THUNDERBOLT

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Version: 1.0

Acknowledgements

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THUNDERBOLT DETAILS

The Thunderbolt is a printed bolt-up, DPMS-cut AR-10 lower receiver. The DPMS-cut was chosen due to its more modern style of design, as well as the ease-of-access of parts required to build the lower. **Most** of the parts needed to build this lower are identical to the ones you would use to assemble and AR-15 lower receiver, with some specific changes that are covered in this manual. It is imperative that you check over which parts that are different so you do not use the incorrect parts and possibly injure yourself or damage your firearm.

The Thunderbolt takes from its Firebolt brother all the strength, modularity, and efficiency in design and packs it into a .308-chambered package. Designed for the user with durability and longevity in mind, the Thunderbolt never has to be completely reprinted once it is assembled if a part fails. Parts that are more prone to failure due to higher stresses have been heavily reinforced, including areas such as the buffer tower and the front takedown. The buffer tower has been split into 3 sections for increased strength and easier printing. The Thunderbolt comes in one variation that utilizes the U-Bolt to further strengthen the lower, with a bolt catch standard to the design.

Most of the functionality and assembly of the Thunderbolt can be matched one-to-one with the Firebolt, allowing for easier builds and faster repairs for those that already own one.

THUNDERBOLT DETAILS

The DPMS AR-10 and a stock AR-15 have a multitude of interchangeable parts, making buying parts for your Thunderbolt very simple and cheap. However, there are a few parts that have to be bought separately that are unique to the DPMS AR-10's function. These parts include:

- Bolt Catch
- Buffer
- Buffer Spring

A complete list of the parts that are compatible between the two systems can be found here: https://www.wingtactical.com/blog/what-parts-are-interchangeable-between-ar15-ar10/

Mil-Spec AR-15 Lower Receiver Parts	DPMS Style .308 AR
Lower Receiver	NOT Compatible
Trigger	YES
Hammer	YES
Trigger and Hammer Springs	YES
Trigger and Hammer Pins	YES
Disconnect	YES
Disconnect Spring	YES
Bolt Catch	NOT Compatible
Bolt Catch Roll Pin	NOT Compatible
Bolt Catch Spring and Plunger	YES
Magazine	NOT Compatible
Magazine Catch	YES
Magazine Release Button	YES
Magazine Release Spring	YES
Pistol Grip	YES
Pistol Grip Screw and Washer	YES
Pivot Pin	NOT Compatible
Takedown Pin	NOT Compatible
Takedown and Pivot Pin Spring	YES
Takedown and Pivot Pin Detent	YES
Safety Selector (a.k.a. Fire Control Selector)	YES
Safety Selector Spring and Detent	YES
Trigger Guard Assembly	YES
Buffer Tube (a.k.a. Receiver Extension Tube)	YES
Buffer	NOT Compatible
Buffer Retainer	YES
Buffer Retainer Spring	YES
Buffer Spring (a.k.a. Action Spring)	NOT Compatible
Receiver End Plate	YES
Castle Nut (a.k.a. Receiver Extension Nut)	YES
Buttstock	YES

Examples of the DPMS buffer and spring can be found here:

- Buffer: https://www.primaryarms.com/expo-arms-ar-10-ar308-short-carbine-buffer
- Buffer Spring: https://www.midwayusa.com/product/1003344493

And a full compatibility guide can be viewed here for more information: https://308ar.com/ar-10-308-ar-compatibility-reference-guide/

PRINTER CALIBRATION

If you have already spent a decent amount of time calibrating your printer and know how to do so, you can skip this section.

Printer calibration is a key aspect of using a 3D printer. Typically, out of the box your printer is probably not going to be printing exactly to spec. Ironing out the kinks and dialing in your printer *prior* to printing a lower receiver can save you not only time, but also material and headaches.

It should be noted prior to reviewing this section that your bed should be leveled properly. You can do this with either your preferred method, test prints, or using hardware like a BLTouch. Regardless, if your bed is not properly level, your print **will** fail.

There are two main points of calibration: your dimensions and your flow. Calibrating dimensions is as easy as printing a test cube, measuring it with calipers, and adjusting your printer's steps/mm accordingly. Flow on the other hand can be more tricky, and typically is the first point you want to address as adjusting your flow can change your printers dimensional accuracy as well.

