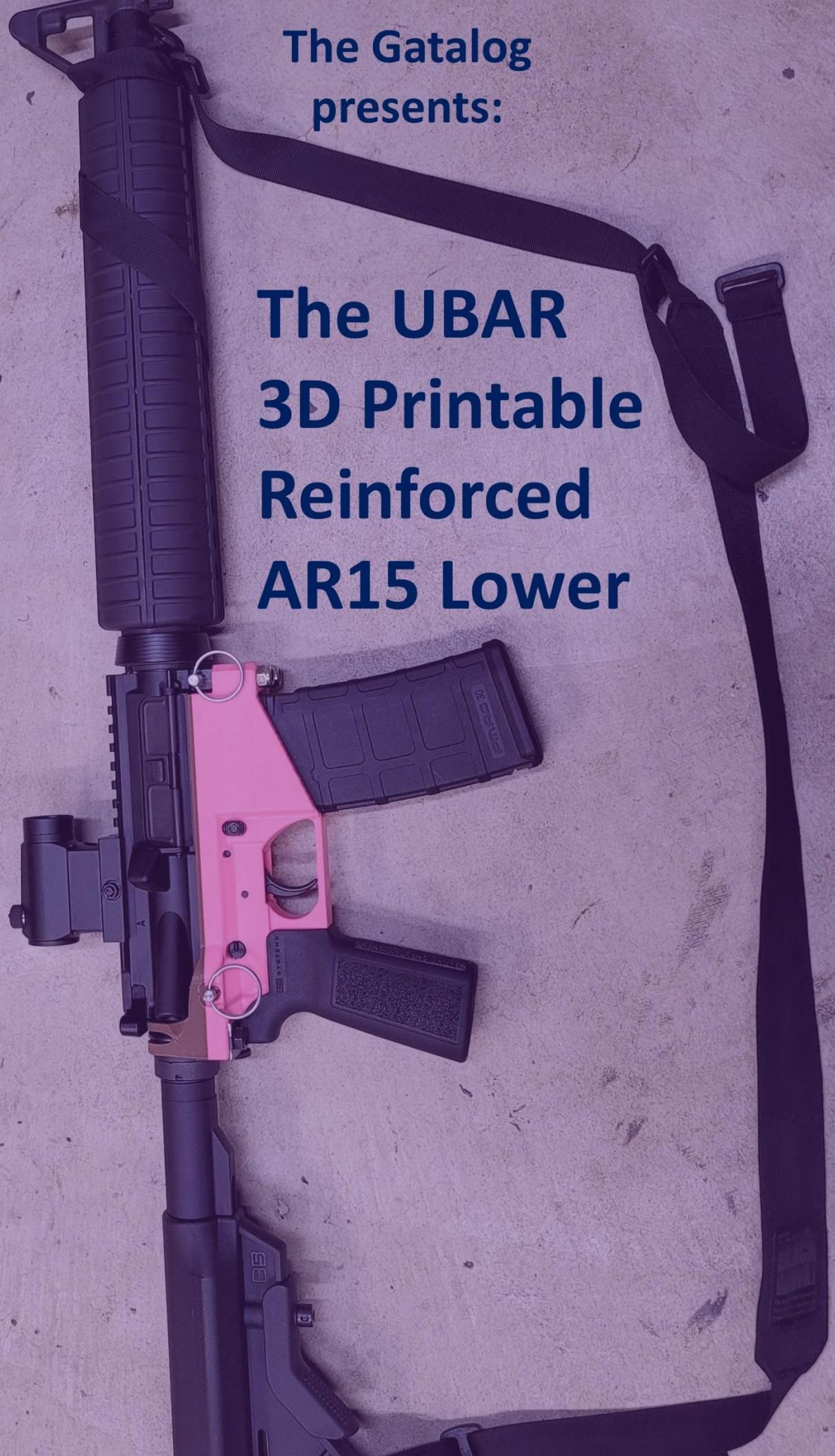


The Gatalog
presents:

The UBAR 3D Printable Reinforced AR15 Lower



Preface

The UBAR (aka U-Bolt V2) is a 3D printable AR15 lower receiver. It utilizes simple metal parts to greatly enhance the strength/durability of the lower – able to withstand pushup tests, drops, throws, kicks, and other hard abuse. At the core of its design is a U-Bolt to clamp the buffer tower down (preventing cracks), two humps to spread bending force at the rear of the receiver along the top deck of the lower, and two eye bolts to act as the front takedown lugs on the lower (which are also help clamp the front of the lower together, enhancing strength).

