

Defense Distributed presents

Zero Percent Receiver Starter Guide

Version 1.0.0

Published 1/18/2022

Contents

Quickstart	2
Overview	3
The AR-15 Non-Receiver Block	4
The Lower-Lower	5
The Buffer Tower	6
The Clamps	7
The Cooling Fan	8
Nuts and Bolts	9
Tooling	10
The Cutcode	11
The Ghost Gunner 3 / DDCut	12

Quickstart

For your first Zero Percent Receiver:

The absolute easiest way to gather the materials needed to create a Zero Percent Receiver is to purchase them from Ghost Gunner at <https://ghostgunner.net>.

Follow the checklist below to determine what to purchase and where to get it:

- ☐ **The Ghost Gunner 3 CNC Machine**
Purchase at <https://ghostgunner.net/product/ghost-gunner-3-deposit/>
- ☐ **The AR-15 Non-Receiver Block**
Purchase at <https://ghostgunner.net/product/ar-15-non-receiver/>
- ☐ **The Zero Percent Lower Build Kit**
Contains the lower-lower and buffer tube adapter and nuts and bolts
<https://ghostgunner.net/product/zero-build-kit/>
- ☐ **The Zero Percent Starter Kit**
Contains the clamps, cooling fan, nuts and bolts, tooling and cutcode
<https://ghostgunner.net/product/zero-starter-kit/>

For subsequent Zero Percent Receivers:

The **Ghost Gunner 3** and **Zero Percent Starter Kit** can be reused to make many more receivers.

For each subsequent receiver after your first you need only obtain one additional **AR-15 Non-Receiver Block** and one additional **Zero Percent Lower Build Kit**.

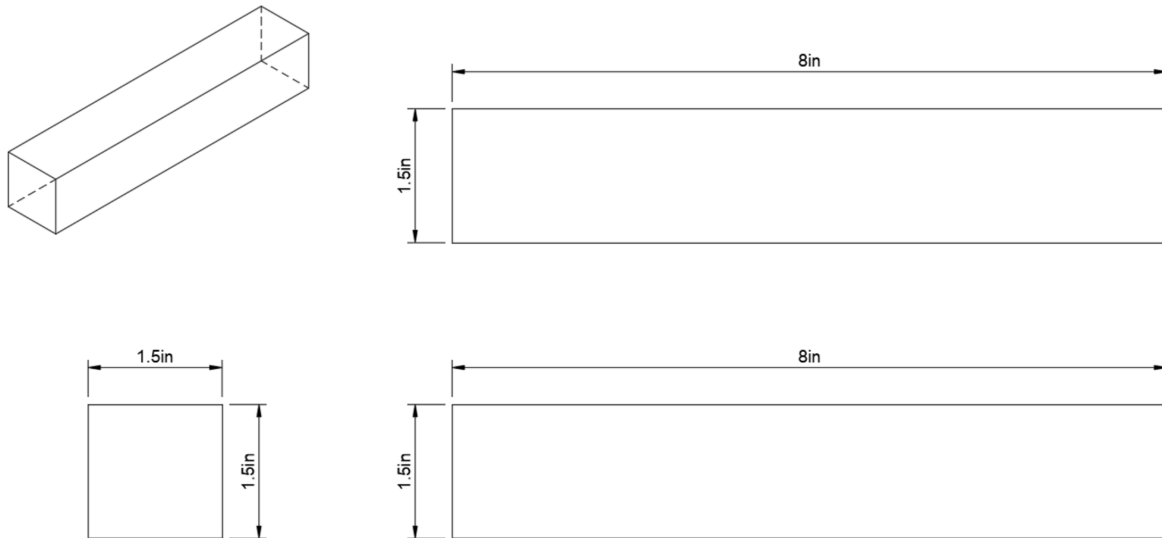
Overview

The following table can be used to quickly determine the methods of acquiring each of the required parts for building a Zero Percent Receiver.