To calibrate you're flow, the first thing you're going to need to do is calibrate your extruder. This can be done very simply by measuring 100mm of filament from the extruder entrance outwards towards the spool and marking the 100mm point. Then, heat up your hot end and extrude 100mm of filament. Depending on where the mark ends up, you might be over-extruding or under. Using the equation below:

$$\left(\frac{\text{Expected Dimension}}{\text{Observed Dimension}}\right) \times \text{Current Steps/mm} = \text{New Steps/mm}$$

Calculate your new extruder steps/mm and run the test again until you are reasonably within a small margin of error with the extruder. Next, we will calibrate your flow in your slicer.

Included in the files are three calibration test prints: Flow_Calibration.STL, Firebolt_Calibration_Test.STL, and Calibration_Cube.STL. Start by printing the

Flow Calibration print; it is a simple 20mm x 20mm shelled box that will print with 3 wall lines on the edges with a 0.4mm nozzle. Once this is printed, measure the walls of the print with a caliper. Each wall should be about 1.2mm wide. If your walls are considerably larger or smaller, take 9 test measurements and average them out, and plug them into the equation below:

$$\left(\frac{1.2 \text{ mm}}{\text{Averaged Dimension}}\right) \times \text{Current Flow Percentage} = \text{New Flow Percentage}$$

Like the first test, print another test print and dial in your flow rate.

Once your flow has been calibrated properly, print the included Calibration_Cube. The settings on this cube should be minimal, with 2-3 walls and ~15% infill, but keep your speed and retraction settings the same as you would print a Firebolt. This calibration cube consists of multiple printer test all in one, including multiple overhang test, dimension tests, inner dimension test, hole dimension tests, stringing tests, and an M3 nut cutout for practical measurement. The dimensions of all the features included in the cutout are viewable in the folder.

Once the print is finished, measure the outside sides first. The cube is exactly 30mm x 30mm x 30mm, with the M3 cutout on the Y-axis and the 7.5mm hole on the X-axis. Measure each side more than once and average out the measurements to determine if you need to adjust your printer's steps/mm on that particular axis using the first equation from before. If you would like a less time-consuming print, find an XYZ cube on Thingiverse to print.

Dimensional accuracy is critical when it comes to a lower receiver. Printing too large can throw off your takedown pin hole alignment, while printing too small can cause your buffer tube to not thread. Inner dimensional accuracy is also important, which is why the third file, Firebolt_Calibration_Test, is the last file *you are going to want to print* regardless if you feel like your printer is up to spec or not. This print includes **all** of the holes that you will find on an AR-15 lower receiver, including the Safety, Takedown pins, FCG pins, and the Magazine release button slot. Not only that, but also included is a short copy of the buffer threads, allowing you to thread your buffer tube through it to test if your printer is calibrated. If you cannot thread your tube or fit the magazine release button into the slot, consider using the Hole Horizontal Expansion setting in Cura (demonstrated here: https://www.youtube.com/watch?v=UUelLZvDelU) to fix this issue. This print is 50mm x 50mm.

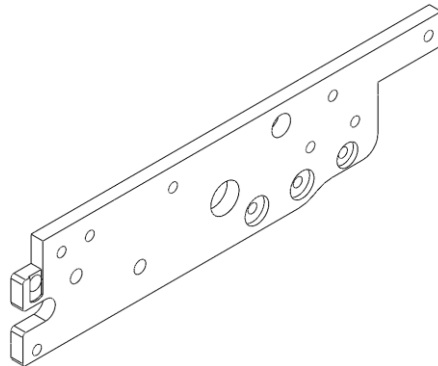# PRINT SETTINGS

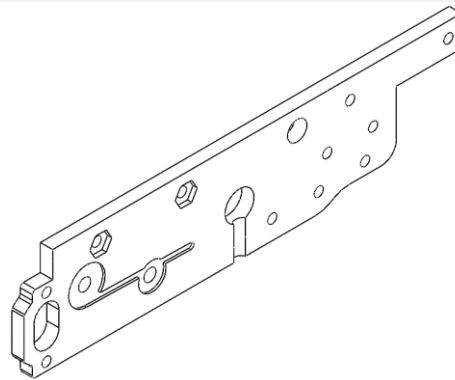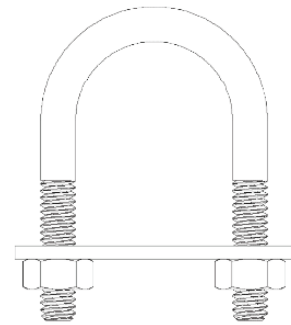|	
Material	PLA+ / ABS / PETG / Polycarbonate / Filled Nylon
Nozzle Size	0.4 mm
Filament Size	1.75 mm
Layer Height	0.16 mm
Top/Bottom Layers	15-20 Layers
Wall Line Count (Perimeters)	6-8 Walls
Infill Pattern	Triangle / Cubic
Infill Percentage	50-75%
Supports	Required, user generated