Note: While the UBAR is a very strong lower, it is not advised to shoot it without its metal reinforcements – without these reinforcements, the lower will not prove strong or reliable.

This documentation will walk you through the process of building your own UBAR lower – while many of the steps are standard to building out any AR15 lower, some fitting is required on the metal reinforcements for this lower.

You can watch this assembly process on video here:

https://odysee.com/@Ivan's_CAD_Streams:c/UBAR-Tutorial:e

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

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.

Make sure you read the README – it has a detailed breakdown of the eight different types of the UBAR2 lower. Printing the correct lower for your parts/desires is important!

If you have found this tutorial useful, consider sending me Bitcoin 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/>

Thanks to dreadnaat and kevin for the genius front takedown lug design
To the community of AR lower designers/builders who continue to push the limits
To all the companies offering affordable AR15 parts kits

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.

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Shopping List

This list will cover what supplies you will need for a UBAR build. You will need some basic tools, such as a 1/4", 5/32", and 3/8" drill bit, a hammer, a 1/8" punch, a screwdriver or allen key to install your pistol grip screw, a battery drill, a Dremel tool with a cutoff wheel (or a metal file), a 1/4-28" tap, and optionally a pair of needle-nosed pliers (these are always handy).

AR15 Parts

The big-ticket item for this build will be an AR15 parts kit – the UBAR is compatible with essentially any AR15 upper (some minor fitting might be required with some rail systems, but railed uppers are generally compatible), though it is designed to only use carbine buffer tubes/buffers. You can use any length upper/gas system with a carbine buffer/tube – the idea that this somehow will damage your gun is wrong. The Canadian military has used 20" uppers with rifle length gas systems in combination with carbine buffers and tubes for a long time, it's a very handy configuration. While it is possible to install a rifle buffer tube and buffer on the UBAR lower, and it will fire and cycle with a rifle tube and buffer, you will not be able to use the buffer retaining pin with this setup – so your buffer will fly out every time you disassemble your rifle. Not a dealbreaker, but something to be aware of.

In general, the UBAR is compatible with most every AR15 configuration, but be aware of the limitations posed by rifle tubes not working with the buffer retaining pin and the potential for some railed uppers to require minor fitting. Gen1 and Gen2 PMAGs may also take a little fitting to work with perfect reliability depending on your parts kit – refer to the FAQ/Troubleshooting section at the end of the document if you will be using older PMAGs or other older polymer mags and have issues with your bolt not locking back after a mag is emptied.

You will need:

- A complete AR15 upper – any barrel length, gas system length, etc. The UBAR has no issues handling big bore AR15 uppers, so bring on the 458s and 50BEOs. Note that you will need a bolt carrier group and charging handle with your complete upper – some uppers don't include them, make sure yours does!
- A standard AR15 carbine lower parts kit (read the introduction if you want to use a rifle lpk)
 - Fire control group – hammer, trigger, disconnector, plus the springs for each of these parts
 - Safety selector, detent, and spring
 - Magazine catch, catch spring, and button
 - Buffer retainer, buffer retainer spring
 - Buffer tube – try and find a "mil-spec" buffer tube, some of the commercial ones really suck
 - Buffer tube castle nut and locking plate

*Note: You do not need the trigger guard or takedown pins/springs – you can save these parts to have as extras for other builds, though.

- An AR15 pistol grip – I really like B5's Type 23 grip, and it fits perfect on the UBAR. You can always print a grip if you'd like.
- An AR15 stock – if you are using a carbine tube, I like B5's Bravo stock – it's a bit pricey, but fits great on mil-spec buffer tubes and works great for me. There are some printable stocks out there.