Part	Purchase at Ghost Gunner	Create from Raw Stock	Access at DEFCAD	Purchase from hardware supplier
AR-15 Non-Receiver Block	Yes	Yes		
Lower-Lower	Yes (<i>in Build Kit</i>)	Yes (<i>future release</i>)	Yes (access and print)	
Buffer Tube Adapter	Yes (<i>in Build Kit</i>)	Yes (<i>future release</i>)		
Clamps	Yes (<i>in Starter Kit</i>)			
Cooling Fan	Yes (<i>in Starter Kit</i>)		Yes (access and print)	
Nuts and Bolts	Yes (<i>in Build Kit and Starter Kit</i>)			Yes
Tooling	Yes (<i>in Starter Kit</i>)			Yes
Cutcode	Yes (<i>in Starter Kit</i>)		Yes	
Ghost Gunner 3	Yes			

Specific details on each item can be found in the sections below.

The AR-15 Non-Receiver Block



The **AR-15 Non-Receiver Block** is the core of the Zero Percent Receiver. It is a raw block of 6061 billet aluminum bar stock which is machined on the Ghost Gunner to produce the **upper-lower**.

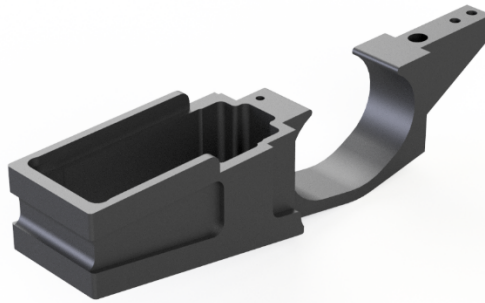
The **upper-lower** holds the fire control group, bolt catch, magazine release and takedown pins.

To acquire this part, refer to the table below:

Method	Description	Link(s)
Method A	Purchase from Ghost Gunner	https://ghostgunner.net/product/ar-15-non-receiver/
Method B	<p>Purchase raw aluminum bar stock and cut to the appropriate size.</p> <p>The raw bar stock should be 6061 billet aluminum sized 1.5" x 1.5".</p> <p>The stock should be cut to be exactly 8" in length. This cut can be performed with a bandsaw or hacksaw.</p> <p>Refer to the blueprints above to confirm the block sizing.</p>	

Note: while not printable, the block and upper-lower 3D model (and blueprints of these models) can be accessed at DEFCAD.

The Lower-Lower



The **lower-lower** mates to the **upper-lower**, which is machined from the **Non-Receiver Block**. The lower-lower comprises the lower part of the magwell and the trigger guard; it also is what the grip attaches to.

To acquire this part, refer to the table below:

Method	Description	Link(s)
Method A	Purchase from Ghost Gunner as part of the Zero Percent Lower Build Kit	https://ghostgunner.net/product/zero-build-kit/
Method B	<p>3D print this part on any printer with a bed of at least 210mm x 210mm.</p> <p>The file to facilitate printing the lower-lower can be accessed at DEFCAD using the link to the right.</p> <p>It should be sliced using the slicer and settings of your choice. 100% infill is recommended but may not be required.</p> <p>This part is not force-bearing and so can likely be printed in most reasonable materials, including PLA+, ABS, PETG, or Nylon.</p>	https://defcad.com/library/a7e80e35-f739-40d5-899c-59d3ebddb7/
Method C	<p>Machine this part on the Ghost Gunner from a raw block of material.</p> <p><i>The cutcode for this method will be provided in a future release.</i></p>	

The Buffer Tube Adapter



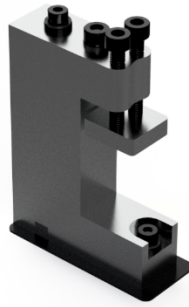
The **buffer tube adapter** mounts to the rear of the **upper-lower** and is used to hold the buffer tube. It is threaded to mil-spec standards.