MATERIAL LIST
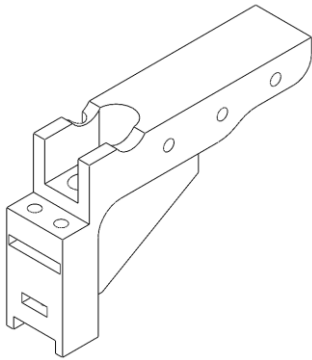
FCG Grip Base	FCG Left	Trigger Guard
<Thunderbolt_Grip_Part>	<Thunderbolt_Side_Left >	<Thunderbolt_Trigger_Guard >
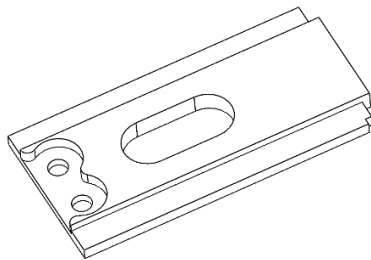
FCG Bottom	FCG Right	Complete U-Bolt*
<Thunderbolt_Fire_Control_Well _Bottom>	<Thunderbolt_Side_Right>	#132-¼" x 1-1/8" x 2-¼"
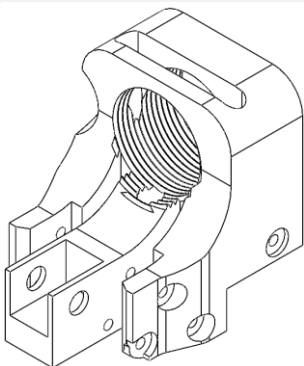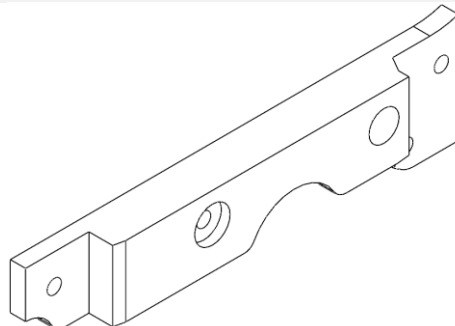
Buffer Tower	Left Buffer Tower Arm	Right Buffer Tower Arm
<Thunderbolt_Buffer_Tower>	<Thunderbolt_Buffer_Tower_Arm_Left>	<Thunderbolt_Buffer_Tower_Arm_Right>
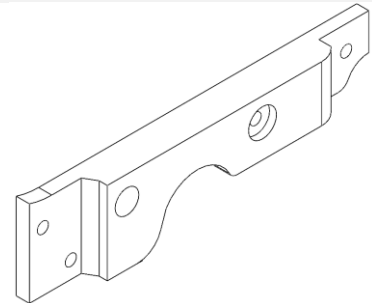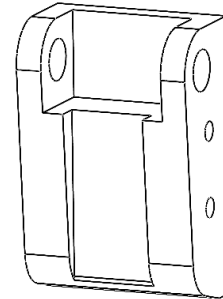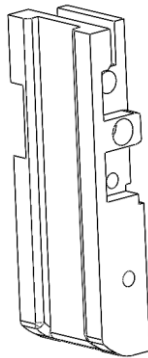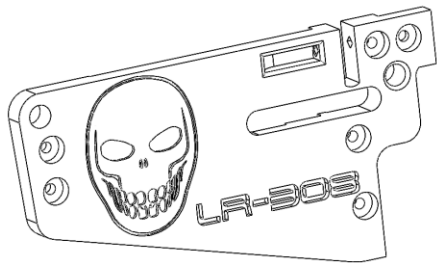