Metal Reinforcing Parts

The UBAR uses a few metal reinforcements to make it strong – a U-Bolt and two rod-end eye bolts. You can source these parts yourself, or buy these parts in a hardware kit, such as that offered here:

- 1x <https://www.mcmaster.com/3201T49/>
 - The U-Bolt required is a 1/4"-20 thread, 1-1/8" ID. I prefer carbon steel to stainless steel (since there is a little grinding required on the u-bolt, and stainless steels can be annoying to file sometimes). You will also need two 1/4"-20 nuts and a nut plate for the U-Bolt, but your U-Bolt will usually come with these.
- 2x <https://www.mcmaster.com/97135A210/>
 - Two 1/4"-20 locking nuts
- 2x <https://www.mcmaster.com/59895K11/>
 - Two 1/4"x 1-3/16" Flat-Shoulder Rod-End Eye Bolts are required – these are a somewhat uncommon size bolt, are tricky for boltmakers to produce, and tend to be pretty expensive.

The UBAR also uses extended length pins in place of the standard takedown pins. You will need two pins – both are 0.250" in diameter. While you can use any sort of pin, I like the spring-detent pins like these.

For the front pin, I use this: <https://www.mcmaster.com/98320A135/>

For the rear pin, I use this: <https://www.mcmaster.com/98404A139/>

Your options are open here, and ¼" bolts, dowell pins, and several other solutions will work. Pick what seems best to you, cut pins to length if you need to, and you'll be good to go.

Build Tutorial

I recommend you read this section in its entirety, then watch the build video while you go about building your UBAR. It's a fairly easy process but following the video should save you from wasting any time due to silly mistakes.

REFER TO THE README FOR BASIC PRINT INFORMATION

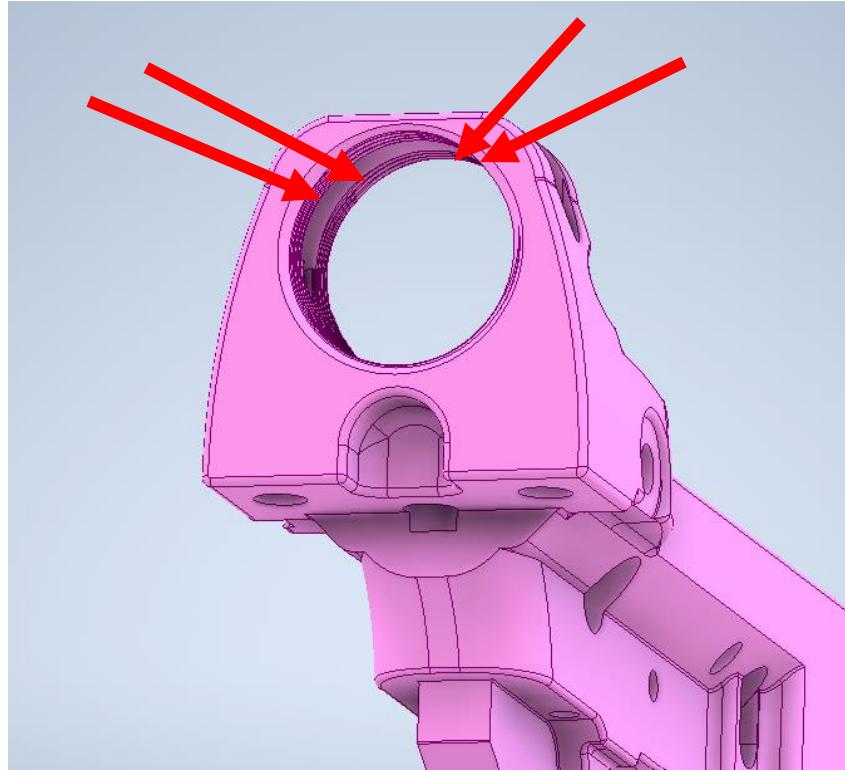
Step 1: Lay Out Your Parts/Prep Work

Begin by laying out all your parts, tools, and other equipment. Being at least sort of organized helps ensure no little parts get lost!