To acquire this part, refer to the table below:

Method	Description	Link(s)
Method A	Purchase from Ghost Gunner as part of the Zero Percent Lower Build Kit	https://ghostgunner.net/product/zero-build-kit/
Method B	Machine this part on the Ghost Gunner from a raw block of material. <i>The cutcode for this method will be provided in a future release.</i>	

Note: while not printable, a 3D model of the buffer tube adapter (and blueprints of the model) can be accessed at DEFCAD.

The Clamps



The **clamps** are used to mount the **AR-15 Non-Receiver Block** to the Ghost Gunner 3's t-slot table to hold it in place for machining. The clamps are made using the following subparts:

- **Body:** the main body of the clamp, made from rigid metal.
- **Insert:** slots into the base of the main body, made from plastic.
- **Jaw:** sits between the material mounted in the clamp and the tensioning bolts, made from aluminum.
- **Insulating Pad:** sits beneath the clamp as a "foot", insulates the metal clamp body from the Ghost Gunner's t-slot plate. Made from plastic.
- **Insulating Washer:** sits in the holes housing the bolts which connect to the t-slot nuts on the t-slot plate, ensures these bolts do not contact the clamp body and short the clamp to the table. Made from plastic.

Specific blueprints for the clamps are provided in **Appendix A** to this document.

To acquire this part, refer to the table below:

Method	Description	Link(s)
Method A	<p>Purchase from Ghost Gunner as part of the Zero Percent Starter Kit.</p> <p>At this time this is the only method supported by Defense Distributed for acquiring these clamps.</p>	<p>https://ghostgunner.net/product/zero-starter-kit/</p>

While these clamps are used currently only to hold the **AR-15 Non-Receiver Block** for machining, they are also generic workholding and can be used to hold 1.5" square bar stock for other projects. Future Ghost Gunner projects and community-developed projects may make use of these clamps.

Note: while not printable, the 3D model of these clamps (and blueprints of the model) can be accessed at DEF CAD.

The Cooling Fan



The cooling fan mounts onto the ER11 collet nut used on **Ghost Gunner 3's** spindle. It helps with both part cooling and chip evacuation.

To acquire this part, refer to the table below:

Method	Description	Link(s)
Method A	Purchase from Ghost Gunner as part of the Zero Percent Starter Kit .	https://ghostgunner.net/product/zero-starter-kit/
Method B	<p>3D print this part on any printer with a reasonably-sized bed capable of printing PETG.</p> <p>The file to facilitate printing the cooling fan can be accessed at DEFCAD using the link to the right.</p> <p>It should be sliced using the slicer and settings of your choice. 100% infill is recommended but may not be required.</p> <p>Defense Distributed experimentation with printed cooling fans has primarily been performed with PETG. We have not fully characterized other materials, nor do we currently have information about longevity for printed cooling fans of any material. We encourage the community to experiment with different materials when printing this part.</p>	https://defcad.com/library/21e33f62-76f4-4508-882a-e8df465dcf76/

Nuts and Bolts

Several nuts, bolts and other common hardware parts are used both for **assembling the Zero Percent Receiver** and for **mounting the AR-15 Non-Receiver Block** in the clamps. This section will provide information about both.

Nuts and Bolts for Assembling the Zero Percent Receiver

You will require one set of the following items for each Zero Percent Receiver you build.

Hardware	Quantity
M3 x 0.5 x 12mm length, fully threaded	2
M3 x 0.5 x 16mm length, fully threaded	2
M3 x 0.5 x 8mm length, fully threaded	1
M4 x 0.7 x 18mm length, fully threaded	2

Nuts and Bolts for the Clamps

You will require one set of the following items for your clamps. These can be reused for multiple receivers.

Hardware	Quantity
M4 x 0.7 x 2mm length	2
M4 x 0.7 x 90mm length	2
M5 x 0.8 x 6mm length	1
M5 x 0.8 x 25mm length	4
M4 T-slot nut	4
M4 insulating washer (Nylon recommended)	4

To acquire these parts, refer to the table below:

Method	Description	Link(s)
Method A	Purchase from Ghost Gunner as part of the Zero Percent Lower Build Kit and Zero Percent Starter Kit .	https://ghostgunner.net/product/zero-build-kit/
	These kits will contain all required hardware in addition to the main parts.	https://ghostgunner.net/product/zero-starter-kit/
Method B	Acquire this hardware from a third-party hardware supplier.	