Left Magazine Well	Rear Magazine Well	Front Magazine Well
< Thunderbolt_Mag_Well_Left>	<Thunderbolt_Mag_Well_Rear>	<Thunderbolt_Mag_Well_Front>
Right Magazine Well	M3 Screw	M3 Hex Nut
<Thunderboltbolt_Mag_Well_Right>	10mm (7) 12mm (3) 25mm (3) 35mm (4) 40mm (2) 45mm (1) 50mm (1)	(21)
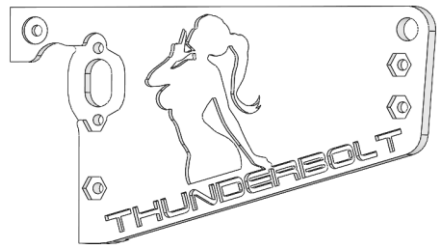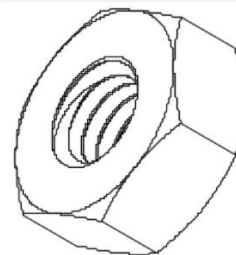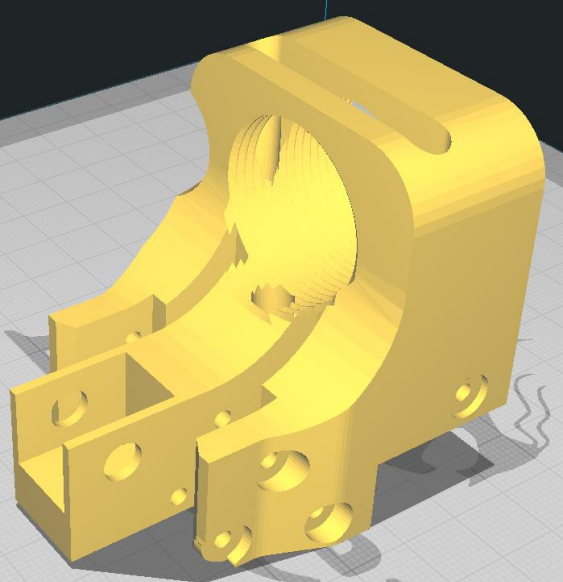
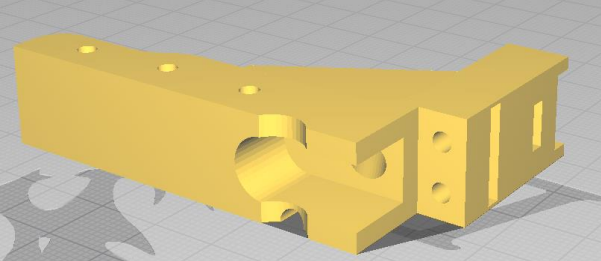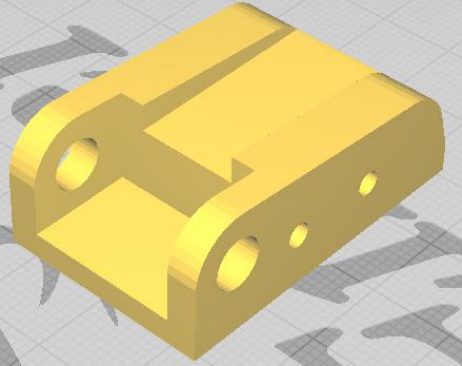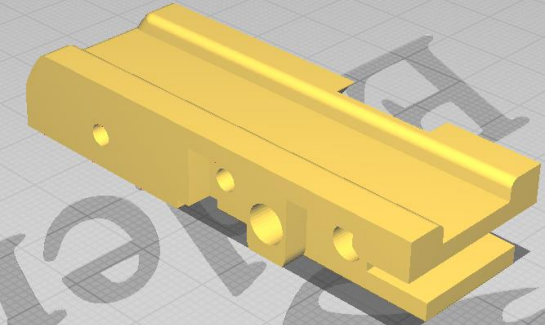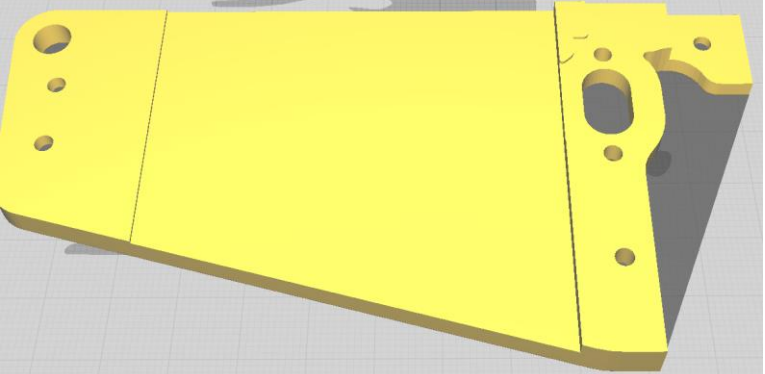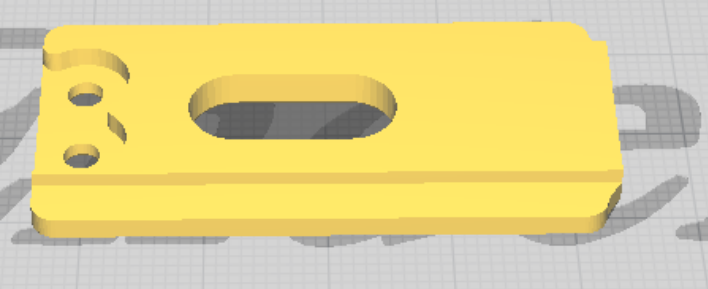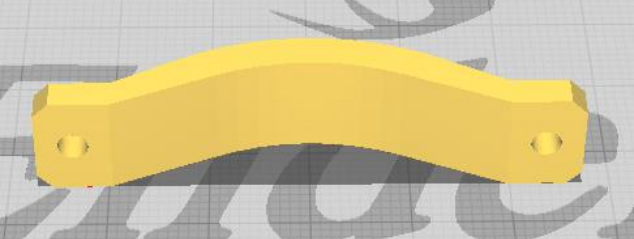# PRINT ORIENTATION FOR ALL PARTS