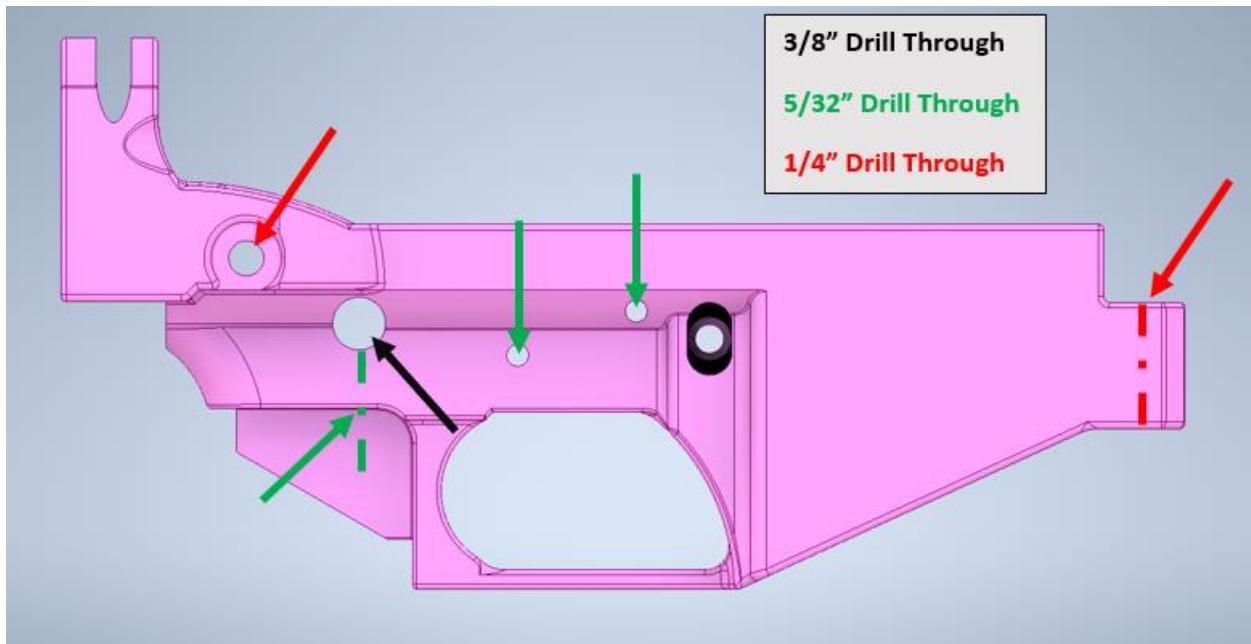
My Spread of Tools/Parts

As usual, remove all support material from your receiver. Be thorough and remove it all – be gentle when removing the supports from the buffer tube threads, you don't want to damage the threads on accident! Note that there are no threads at the top of the buffer tube hole – you won't need to remove support material from there, so don't accidentally try gouging threads into the top of the hole.



The top of this hole doesn't have threads – don't make the mistake of thinking the threads are clogged with support material!

Finish your prep work by using your drill and drill bits to clear out the through-holes on the lower – your $5/32"$ drill bit will be used to clear out the hammer and trigger holes, as well as the safety selector detent hole. Your $3/8"$ drill bit will be used to clear out the safety selector hole. Finally, your $1/4"$ drill bit will be used to clear out the rear takedown pin hole.



