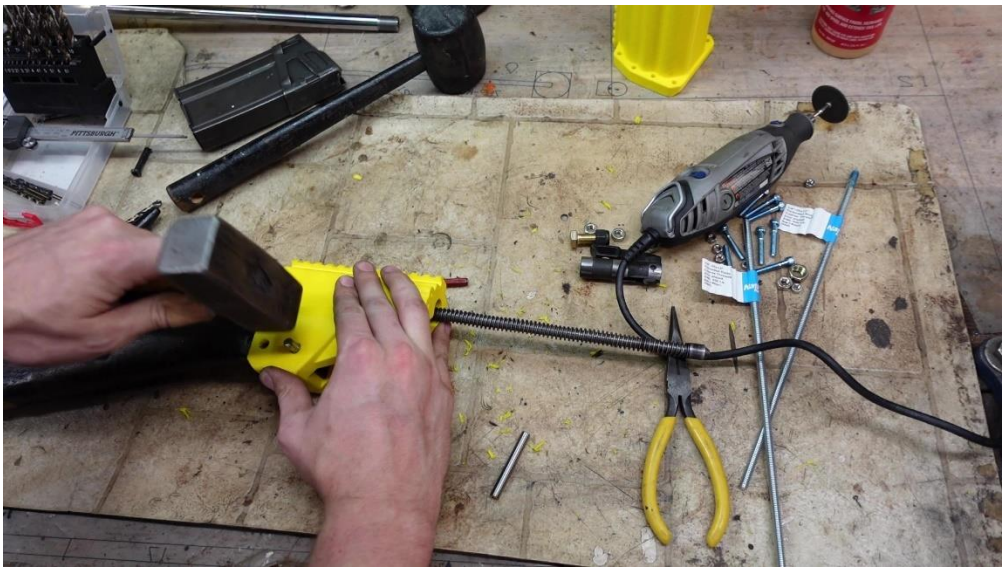
Now, with the stock pushed on all the way, you are ready to pin it in place. Note that if you buy a hardware kit for this build, you may be sent ¼-20 bolts that eliminate the need to mate drill and might come with special instructions of their own – but if you are using 7mm solid pins, you will follow the instructions in the paragraph below.

This is where mate-drilling may come into play for you. If the holes are not aligned, chuck up a 7mm drill bit in your drill, then look through the two holes that go through the receiver and stock. Try and determine which direction, if any, the holes in the plastic need to go in order to line up with the steel holes in the stock. Once you have identified this, take the drill bit and ***GENTLY*** guide it so that you cut the plastic away to line up with the hole in the stock. If you ram you drill in at high speed, you will likely take a bit out of the stock – but if you spin the drill slowly, in small bursts, you can guide the drill into the hole in the stock while the plastic gets cut away. Once you can stick your 7mm drill bit through one side of the receiver and out the other, you are ready to proceed. Please refer to the video (Part 3, around 40 minutes in) if this is unclear, as the video shows how I did it.

Another, more precise but also laborious option would be to use a chainsaw round file, or similar, to file away the intruding plastic.

If using 7mm solid pins or 7mm bolts, be sure to carefully drill out the plastic holes to line up with the holes in the stock.

With the holes lined up, you can now install the pins. If you are making your own pins, take 7mm steel stock and cut two pins 51mm long each. It is useful to chamfer the ends of these pins. Install these pins through the receiver. You may have to stick your hand into the receiver to help line the pins up so that they go through both sides of the stock. If you are using simple 7mm round pins, I recommend using a soldering iron and some scrap support material to melt plastic around the ends of the pins to help retain them – on one of my builds, the mate-drilling that I had to do caused the pin to fit a little loose, and it would try to fall out under recoil – melting a little plastic over the end of the pin keeps it in place. If you are using a nut and bolt, then you don't need to melt any plastic – the nut and bolt will not fall out.



Insert the pins to retain the stock. If using solid pins, it is recommended to melt some support material over the ends of the pin using a soldering iron – this will retain the pins.

At this point, the rear receiver is assembled – and is ready to be installed. Gather the front receiver, bolt carrier, grip assembly together for installation. Prepare 10 M4x35mm bolts, 10 M4 nuts, and the trigger housing push pin from the parts kit. The trigger housing push pin is the smaller push pin of the three included in the kit.

Insert the bolt carrier/bolt assembly into the rear end of the front receiver. Be sure that the rollers are **not** extended when inserting the bolt, you may have to pinch the rollers in before the bolt can be inserted. If the rollers are not extended, they should fall flush to the bolt head with a light touch. Let the bolt come all the way forward and lock into the trunnion. Next, take the grip assembly and place it onto the front receiver as shown below:

Line up the assembly as shown. You don't have to line up the grip assembly hole at this time.

Take the rear receiver/stock assembly and slide it toward the front receiver. The tongue on the grip assembly will slot into the rear receiver – you may have to push up or down on the grip assembly to get it to fit into the rear receiver. Gently guide the two receivers together until the flanges on the receivers meet up. At this point, take an M4x35mm bolt and M4 nut to secure one of the holes in the flange. After this, secure the rest of the holes using M4x35mm bolts/nuts. I recommend you tighten the bolts in a cross-wise pattern – for example, if you start from the left top bolt, do the right bottom bolt next, then the left bottom, then the right top, etc.

Tighten the bolts fairly tight, using pliers or a wrench to hold the nuts from spinning while you tighten the bolt with an Allen wrench. Do your best to make sure the receiver sections are aligned when you mate them – the easiest way to do this is by installing all the bolts and nuts finger-tight before you tighten them down all the way.

Ensure that the tongue on the grip assembly fits into the rear receiver, and gently push the receiver sections together.

Once the flanges meet up, you can start inserting M4x35mm bolts.

Install bolts in a cross-wise pattern – if installing top-left first, do bottom right next. Install all 10 bolts. They should be tight, use pliers to hold the nuts while you tighten the bolts with an Allen wrench.

Finally, take the grip assembly push-pin and see if it will push through. Because this hole was mate-drilled on original guns, you may have to take a 6mm drill bit and drill through this hole to remove a little plastic from the receiver to allow the pin to push through.

Try pushing the push-pin through – if it won't go, run a 6mm drill bit through this hole, then push the pin through.

An overview of the mated front and rear receivers.

At this point, the gun is nearly complete – all that remains is installing the handguard and setting proper charging handle gap. Congratulations on making it to this point! I can't wait to tell all of my friends at the bridge club about what you did.