Tooling

The **tooling** comprises the various end mills and drill bits that are used to mill the **AR-15 Non-Receiver Block** into the upper-lower.

The following tools are required:

- 1/8" ER11 collet
- 1/4" ER11 collet
- 1/4" end mill
- 1/8" end mill
- 1/8" deburring end mill

Note: this list does not include tooling that is included with the Ghost Gunner 3, such as the ER11 collet nut.

To acquire these parts, refer to the table below:

Method	Description	Link(s)
Method A	Purchase from Ghost Gunner as part of the Zero Percent Starter Kit .	https://ghostgunner.net/product/zero-starter-kit/
Method B	Acquire this tooling from a third-party hardware supplier.	

The Cutcode

The **cutcode** is the special file containing the G-code and step-by-step instructions used to mill the **AR-15 Non-Receiver Block** into an **upper-receiver**.

The “.dd” cutcode file is loaded into Ghost Gunner’s **DDCut** software. The software will then walk you through each step of the milling operation.

To acquire the cutcode, refer to the table below:

Method	Description	Link(s)
Method A	Purchase from Ghost Gunner as part of the Zero Percent Starter Kit . The cutcode is provided on a USB flash drive.	https://ghostgunner.net/product/zero-starter-kit/
Method B	Purchase from Ghost Gunner on the Ghost Gunner 3 USB Drive . <i>Because this same flash drive is provided as part of the Zero Percent Starter Kit, this method is useful only for users who have acquired the clamps and other starter kit components through other methods.</i>	https://ghostgunner.net/product/usb-flash-drive-ghost-gunner-3-software/
Method C	Access the cutcode at DEFCAD using the link to the right.	<i>Cutcode link will be added in a future version of this guide.</i>

The Ghost Gunner 3 / DDCut

The **Ghost Gunner 3** CNC mill is used to easily perform all milling operations for the **Zero Percent Receiver**. **DDCut** is the software used to run the **cutcode**. This software provides step-by-step instructions for all operations and will control the movement of the actual Ghost Gunner 3 mill.

The **Ghost Gunner 3** can be purchased from Ghost Gunner. DDCut is included on a flash drive in the Ghost Gunner package, but can also be downloaded at any time from <https://ghostgunner.net/downloads/>

To acquire this item, refer to the table below:

Method	Description	Link(s)
Method A	Purchase from Ghost Gunner.	https://ghostgunner.net/product/ghost-gunner-3-deposit/
Method B	<p>Purchase a used model. Ghost Gunners often can be found for sale at auctions or other places where hardware is resold.</p> <p>Defense Distributed supports the reuse and free exchange of maker hardware; however, be careful to ensure that any preowned Ghost Gunner functions as expected before purchasing it.</p> <p>Please also be aware that the cutcodes for the Zero Percent Receiver will only run properly on the Ghost Gunner 3. Earlier models of the Ghost Gunner CNC mill will not properly run this cutcode.</p>	



Questions?

Contact us at:

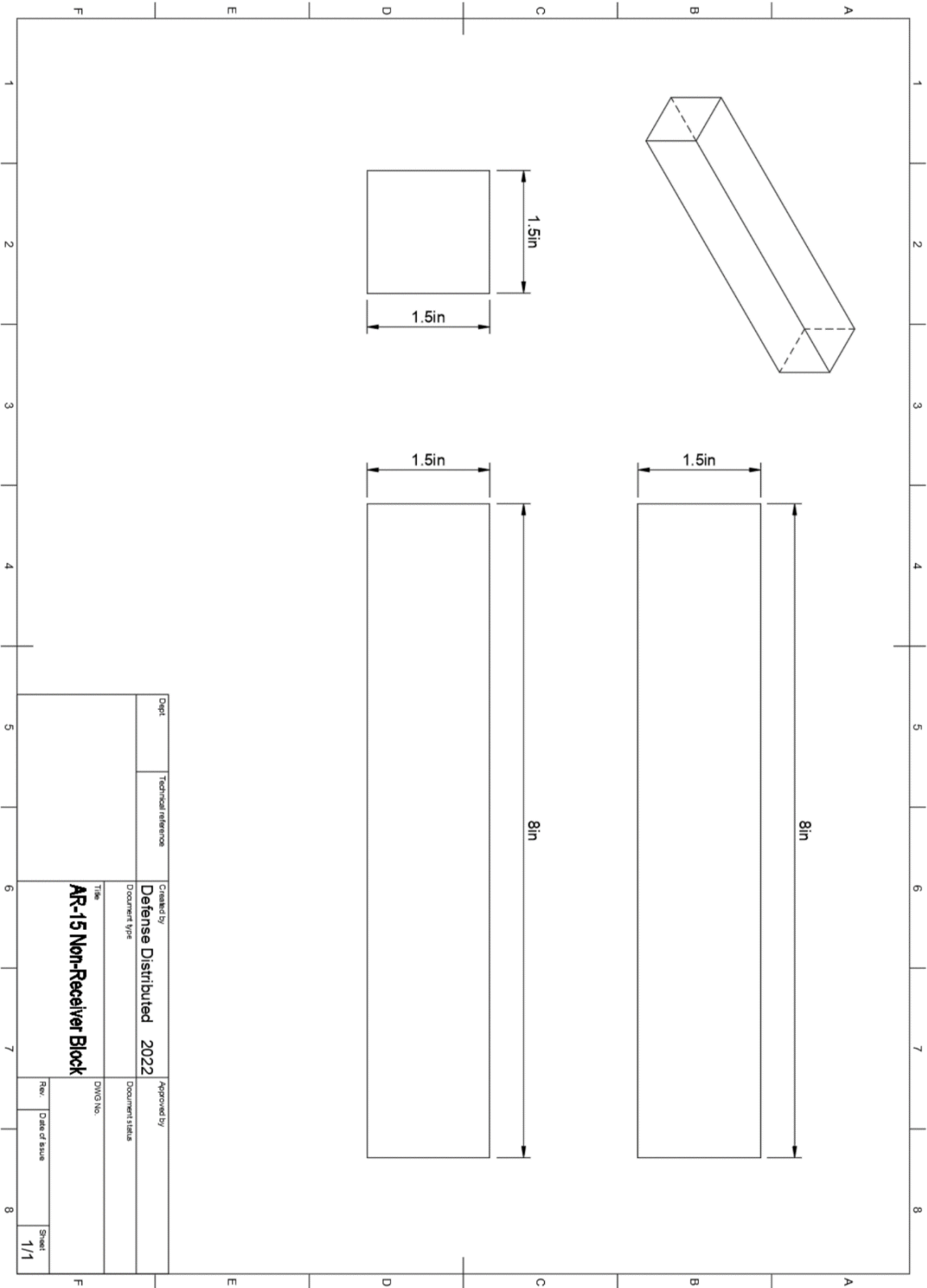
support@ghostgunner.net

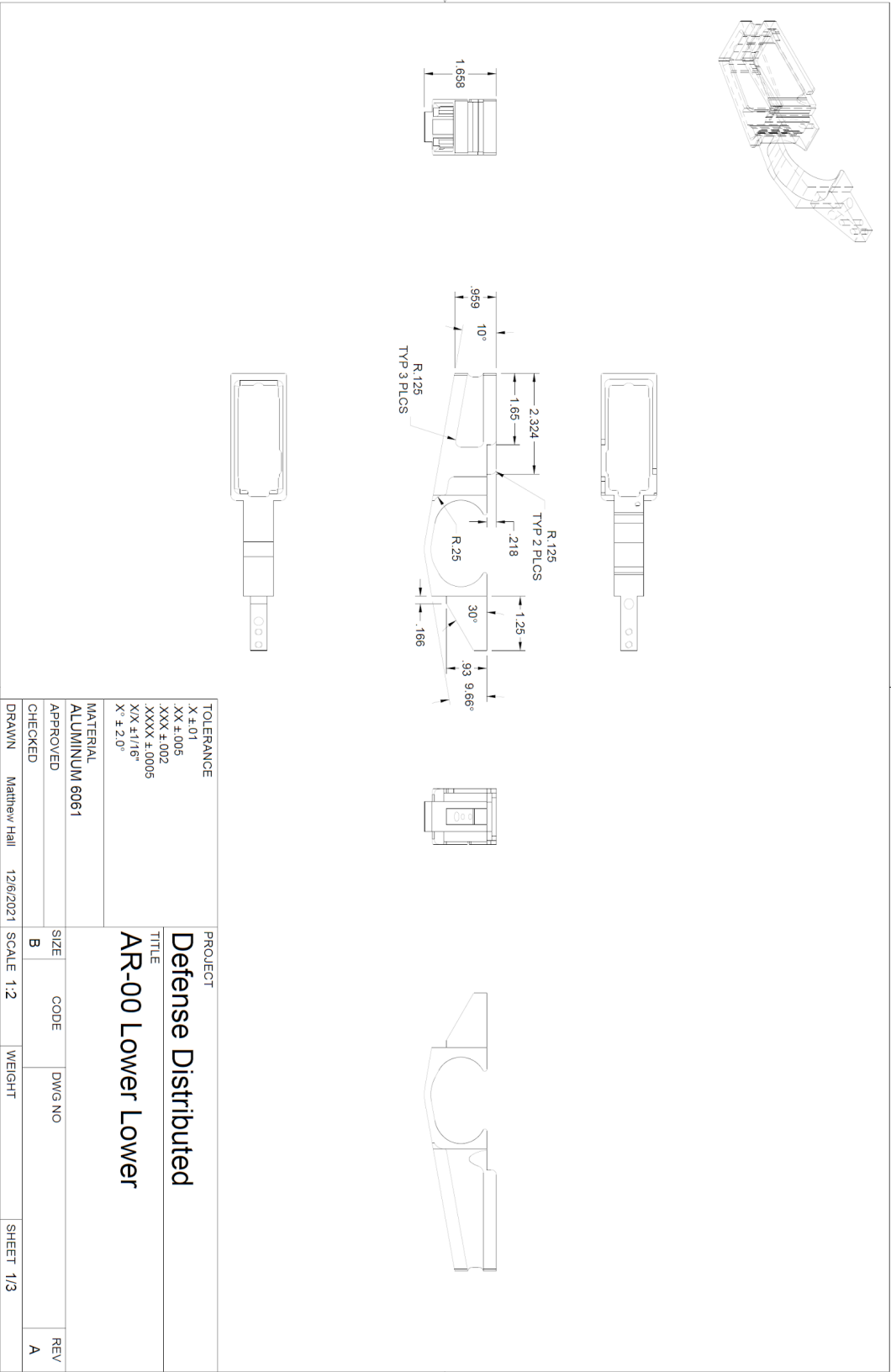