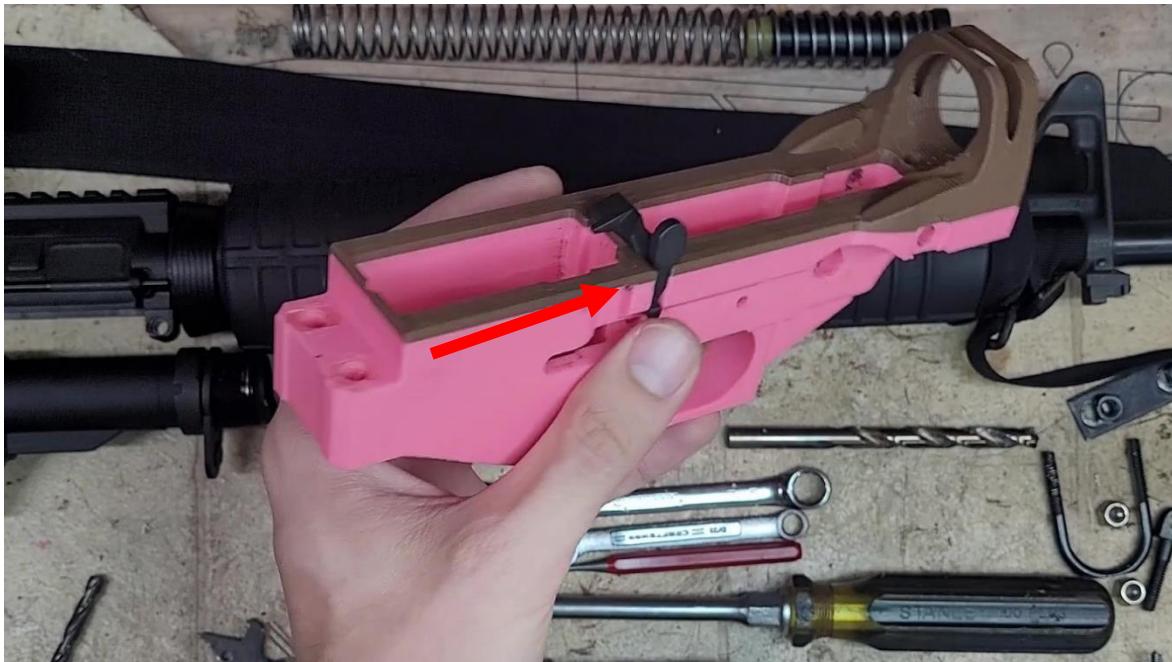
Step 2: Install the Bolt Catch/Hold Open

This step is easy – you will need to clean out the hole for the bolt catch plunger and spring using your 5/32" drill bit. Be gentle (drilling with the drill in reverse can help) and ensure you don't drill the hole any deeper than it was printed – you just need to remove all the stubborn support material in that hole.



Clean out the bolt catch spring plunger hole with a 5/32" drill bit.

Take your bolt catch, bolt catch plunger, bolt catch spring, and bolt catch roll pin and install the bolt catch – this is done just like on a standard AR15 lower, where you place the spring into the hole you just cleaned up, then place the plunger, then slide the bolt catch into place, depressing the plunger, and stick the roll pin through. Note that the roll pin/bolt catch are generally non-removable on the UBAR – while you can use a soldering iron to remove and reinstall the roll pin, you will not be able to remove the bolt catch once it is installed unless you remelt the plastic around the roll pin hole.



Depressing your spring and plunger using the bolt catch itself, line up the hole in the bolt catch with the lower and stick your roll pin in place.

Step 3: Install the Buffer Tube/U-Bolt

Take your lower, buffer tube, castle nut, locking plate, buffer retainer, buffer retainer spring, and u-bolt (along with its nuts and nut plate). At this point, you will need to make a decision – you will either have to clearance the threads on your u-bolt, or your buffer tube. It's generally quicker to clearance the threads on the buffer tube, but if you mess it up you can ruin the buffer tube. Clearance the threads on the u-bolt, and you'll spend a little more time but it's rather hard to mess things up with this. I recommend the latter method. If you wish to instead clearance the buffer tube, refer to the general steps I provide in the build video (linked at the top of this document). Generally, you just need to ensure that the bolt can fit over the top of the buffer tube without having to be forced.

Begin by taking your buffer tube and u-bolt. The u-bolt will need to be able to straddle the threads on the buffer tube – because no perfect-fit u-bolt exists, you will have to do a little grinding/filing on the u-bolt.



Test the fit between the u-bolt and buffer tube. Out of the box, the u-bolt will not be able to sit down on top of the tube – you will need to clearance the u-bolt so that it can sit down on the tube.

Generally, you will just need to grind down the threads on the inside edges of the u-bolt in order to make it fit over the buffer tube – I use a Dremel tool with a cutoff wheel, and it takes me about 5 minutes to clearance a u-bolt. You can use a metal file to make this modification, but it might take you a little longer. Use your Dremel or file (or both) and cut away on your u-bolt to make it look like mine below. You will want to grind down on both legs of the u-bolt. After your cuts start to look similar to mine, you can start test fitting the u-bolt on the tube – it should be able to sit down onto the tube without much resistance. If you have to force the bolt onto the tube, you should clearance the bolt further.