Handguard/Cocking Tube

Take your handguard/cocking tube (hereinafter just "handguard," just understand that the cocking tube is integrated into the handguard) and remove all supports from it. Take a 3/8" drill bit and drill out the large hole at the end of the handguard. Then take a 5mm drill bit and drill out the eight holes on the rear flange of the handguard. Next, gather the charging handle assembly, 3/8 x 1.5" bolt, 3/8" locking nut, 3/8" hex nut, and your Dremel tool. You will also need a 9/16" wrench and a vise, or two 9/16" wrenches. ***Note:*** Depending on your print settings, your handguard may warp at the end – if you have optimal cooling settings, this won't happen, but if you have a little curve at the end of your handguard, don't fret – it will still function fine. Probably.

Drill out the hole in the front of the handguard with a 3/8" drill bit.

Start by taking the Dremel tool (or a metal file) and removing all the markings from the head of the 3/8" bolt – you want the face of the bolt to be smooth. Next, thread the 3/8" bolt all the way into the 3/8" locking nut. You can hold the nut in a vise and tighten the bolt with a wrench or simply use two wrenches.

Use a Dremel tool or file to grind the face of the bolt smooth – remove any markings from the face of the bolt.

Thread the bolt fully into the locking nut.

Now is where the concept of "charging handle gap" comes into play. On rifle caliber roller-delayed guns (like the CETME C, G3, CETME L, HK33, etc), the charging handle doesn't just fold away to be more compact – it actually acts as a camming lever that helps in unlocking the rollers. This makes these guns possible to unlock by hand. If there is no camming action, it takes either a hammer to the charging handle or idiot strength to unlock the rollers and charge the gun.

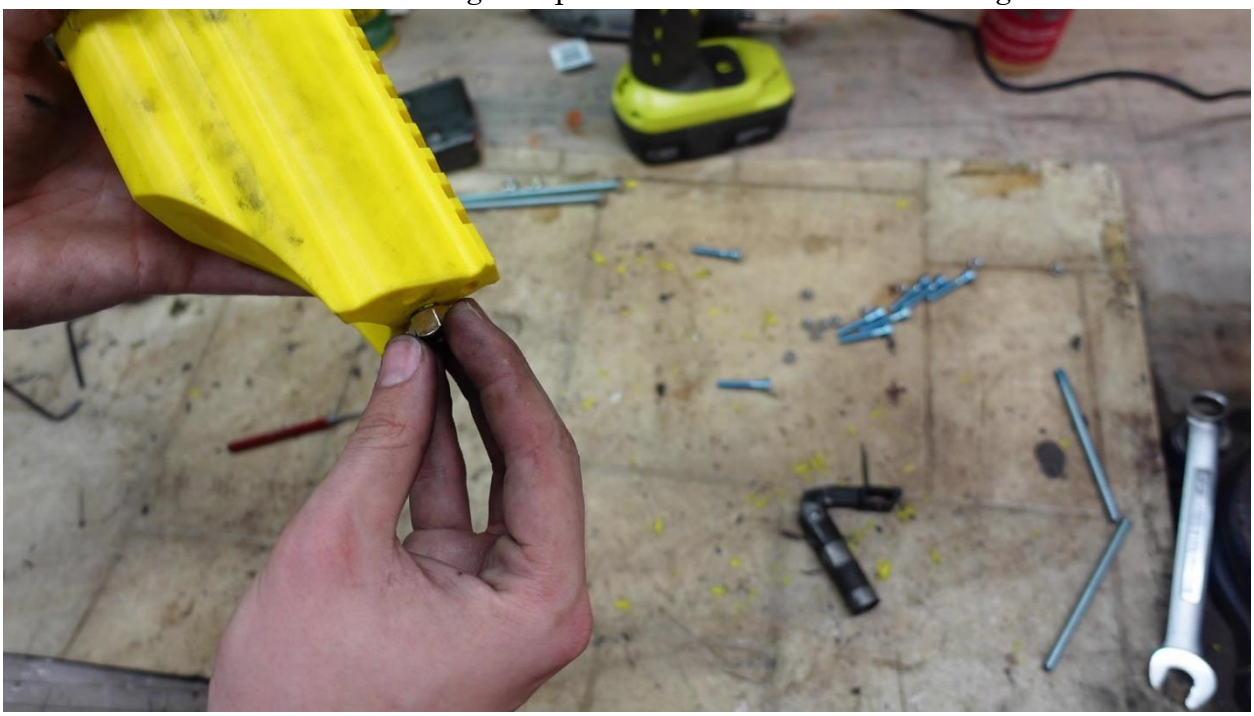
For the charging handle to be able to help unlock the rollers, it must push against the end of the cocking tube. The 3/8" bolt head will act as the abutment that the charging handle cams against. "Charging handle gap" is relevant because these rifles had varying length assemblies from the factory – which means that the abutment from one gun to the next wasn't the same relatively speaking. To account for this, the Amigo Grande allows you to screw the 3/8" bolt further in or out of the locking nut to set the perfect location for the handle to cam against, such that you can attain the right amount of charging handle gap.

To start, install the 3/8" bolt (which is threaded fully on to the locking nut) into the handguard. You do this by dropping it, threaded portion first, down the cocking tube channel in the handguard. Align the locking nut with the hex-shaped cutout in the handguard – spin it to line it up and pull on the threaded section of the bolt to seat it.

Drop the 3/8” bolt down the tube as shown.