Appendix A: Blueprints

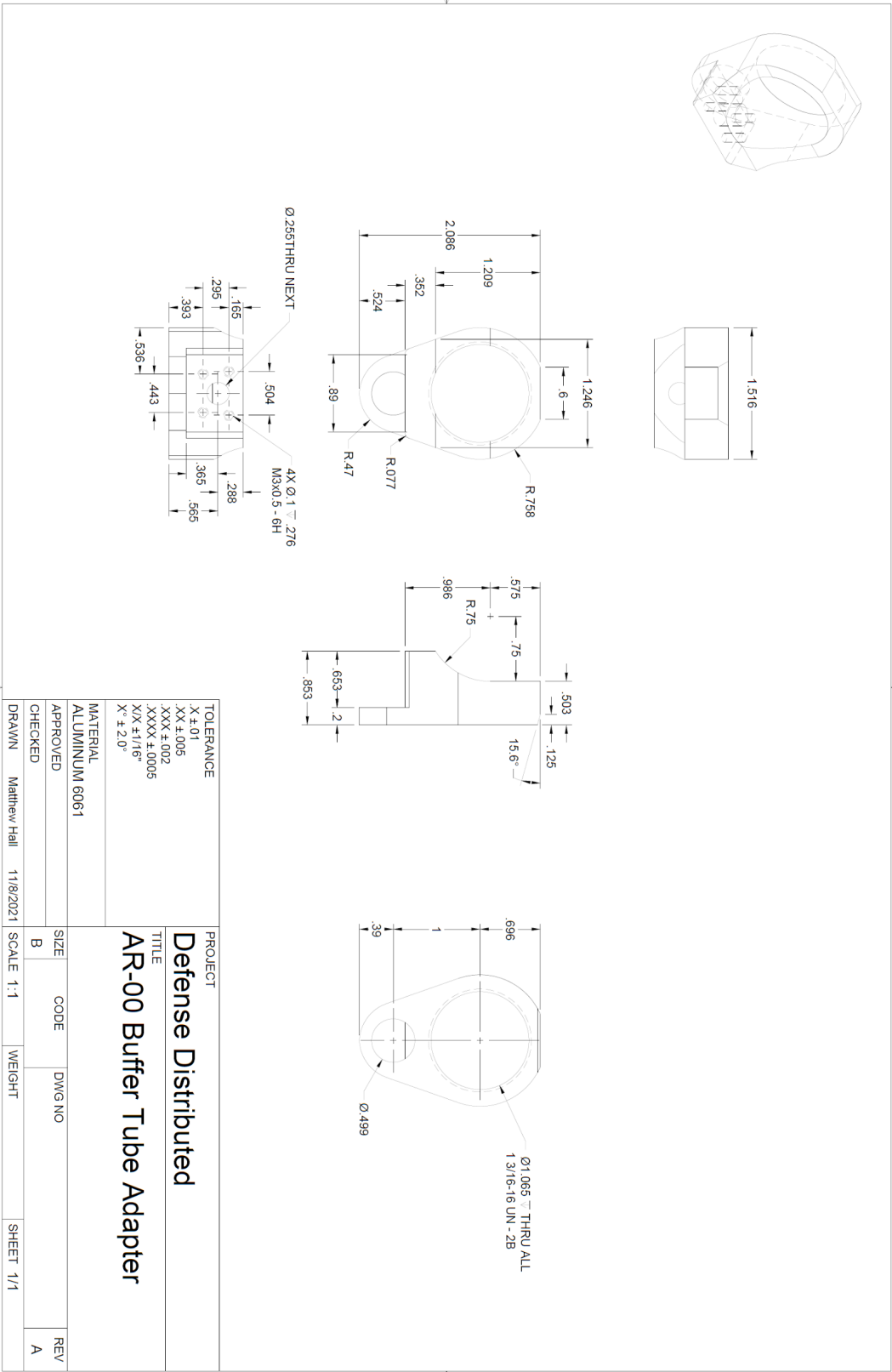
The following blueprints are included in this guide. Versions of these blueprints are also available on DEFCAD.