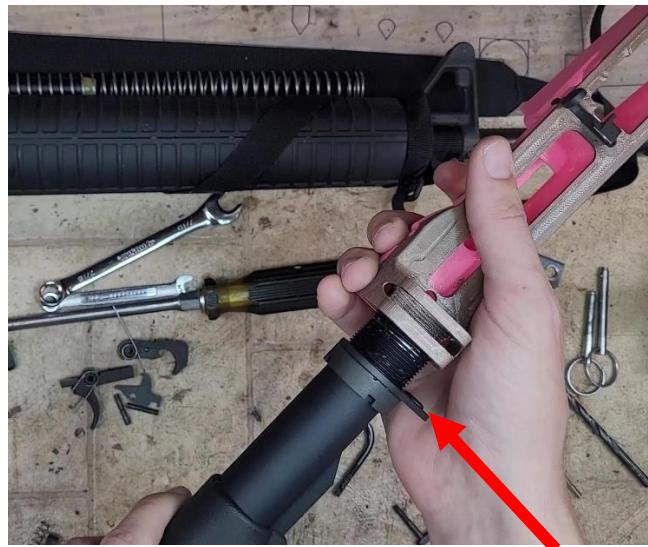
Example of how much clearance is usually needed.



Example technique to grind down on the insides of the bolt using a Dremel tool – you will want to hold the bolt using pliers or a vice, as it will get too hot to hold quickly.

Once you can get the u-bolt to fit fully over the tube, you are ready to move on. Take your buffer tube, castle nut, and locking plate. Thread them into the buffer threads on the back of the lower. You will need to ensure that you don't screw the tube in crooked – take your time and ensure things thread together straight. Your tube should thread in without excessive resistance – if things feel tight, ensure that you aren't screwing things in crooked. Depending on your print settings, your fit might be tight enough that you should use a little oil on the threads of the tube to help things thread in a little easier, but this is generally not required.

Like with normal AR15 assembly, thread your tube in to the point that it is one turn away from the bottom edge of the tube covering the hole for the buffer retainer.



Behind threading your tube into your lower. Ensure you thread things together straight! Ensure that your castle nut and locking plate are in place on the tube before you begin threading it on to the lower. And remember – the side of the locking plate with the nub goes towards the lower!

Once the tube is started screwing in, you can take the buffer retainer and place it into its hole in the lower. Remember, the nipple-side goes up!



Place the retainer into this hole before you screw the tube in fully. Do not install the retainer spring yet.

After installing the retainer, screw the buffer tube in just enough so that the retainer can no longer fall out of its hole. Spin the castle nut to clamp the locking plate against the rear end of the lower – the nub on the locking plate will sit inside the cutout on the lower.



Screw the tube in just enough to keep the retainer from falling out, while ensuring the tube is more or less straight (the lug on the bottom of the tube which the stock locks onto should be at the bottom of the tube).



Begin tightening the castle nut, which will push the locking plate towards the lower.



Ensure that the nub on the locking plate aligns with this cutout in the lower. Tighten the castle nut enough to keep it from coming loose, but do NOT tighten it down to mil-spec.

When tightening the castle nut down, avoid using a castle nut wrench or tightening to mil-spec – you just need the castle nut to be tight enough to ensure it doesn't come loose. You can get it tight once the u-bolt is properly installed but tightening the castle nut too much without the u-bolt in place can damage the receiver.

With the castle nut snug and buffer tube installed, it's time to take your u-bolt and make one final adjustment to it. Place your u-bolt down over the tube, into its slot on the lower. You will notice the top of the u-bolt sticks up past the top of the lower – you will need to Dremel or file the top of the u-bolt down so that it is flush with the top of the lower. Note: you should take the bolt out of the lower before grinding or filing it down – it will get hot as your grind on it, and you don't want to melt your lower.



Install the u-bolt. You may have to gently tap the bolt to get it into place, but it shouldn't take much force. If it feels like it needs to be hammered into place, ensure that your u-bolt legs are not bent out of shape and clearance the parts further.



Grind the top of the bolt so that it's flat and flush with the top of the lower. REMOVE THE BOLT FROM THE LOWER BEFORE GRINDING ON IT! Don't melt your lower on accident!

With the top of the bolt buzzed off, you are ready to clamp things in place. Start by taking your buffer retainer spring and stuffing it up the underside of the hole that the buffer retainer is already installed in.