Part	Orientation
Buffer Tower	
Buffer Tower Arms	
Grip Part	
Mag Well Front	

Mag Well Rear	
Mag Well Sides	
FCG Sides	
FCG Well Bottom	
Trigger Guard	

NOTES

- Buffer tower **must** be printed upright, NOT threads down. This gives the part the required strength.
- Grip part should be printed on its side with support. Use trees in Cura.
- The rear magazine well should be printed with the largest flat side against the print bed. This is the side opposite the mag well.
- The left and right magazine well sides should be printed on their largest flat face, the side opposite the magazine well.
- Both left and right fire control group sides should be printed with the internal facing (flattest) sides against the print bed.
- The bottom fire control group wall should be printed flat, so the side facing the trigger guard is against the print bed.
- Trigger guard can be printed either flat (so it looks like a bridge), or on its side (so it needs no support). Printing on the trigger guard on its side is recommended.

ASSEMBLY

Note: Because of the similarity in assembly to the Firebolt, the graphics used in this manual are of the Firebolt, however the bolts required and the description will apply to the Thunderbolt.
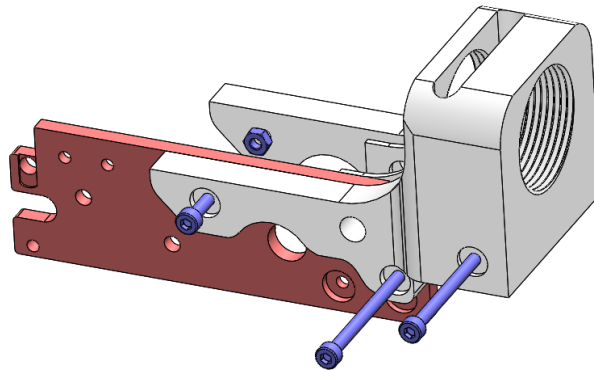
12mm

1

40mm
45mm   2
        1

50mm

1

1

Attach the left fire control group plate to the buffer tower and left buffer tower arm. Make sure not to push the 40mm, 45mm, and 50mm bolts all the way through, as they will need to fit through the right fire control group plate in the next step. Finish securing the buffer tower to the left fire control group plate with a nut and 12mm bolt.
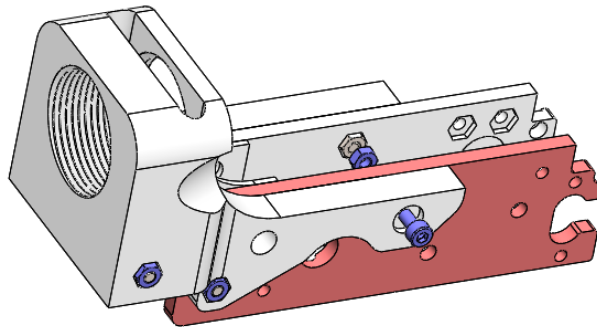
12mm