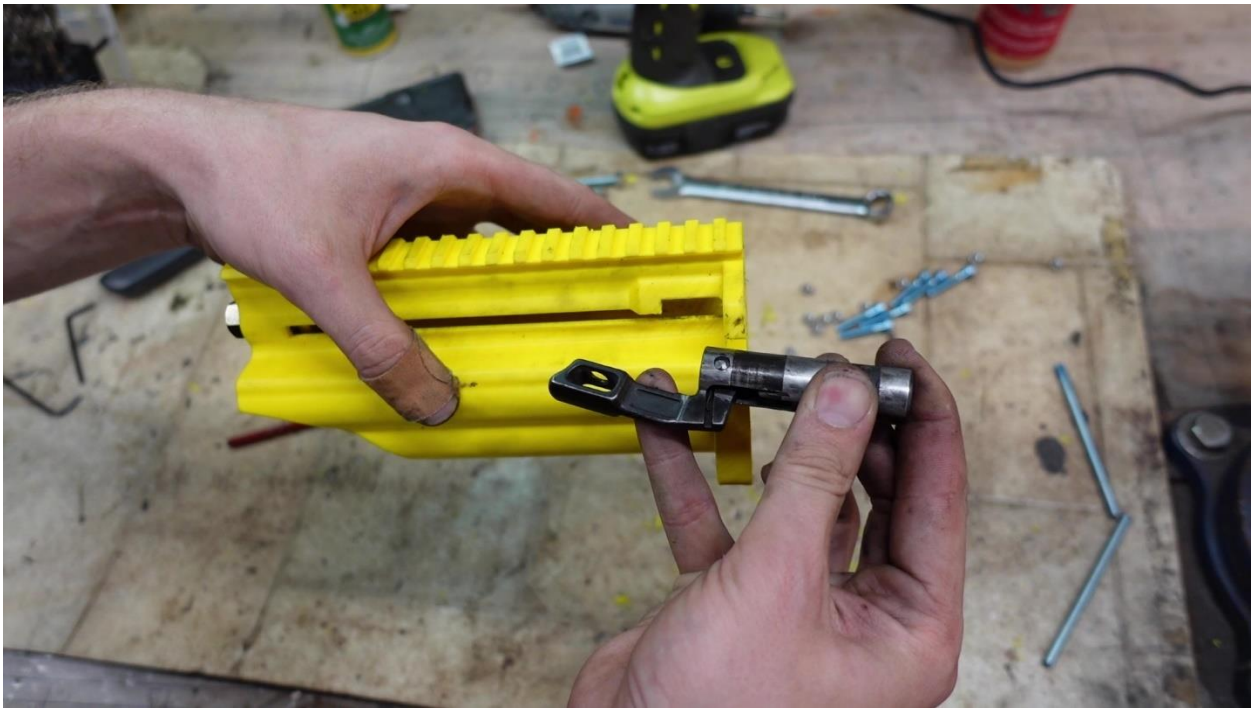
Line up the nut with the hex-shaped recess in the handguard, then pull it to seat it.

Take your 3/8” standard hex nut and spin it onto the exposed threaded section of the 3/8” bolt. Snug up the hex nut using a wrench.



Thread the standard hex nut unto the bolt. Snug it up with a wrench.

Next, take your charging handle assembly and drop it into the track in the handguard as shown below:



Orient the charging handle assembly as shown.

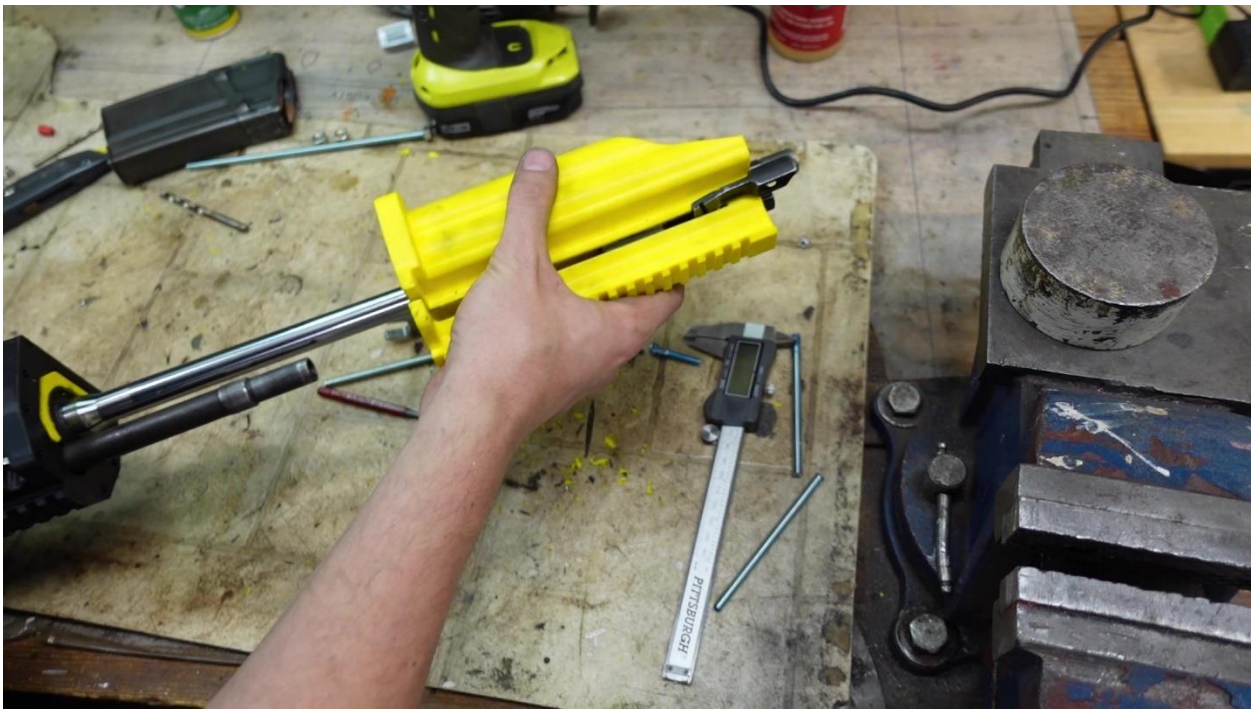
Slide the charging handle into the cutout in the handguard, aligning the guide with the tube in the handguard.

Push the charging handle all the way forward. If it feels a little tight in the tube, apply some oil or grease to the charging handle guide. Also wash your hands or it will look like this.

Now, take the build thus far (the front and rear receivers, which you've mated together already) and slide the handguard over the barrel. Push the handguard as far on as you can – it should go on far enough for the flange on the front receiver and the handguard to meet.

Once the flanges meet up, check how much wiggle backwards and forwards the charging handle guide has when the charging handle itself is folded flat and the receiver and handguard flanges are held tight together. If you have trouble holding the handguard and front receiver flange together, you can install a couple of M5x30mm bolts and M5 nuts to hold it in place. You will want the charging handle guide (the cylinder-shaped "shuttle" that sits inside the tube) to have just a tiny amount (like a tenth of a millimeter) of forward-backward wiggle when the flanges on the receiver and handguard are touching.

NB*:* In some rare cases, you won't be able to push the handguard on far enough for the flanges to meet – if this happens, first check to ensure the 3/8 bolt is screwed all the way into the locking nut. If it is, try to measure the gap between the handguard and the front receiver. Then remove the handguard, remove the charging handle assembly, remove the hex nut, pop the bolt and locking nut out of the handguard, and grind down the face of the bolt by the amount you measured, then reinstall the parts and check to see if the flanges meet up before proceeding. ***It can be unsafe to fire this build if your charging handle gap is set such that your charging handle holds the bolt out of battery because you didn't follow these directions!***



Slide the handguard over the barrel.