Install the buffer retainer spring into this hole – the underside of the hole you already put the buffer retainer into.

Take your nut plate and use it to compress the buffer retainer spring. Screw your two nuts onto the legs of the u-bolt while holding the plate in place. At this point, tighten these nuts down to clamp the buffer tube into place. You don't have to get these nuts extremely tight, but a good, more-than-snug fit that doesn't have any chance of coming loose is desired.



Install nut plate and nuts. Use a 7/16" wrench to tighten these nuts.

After tightening these nuts, you can install your buffer and buffer spring. Congrats! You're done with this step (which is the hardest part of the assembly).



Installing the buffer and buffer spring – simply push it into place and it'll shove past the buffer retainer.

Step 4: Install the Eye Bolts/Front Takedown Lugs

Take your lower, your upper receiver, your two eye bolts, your two locking nuts, and your two takedown pins. At this point, you will want to use your Dremel tool or metal file to knock down the tops of these eye bolts by just a little – while sometimes this fitting isn't necessary, some upper receivers have their bottom deck a little lower than others, which can cause fitment issues with the top of the eye bolts. A quick buzz with a Dremel tool to add a little clearance, and you'll be good to proceed.



Grind down on the top of the eye bolts about this much – you want the top of the eye bolts to sit flush with the top deck of the lower.



Make sure that the top of the eye bolt is flush with the top deck of the lower.

After you've cleared the top of the eye bolt, stick both eye bolts into their holes at the front of the lower. Take your locking nuts and start threading them on the two bolts – do not tighten them yet, just get them started. Because the eye bolts will have to be aligned parallel in order for the takedown pins to fit through them, you will have to use your upper receiver as an alignment tool. This is rather simple – take your upper receiver and seat it on the lower. Ensure that the upper receiver is pushed towards the buffer tower on the lower, then stick your rear takedown pin into place. Because you haven't tightened the nuts on the eye bolts yet, the rod ends should be able to spin so that the front lug on the upper receiver can sit down between them.



Mate your upper and lower receivers. Make sure that the eye bolts are not tightened down yet! They should be able to rotate to allow the upper to fit.



Make sure that the upper and lower receivers are pushed together, then stick your rear takedown pin into place. It might be tight when you first insert it – it will loosen up some over time, but if you can't stand pins being tight then you can oil the pin, or sand the pin down a little.

After you have laid the upper on the lower and stuck the rear pin in place, you can stick your front takedown pin into place – it might be tight, and you can apply oil or sand down the pin a little if it feels too tight. Once the front pin is in place, tighten the locking nuts. You don't need these nuts to be extremely tight – because they are locking nuts, they won't come loose from vibration. You just need them to be tight enough to keep the bolts from trying to rotate on their own. On my builds, I have tightening the nuts until the front takedown pin becomes hard to remove, then loosened the nuts just enough so that the front takedown pin is still a little tight to remove, but not something I have to struggle with.



Install your front takedown pin. You may have to wiggle the eye bolts to ensure the holes all line up.



Use your 7/16" wrench to tighten the nuts on the eye bolts. Don't make things so tight that the pin becomes very hard to remove, but don't leave any gap between the nut and the bottom of the lower.

After you have snugged up the nuts, you can remove both takedown pins and separate the upper and lower – all your metalwork is now done, and you're ready to move to the next step.



Separate the upper and lower

Step 5: Install the Pistol Grip

Take your 1/4-28 tap, tap handle/wrench, your lower, your pistol grip, pistol grip screw, pistol grip lock washer (if you have one that came with your grip screw), and whatever tool you need to tighten your pistol grip screw (some screws need an Allen wrench, some need a screwdriver).

While you don't necessarily *have to* use a tap to thread your pistol grip screw hole, doing so ensures that your threads will be strong and secure, and that you won't damage your lower while installing your pistol grip. It is possible to just ram your bolt into the lower and have it cut its own threads, but this tends to damage the receiver, even if you are gentle.

Tap the pistol grip screw hole with your tap. If you aren't familiar with using a tap, refer to the build video linked at the top of this document – you will want to use some form of oil on the tap, to two two twists forward, one twist back as you tap, and avoid going too quickly.