1

5

Attach the right fire control group plate to the buffer tower, pushing the 40mm, 45mm, and 50mm bolts through the rear-most holes when completed. Finish securing the buffer tower and arm to the right fire control group plate with a nut and 12mm bolt.
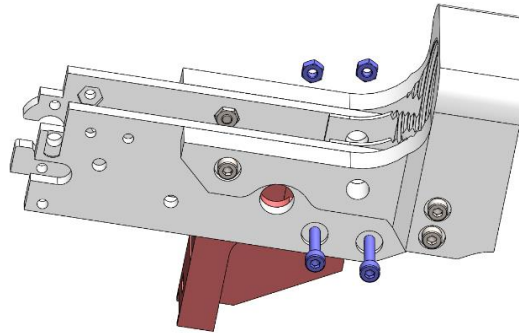
25mm

3

3

Place the grip part between the two fire control group plates. Next, fit three 25mm bolts through both fire control group plates and the grip part. Screw a nut onto the end of the bolt to hold it in place.
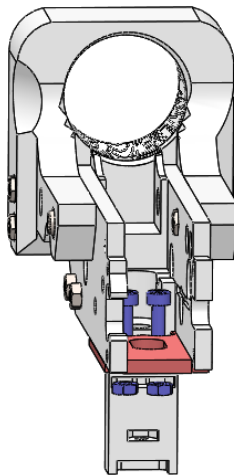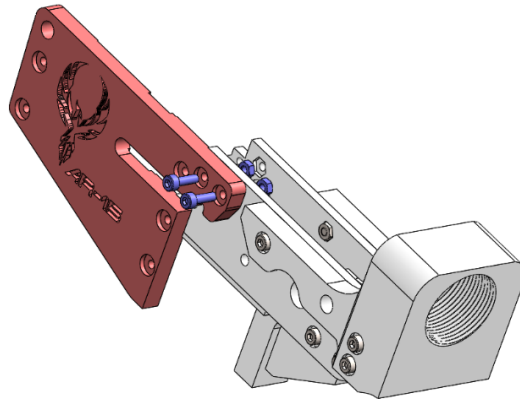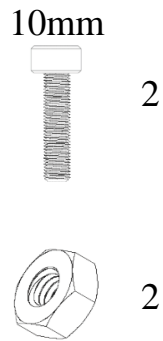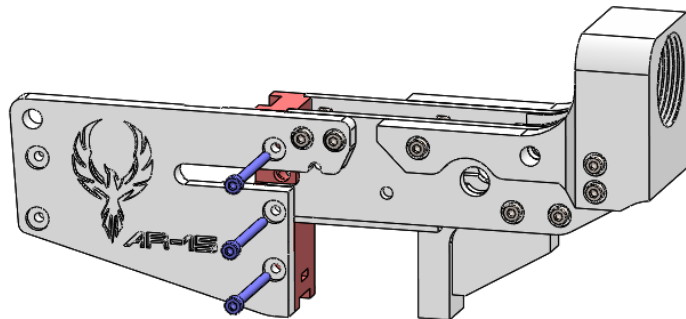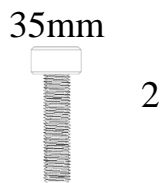
10mm

2

2

Fit the bottom fire control group plate between the left and right walls and the grip part. Use two 10mm bolts and two nuts to secure the plate in place.

10mm

2

2

Place the left magazine well plate against the left fire control group plate, securing it in place with two 10mm bolts and two nuts.

35mm

2

Using two 35mm bolts, hold the rear magazine well part flush against the left magazine well plate and back against the fire control group plates. Install Bolt Catch.