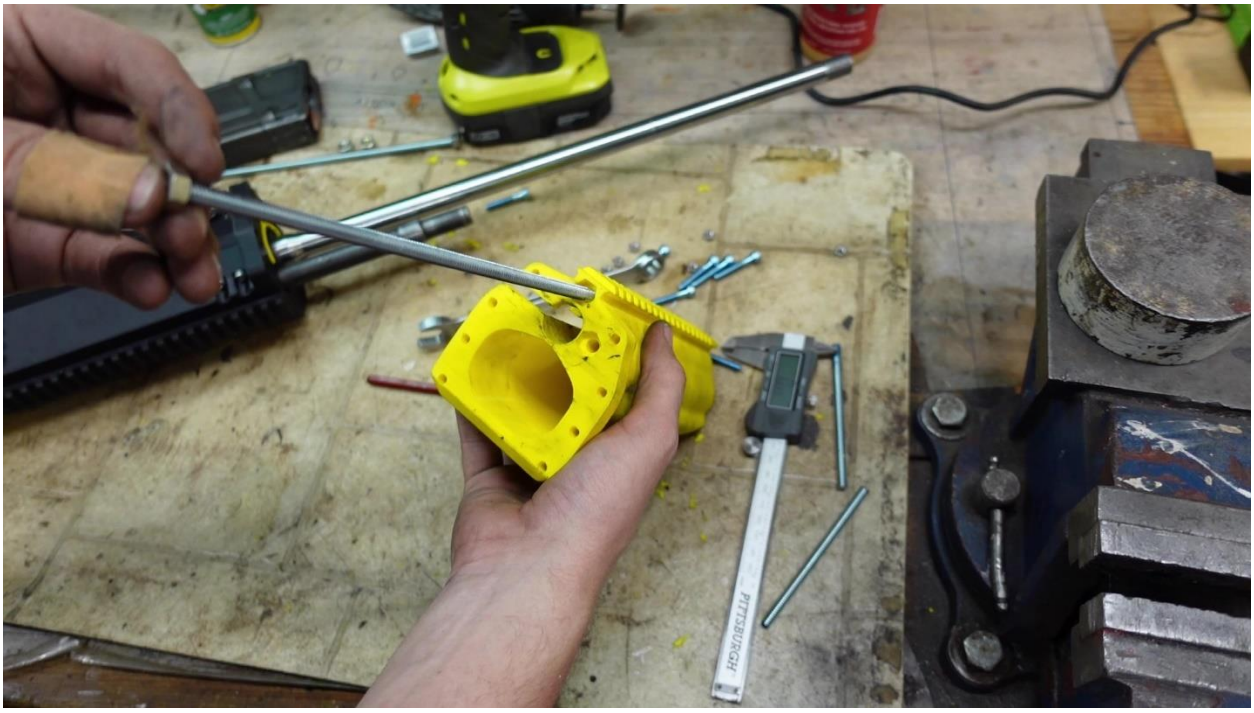
The flange on the receiver and handguard should touch – if they won't touch, ensure that the charging handle is folded flat – if it still won't touch, refer to the **NOTE** *above to fix this issue.*

While holding the handguard tight to the front receiver, wiggle the charging handle forwards and backwards. Leave the charging handle folded flat while you wiggle it! Look at the charging handle guide inside the handguard and observe how much visible wiggle it has.

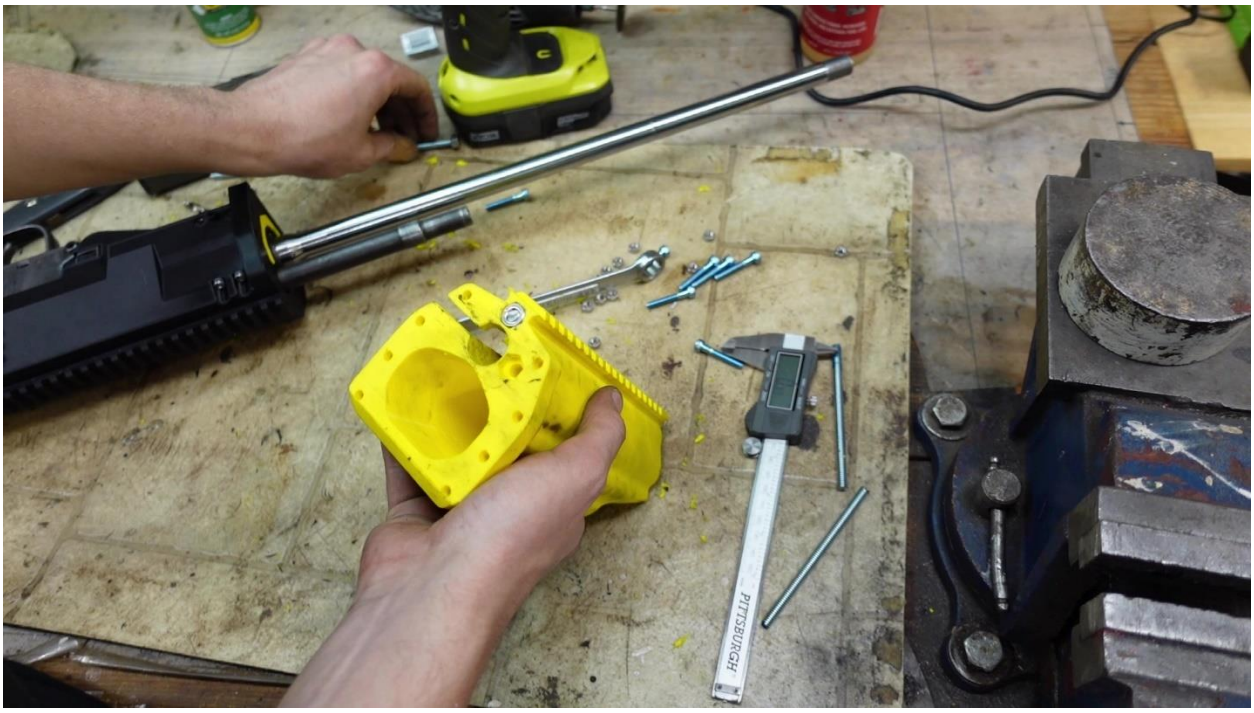
Adjust your 3/8” bolt to remove all but the tiniest amount of wiggle that the charging handle guide has. In order to reduce the amount of wiggle, remove the handguard from the barrel, remove the charging handle assembly, remove the hex nut, then pop the bolt and locking nut out of the handguard. Thread the bolt away from the locking nut to reduce the gap.