Tap the pistol grip screw hole if you're cool. Otherwise, you can just jam a screw in there.

After tapping the grip screw hole, you can install your fire control group – this is bog-standard AR15 stuff, if you are unfamiliar with it, refer to the build video, or an AR15 build video like Larry Potterfield's on Youtube.



Install the trigger and disconnector



Install the hammer

Next, install the safety, safety detent, safety detent spring, and pistol grip – again, bog-standard. Check out the build video or Larry Potterfield if you get stuck.



Install the safety, detent, spring, and pistol grip. Standard AR15 lower building operation.

At this point, all you have left to do is install the magazine catch and function check. Magazine catch installs standard as well – just like any other AR15 lower. Double check to make sure you've got all your support material removed before you install your magazine catch parts.



Install the magazine catch.



You can check magazine fitment now – they should slot in easily and drop free, assuming your print settings were good and you removed all your supports. If your printer exhibits ringing or z-banding, you may need to do some light sanding on the front and rear faces of the magwell – it is designed to be a perfect fit with a perfect print, and has no added tolerance for rough prints.

Set your upper on your lower, install your push pins, and do a basic function test. Congrats! Your UBAR build is ready to test fire.



Mount the upper on the lower. Function check, then fire test!

FAQ/Troubleshooting

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

A: You should expect thousands of rounds, plus a lower that can stand up to rough handling and abuse. While heat will still be a concern for lowers print in PLA, this lower is rugged and rigid.

Q: What sort of reliability should I expect?

A: I haven't had any reliability issues – all the important geometry on this lower is mil-spec (or adjusted slightly from mil-spec to make things easier to print). Magazines, your choice in upper/parts kit, and your ammo will end up determining the reliability of your build more than anything.

Q: What can I do about the rough finish where supports were touching the lower

A: If the few places this happens bothers you, you can use a soldering iron to melt these areas smooth.

Q: Why can't I get the upper on? Why won't the pin holes align?

A: Two things – first, note that the rear pin hole in the upper is oblong – as a result, it might look like the front pin hole isn't lining up, when in reality you just need to push the upper towards the butt of the rifle after inserting the rear takedown pin. Secondly, if you don't clearance the top of the rod ends, some uppers will contact the rod ends and will be unable to sit flat on the lower. If your pin holes still don't line up, your issue lies in your printer calibration – if you calibrated to a 20mm cube and then your pin holes don't line up when printing an AR15 lower, it's very likely that you need to calibrate on a larger cube.

Q: What parts work?

A: Essentially any AR15 kit *can* work, but the UBAR is intended for use with any upper and a carbine lower parts kit. Rifle lower parts kits can sort of work, but won't be able to use the buffer retainer pin. The UBAR improves on the old U-Bolt Vanguard by working with common railed "free float" handguards without having to cut on the lower. The angled magwell on the UBAR should also allow the use of drum magazines.

Note that some billet and sidecharging/nonstandard AR15 upper receivers may require you to print the UBAR2C variant of the UBAR – some of these uppers have a larger footprint on the lower, so extra clearance is required.

Q: What mags work?

****As of the UBAR Version 2, the issue described below should be resolved – however, these instructions are being left in place should you have a weird tolerance stack between your print, bolt catch, and desired magazine****

A: I recommend you stick with PMAGs or aluminum mags. If using PMAGs, I recommend Gen3 PMAGs, as Gen2 PMAGs sometimes require a little fitting to consistently engage the bolt hold open on the UBAR. Some Gen2 PMAGs work fine, and some bolt catches just work with any Gen2 PMAG, but if you have a lower that isn't consistently holding open on an empty Gen2 PMAG, you can easily fix your PMAG to enable it to work reliably. You just need to make a small cut on the top of the spine of the magazine – Gen3 PMAGs all have this feature, but Gen2s do not.



If you have inconsistent hold open with Gen2 PMAGs, you will probably be able to see where the bolt catch has been rubbing on the spine of the magazine – take your Dremel tool or a file and clearance the magazine slightly.



You don't have to remove much material, just add a little clearance. I usually clearance both sides of the magazine, though only the right side is usually required. If you have questions or doubts about how much material to remove, refer to the build tutorial video!