10mm
12mm

1
1

4
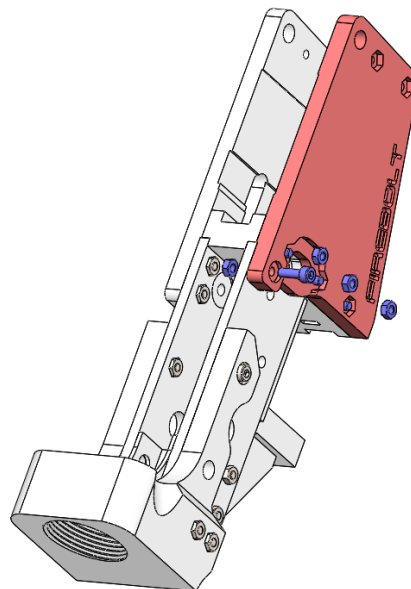
Put a nut into the slot of the back of the mag well rear. Place the right magazine well against the frame and screw in the single 12mm screw into the top screw hole of the mag well rear. Secure the right magazine well plate to the lower with three M3 nuts and a 10mm M3 bolt.
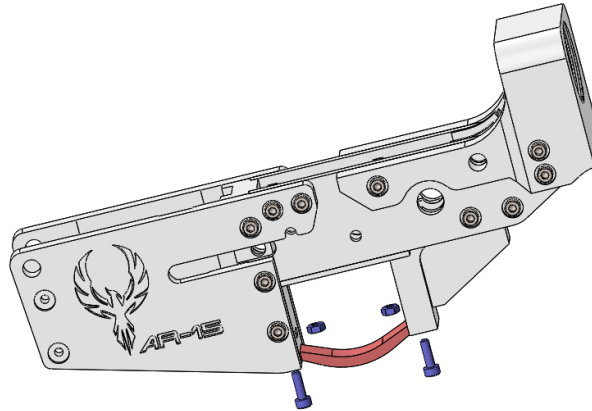
10mm

2

2

Place the trigger guard against the bottom of the grip part and the rear magazine well part, securing it in place with two 10mm bolts and two nuts.
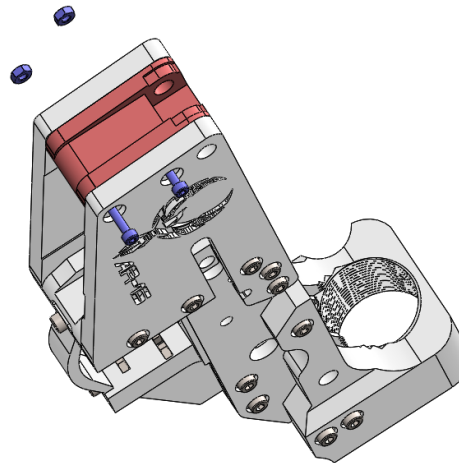
35mm

2

2

Secure the magazine well front part in place using two 35mm bolts and nuts.

APPENDIX

Hardware

The U-Bolt can be found for $1.38 on Amazon here:
https://www.amazon.com/gp/product/B002Y0VRI8/ref=ppx_yo_dt_b_asin_title_o00_s00?ie=UTF8&psc=1

This set of M3 screws contains all of the screws you will need to assemble your Thunderbolt, and the head of the screws is low profile enough that a standard safety switch will fully operate over them:
https://www.amazon.com/gp/product/B07L65DHV6/ref=ppx_yo_dt_b_search_asin_title?ie=UTF8&psc=1

You can also reach out to RKSpookware on Twitter for build-specific parts kits.

https://twitter.com/RKSpookware

https://www.rkspookware.com/shop

Devs Notes

- The Firebolt_Pistol_Grip from the Firebolt files is compatible with the Thunderbolt, the UBolt-style pistol grip is not.
- The Thunderbolt has not been tested in PLA, but the Firebolt has been tested in PLA firing .458 SOCOM, which has similar recoil energy to .308 Win. In any case, print using the **correct orientation.**
- Included in the Accessories folder is a miniature Shockwave Blade brace, intended for **pistol buffer tubes only**.
- The bolt catch can be stiff at first, but with proper sanding and operation it will wear in.
- Keep an eye open for the screw that fits through the right side of the mag well on the bolt catch variant, it feeds into the mag well rear underneath the bolt catch. Putting an M3 nut into that slot can be tight so handle with care.
- If you fully assemble your lower and *then* try to insert your hammer and trigger group, it will not fit because the walls of the FCG sides are thicker on the inside for durability. Loosen the screws that feed through the mag well rear to loosen the FCG sides at the front, and then place your trigger and hammer pieces in. Once you have them in, tighten down the screws.

- Make sure the screws that feed into the Fire Control Well are tight, as a loose M3 nut can jam up your FCG.
- If you didn't print the test print, once you print all the pieces of the mag well that house the magazine release, test your release button in the slot to ensure it fits and operates smoothly. If it does not, sand accordingly.
- Included are some stencils for the mag wells.
- If you have any further questions, message me on Keybase: @spookyspectre