Reinstall all the parts, ensure that the flange on the handguard can still press against the flange on the receiver – if you thread the bolt too far out of the locking nut, the charging handle will hold the gun out of battery (bad). Once you have near-zero visible wiggle on the charging handle guide while the flanges are touching, your charging handle gap is properly set.

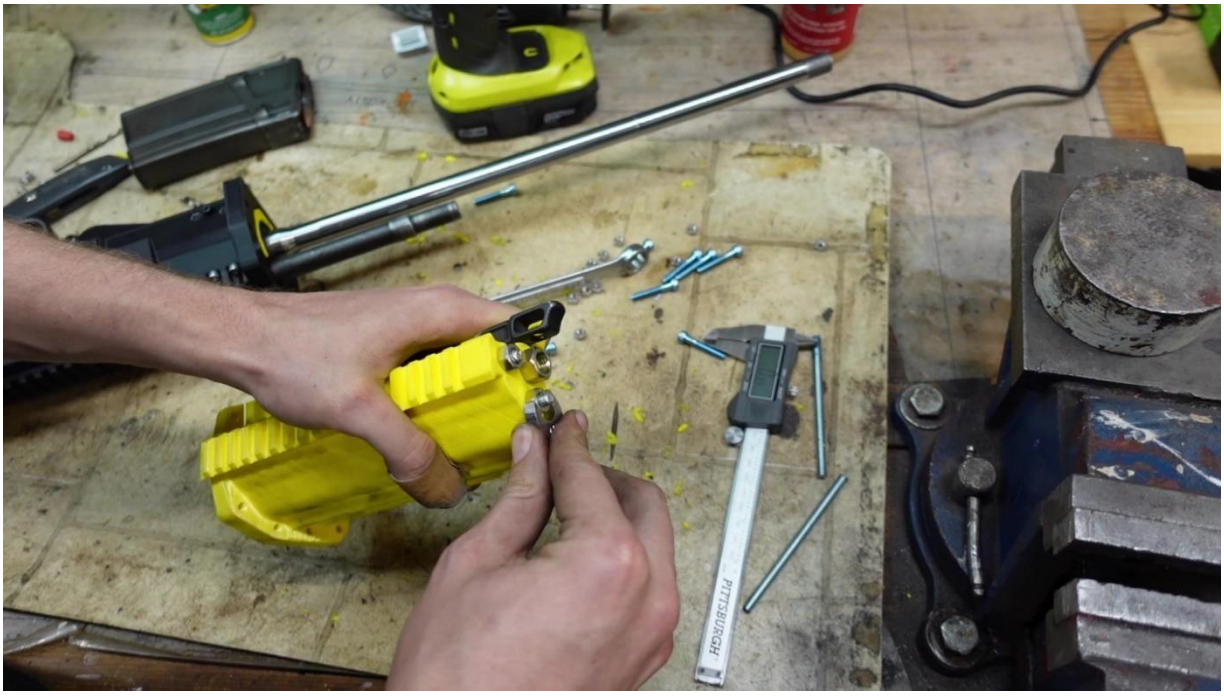
Complete your handguard assembly by taking your ¼” threaded rods and threading one of the 1/4" nuts onto the end of each of them (or by using ¼” x 8” bolts). Insert the rod/bolts into the holes in the handguard from the rear of the handguard – you may have to spin the rods/bolts and/or tap them in with a hammer. Once your rods/bolts are fully inserted, use a wrench to tighten the 1/4" nuts on the other end of the rods/bolts. If you ordered 1ft sections of threaded rod, cut it down to 7.75” in length.



Insert the bolts/threaded rod. If using threaded rod, make sure you have a nut threaded onto the rod just far enough to make the rod act like a bolt.

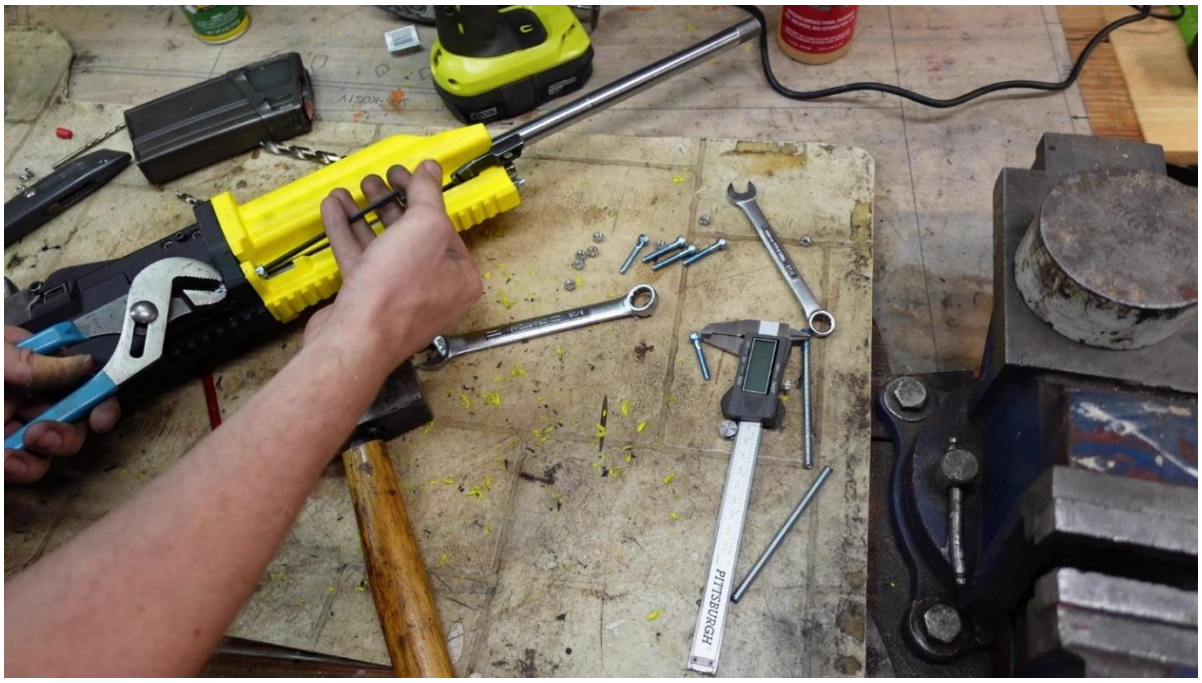


Insert the rods/bolt fully, lining up the nut on the rod/head on the bolt with the hex-recess in the handguard.

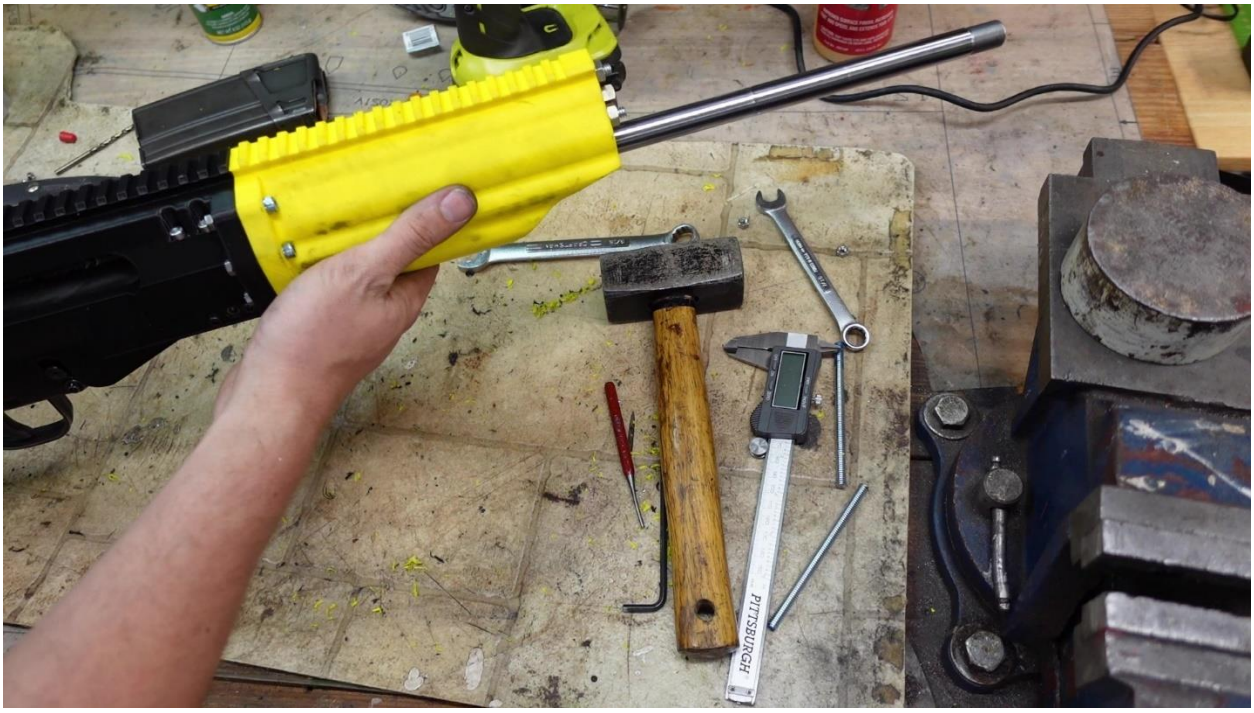


Tighten nuts on the end of the rods/bolts. Get these nuts nice and tight – they help to reinforce the handguard, but only help if they stay tight.

Finally, mate your handguard to the receiver. Take eight M5x30mm bolts and M5 nuts and tighten them using pliers and an Allen wrench. Just like when you mated the two receiver sections, tighten these bolts in a cross-wise pattern.



Install the M5x30mm bolts to mate the handguard to the receiver. Tighten in a cross-wise pattern!



Install all eight M5 bolts.

Finally, you've finished putting stuff together! Pat yourself on the back, this build takes patience and you've done pretty okay, I guess, if you've made it this far.

Now, it's time for a couple of safety checks! First, do a basic function check. ***REMEMBER***: you cannot charge this firearm when it is on safe and the hammer is up. When it comes to doing function checks, make sure that the selector is turned upwards or downwards. Basic function checking includes making sure that the fire control group behaves correctly, that you can open the bolt/rack the gun, that you can lock the bolt back (and slap it closed), and that magazines lock in. Check bolt gap one last time before going to fire your build – you can do this with everything assembled by slapping the bolt closed, dry-firing, and sticking feeler gauges up the mag well. If your bolt gap has changed outside of the ideal 0.012-0.020" range since you pressed and pinned the barrel (which can happen when drilling, and there's usually some settling even after you've pinned), you should consider replacing the rollers in your bolt to bring the gap into the ideal range – you can find a video tutorial on replacing your rollers here: https://odysee.com/@Ivan's_CAD_Streams:c/Roller-Video:2. Going up or down one size of rollers *does not* always move the bolt gap by the same amount, so if your bolt gap is way off, consider getting a couple sets of rollers and finding what fits best. If your bolt gap moved from 0.020" to 0.022", a set of -2 rollers should fix things, if it moved from 0.012" to 0.010", a set of +2 rollers will usually fix things – but if your gap moved from 0.020" to 0.026", I'd get a set of -4, -6, and -8 rollers – since there's no great way to tell exactly what you need.

Do note that charging these guns is a chore – it takes a surprising amount of upper body strength compared to something like an AR or AK. While the charging handle will wear into the printed tube in the handguard quickly, adding a little oil or grease to the charging handle guide can help loosen up guns that are very hard to charge. Having charging handle gap that is improperly set (too much gap between the charging handle and 3/8" bolt) can make the gun very hard to charge. Note also that having zero gap can mean the bolt can't go all the way forward and is potentially unsafe.

That all having been said – if your bolt is getting stuck to the rear of the receiver when you charge the gun (or if it's getting stuck when shooting it), refer to the FAQ section titled "My bolt gets stuck to the rear of the receiver whenever I charge the gun. What's wrong?".

A Treatise on Scope/Optic Selection

Through the course of testing the Amigo Grande for accuracy, a lot has been learned by way of selecting the best scopes/optics for use with this build. The most important discovery was that printed plastic picatinny rails are not rigid enough to allow heavy, poorly supported optics to clamp tight on the rail - as such, optics that are heavy and aren't well-supported can lose their zero due to shifting and deforming the plastic pic rail. When using lightweight optics that support nearly all of the length of the optics on the rail (meaning that the optic does not overhang it's mount, such as on most red dots) can be used for at least a thousand rounds on these builds without zero shifting or needing to adjust your zero. When it comes to adding magnification, prism optics such as ACOGs and SIG's Bravo 5 are good options – while they are heavy, the scopes don't stick out much past their mounts. You may need to rezero or remount these optics if you find your zero has shifted. I do not recommend using LPVOs or rifle scopes mounted on cantilever style mounts – these optics are fairly heavy, and these mounts do not support the ends of the optics – allowing these scopes to bounce and wiggle on the printed rail under recoil, which will shift zero as quickly as 20 rounds with very poor setups. If you wish to use riflescopes or LPVOs, you should use standard riflescope mounts, clamping the scope as far forward and rearward as you can so as to minimize the amount of unsupported optic sticking out past the mount. Finally, it isn't a bad idea to use two sets of mounts (meaning four mounts total) if you wish to use a heavy LPVO or riflescope. You want to minimize the weight of the optic attached to the rail while maximizing the area on the rail to which the mount it attached to.

Keep these guidelines in mind when selecting your sight setup. If you won't shoot past 100 yards, you may not ever even notice the zero shift – and if you aren't interested in shooting small targets at that range, this advice can mostly be disregarded. But if you're like me, and you get your kicks smoking soda cans at 100 yards (or more), picking the right optics setup is important to avoid frustration.

Red Dot sights like this are a good option because they are lightweight, don't stick out much past their mount, and usually come with mounts that can get a good, tight hold on the printed rail.

Basic red dot sight – Holosun, Vortex, SIG Romeo, and other similar red dots are a great choice for your Amigo Grande. They can be used with magnifiers, just be sure to pick a sturdy mount for your magnifier.

Certain prism sights can be a good choice due to the fact that they don't stick out much past their mounts, and are usually built rigidly – meaning they won't wiggly harmonically under recoil, and won't tug and wiggle their mounts loose.

Prism optics like ACOGs, SIG Bravo 5, Vortex 5x, or Primary Arms 5x are good options – while you should be aware of the possibility of your optic shifting under recoil, a properly installed prism optic should perform well.

LPVOs and riflescopes with cantilever mounts like the mount pictured should not be used – due to how flimsy the bodies of these optics are, plus the fact so much of the optics sticks out past the mount, recoil will cause the tube on these optics to wiggle harmonically, which will be amplified due to how the optic sticks out past the mount – this is what causes zero shift.

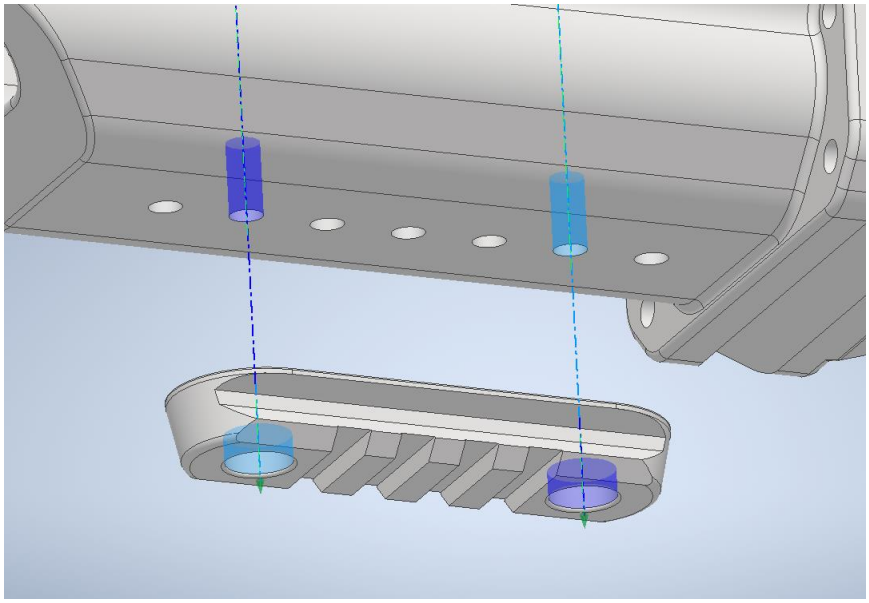
If you wish to use LPVOs or riflescopes, you should use standard ring-style mounts to hold it on. Make sure you use the correct size rings for the diameter of your optic tube. I recommend that you use two sets of mounts like these (such that you'd have four total mounts holding the optics to the rail) if your LPVO or riflescope is long, heavy, or you experience shift with only two rings.

One final note on optics selection – until you are totally familiar with how your Amigo Grande and optics choice work together, don't rely on your Grande for long range accuracy without shooting some verification groups first. Long term storage, subjection to heating/cooling cycles, and drops/impacts can effect your zero in unpredictable ways when using a plastic optics mount!

Mounting Foregrips, Bipods, and more (Optional)

The Amigo Grande's handguard has a pattern of 5mm holes along its bottom – this is for mounting foregrips and/or pic rails so that bipods and other widgets and doo-dads can be used. In order to install a rail, you'll need two M5x20mm screws and M5 nuts. You will need to remove your handguard from the gun in order to install the printed mount.

Line up the holes in the printed mount with the holes in the handguard, then insert the two M5 screws. Using a pair of needle-nosed pliers, hold the M5 nuts in alignment with the M5 bolts and tighten the bolts down. If you'd like to avoid having to retighten these bolts, either tighten then very tight or use locking M5 nuts.



You can mount the picatinny rail to the bottom of the handguard/cocking tube using two M5x20 bolts and nuts – you will have to remove the handguard from the gun to tighten the nuts using a pair of pliers.

Some Friends With Grips!

FAQ/Troubleshooting

Q: What sort of round counts should I expect? What ends up breaking?

A: Assuming you keep up with the sort of maintenance that these rifles require (checking bolt gap every 250 rounds or so, and switching out rollers if required), the printed receiver should last at least a thousand rounds.

This receiver is designed to be as close to static under fatigue as possible (no bending or stretching in the receiver when firing), so breakages should take the form of cracks that should stop the gun from running before anything major breaks. Still, keep an eye on it. It is a plastic gun at the end of the day.

Do note, however, than it is possible to overheat barrel mounts that are printed in PLA or other low-temperature materials. Experiments with non-thermoplastic mounts are ongoing, so one day you may be able to buy a mount that can handle hundred round dumps without losing accuracy – but when printing the barrel mount in PLA, keep shooting to under 40 rounds between cooling breaks.

While we have pushed 80 rounds or so through a PLA mounts in testing, the gun went from shooting 3" groups at 100 yards to shooing 5" groups, and the rifle's zero shifted upwards some – a sign that the barrel mount got overheated, but even after overheating the rifle remained reasonably accurate.

For more detailed information on the sort of testing we've done on barrel mounts, refer to the bottom of the readme, section titled "Notes on printing barrel mounts:"

Q: What sort of reliability should I expect?

A: Reliability has been very good on all builds to date – the one thing that we have found that causes issues are magazines that are slightly out of spec. Some magazines pop out at the front and just won't work well – so I recommend you pick of 3-5 magazines to ensure you get a good one. I have 7 magazines, and only one of them won't work 100%. With any of the other magazines, I have yet to have a single issue over about 700 rounds.

Q: Why is the charging handle so tight? Why is it hard to charge my build? Why does my bolt feel sluggish?

A: Depending on your print settings, your handguard/cocking tube might warp a little – remember to use low cooling settings when printing this part. These parts will break in over time, so dry cycle the gun and add some oil to the cocking tube.

Do note, however, that these guns are really hard to charge compared to guns like AKs or AR15s – the nature of the roller delay system requires you to do substantial work to manually unlock the gun.

Finally, if your bolt feels like it's tight in the receiver, you may just need oil inside the receiver and to break things in. Since the stocks for these guns were made to varying specs, sometimes a tight stock can pinch the bolt carrier and cause some drag at the end of travel. This should break in and stop being an issue after some shooting, but dry cycling and oil will likely solve the problem. Also note that if you don't set the charging handle gap properly (this is discussed in the Plasticwork>Handguard section), your rifle may be very hard to charge.

Q: My bolt gets stuck to the rear of the receiver whenever I charge the gun. What's wrong?

A: Thanks to the efforts of the beta testing team, we've managed to nail down the reasons why this could be happening. There's three main causes – while you could have more than one issue giving you trouble at a time, it's usually only one of these issues that will give you something to fix.

To trouble shoot this issue, first start by racking the gun 50-100 times, applying a little bit of gun oil to the "humps" inside the receiver that the bolt carrier rides on. The most common issue with the bolt getting stuck back is simply due to the printed receiver sections being tight enough that there's excess drag on the carrier – racking the gun and applying a little oil will get things running smoothly. If your bolt still gets hung up at the rear after 100 dry cycles, try pushing out the pin at the front of the trigger housing *while the bolt is stuck back* – you'll want to rack the gun to the point that the bolt sticks open on it's own, then push the pin out. WHILE KEEPING YOUR FINGERS AWAY FROM THE EJECTION PORT, wiggle the trigger housing gently up and down. What can happen (as is the issue with all CETME builds) is that the rear end of the ejector will bind against the bolt carrier and keep it from moving. If removing the pin and wiggling the trigger housing allows the bolt to come slamming forward, then this is your issue. If wiggling the trigger housing does not send the bolt forward, then your issue is lies in the recoil spring assembly/guide rod.

To recap: If your bolt stops sticking after 50-100 dry cycles and application of oil, you're all set. If popping the pin on the trigger housing and wiggling it frees the bolt when it is stuck, then your issue is the ejector-carrier fitment. If wiggling the trigger housing doesn't fix the issue, then your issue lies in the fit between the recoil assembly and the bolt carrier.

1.) To fix the ejector-carrier issue, you will have to remove your trigger housing from the gun. Start by simply applying a little grease to the rear of the ejector, then reinstall the trigger housing and test to see if the bolt binding issue is better. If it's solved, then you should be good to go – if the bolt is still binding, remove the trigger housing again and use a metal file to file down the rear end of the ejector slightly. Reinstall and re-test. In most cases, the ejector only needs to be filed on very minimally. Don't overdo it – this binding is almost always caused by a <0.010" stacked tolerance, so you shouldn't have much to file.
2.) To fix the recoil assembly–bolt carrier issue, unscrew the rear receiver and front receiver while the bolt is stuck to the rear. If unscrewing the receivers causes the bolt to fly forward, then your issue is likely the ejector-carrier issue described above – put a little grease on the rear end of the ejector and check if that fixes things. If your bolt carrier stays stuck in the rear receiver, however, you have a rare issue that these rifles faced – the recoil spring, guide rod, and bolt carrier and binding up. While there isn't a guaranteed way to fix this (some people just buy a whole new stock/recoil spring assembly), our testing seems to indicate that putting a lot of grease on the recoil spring/guide rod seems to help. Try greasing the guide rod up, reassembling the gun, and racking it. If this doesn't fix the issue, you may have to get a new recoil spring assembly/buttstock.

Where to lightly file to fix ejector-carrier hangups.

Apply plenty of grease to the recoil spring and guide rod to fix the recoil assembly-bolt hangups.

Finally, if none of these options work, then there is likely an issue with your print itself – either something warped, wasn't supported correctly, or maybe even a bad batch of filament was used to print the parts. Look for gaps between the printed parts that might indicate that one of your parts printed with warp and reprint them. If you can observe warp, make sure when you reprint that you use print settings that will help prevent warp.

Q: Why is my trigger pack doing dumb things?

A: There are two main issues that we have identified with the original trigger packs: first, the steel the parts are made of is poor quality, and the sear surfaces have deformed a little over time. Second, the hammer spring (which is also the trigger and disconnector spring) on these kits can be extremely worn out. Though most trigger packs seem to work fine (after they have been prepared as this document describes), the two issues that seem to crop up are triggers that won't reset (pulling the trigger just catches the hammer on the disconnector) and triggers that randomly act as binary triggers (the hammer falls when the trigger is pulled (AND released). In order to fix triggers where the hammer won't reset, you will need to gradually file material off of the primary sear surface on the trigger:

File a little material away at a time, then reinstall everything and check to see if the issue is fixed. If you are unable to fix the issue by filing, you will likely need to buy a new trigger, hammer, and potentially a new disconnector – maybe just a whole new trigger pack.

If your trigger has consistent and/or intermittent binary firing issues (this can be a big problem with these guns due to how easy they want to bump-fire), replacing the hammer spring seems to do the trick to keep them working correctly.

Q: What kits work?

A: CETME C kits (though the remix folder has files that allow use of G3 and PTR91 kits). G3 and PTR91 barrels can work with CETME C kits. Compatibility issues may present themselves when mixing kits. Also remember that bolt gap is likely to change if you swap bolts, so stick to the bolt assembly you set the rifle up with. Barrels are cross-compatible, with the caveat that you cannot mount the CETME front sight post (and thus, the CETME bayonet) to G3 or PTR barrels.

Q: What mags work?

A: CETME C, PTR91, and G3 mags are all tested as working. Some of these surplus magazines are out of spec enough to have issues, so pick up a couple mags to ensure you have at least one that works well – out of 7 mags, I found one that wouldn't stay in the gun. Some steel G3 mags may require some fitting on the magazines and/or the receiver to work, these mags were made to different specs when compared to the aluminum G3 mags and CETME C mags.

Q: Can I reorient the parts to print them how I want?

A: I would strongly recommend you stick with the way the parts are oriented when you import the STL files – this orientation maximizes the strength of the printed parts and will extend their lifespan significantly.