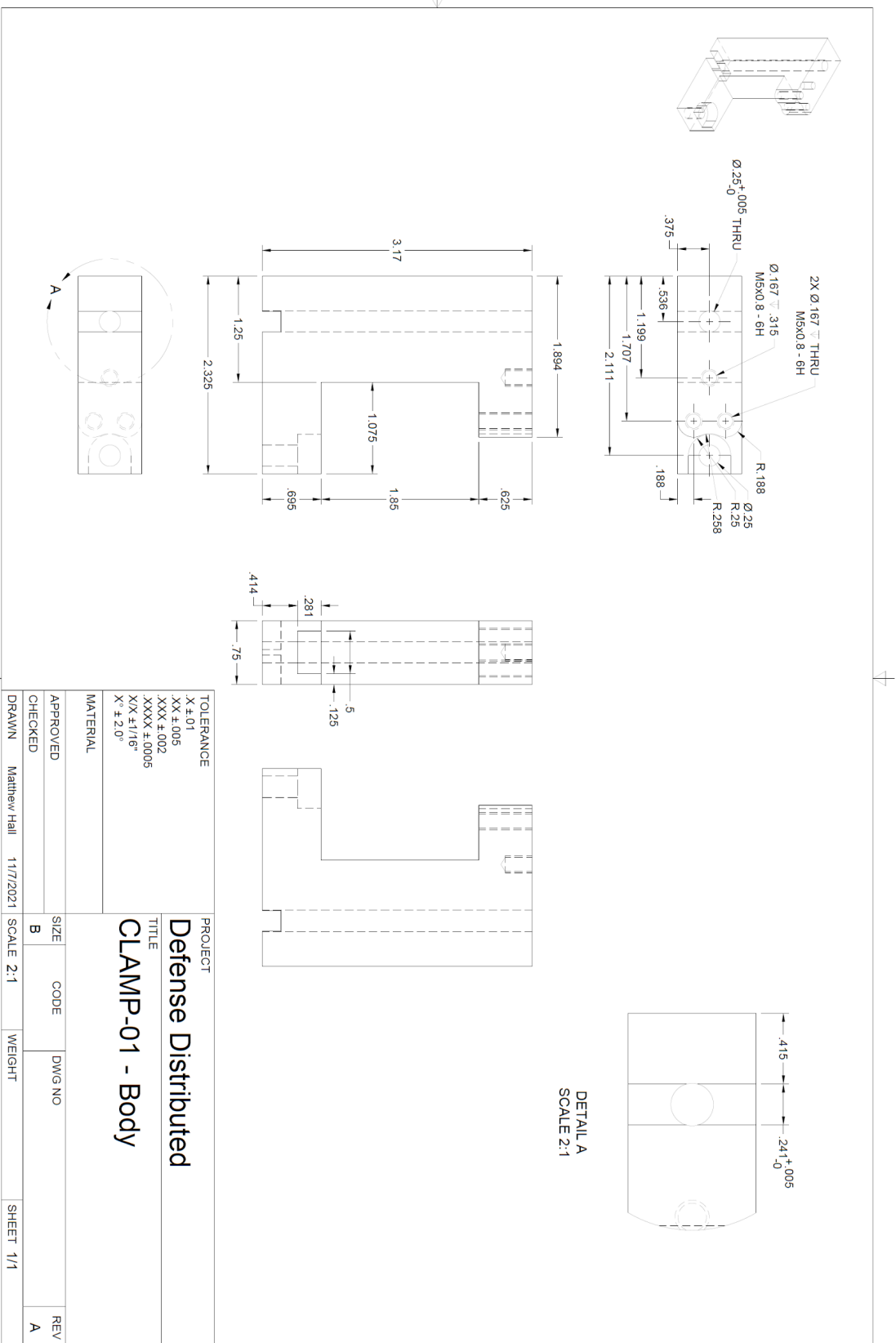
Page	Blueprint	Link(s)
15	AR-15 Non Receiver Block	https://defcad.com/library/8907eec8-188d-4ac8-ae74-8976dcae1051/
16	Lower-Lower	https://defcad.com/library/d7cf404f-e387-4694-8a95-81584c64cfa4/
17	Buffer Tube Adapter	https://defcad.com/library/1170680f-4787-4b6b-848b-61cf6aa53ce0/
18	Clamp Assembly	https://defcad.com/library/25ce9e93-e370-492b-8328-ddd9424e4e9d/
19	Clamp - Body	“
20	Clamp - Insert	“
21	Clamp - Jaw	“
22	Clamp - Insulating Pad	“
23	Clamp - Insulating Washer	“

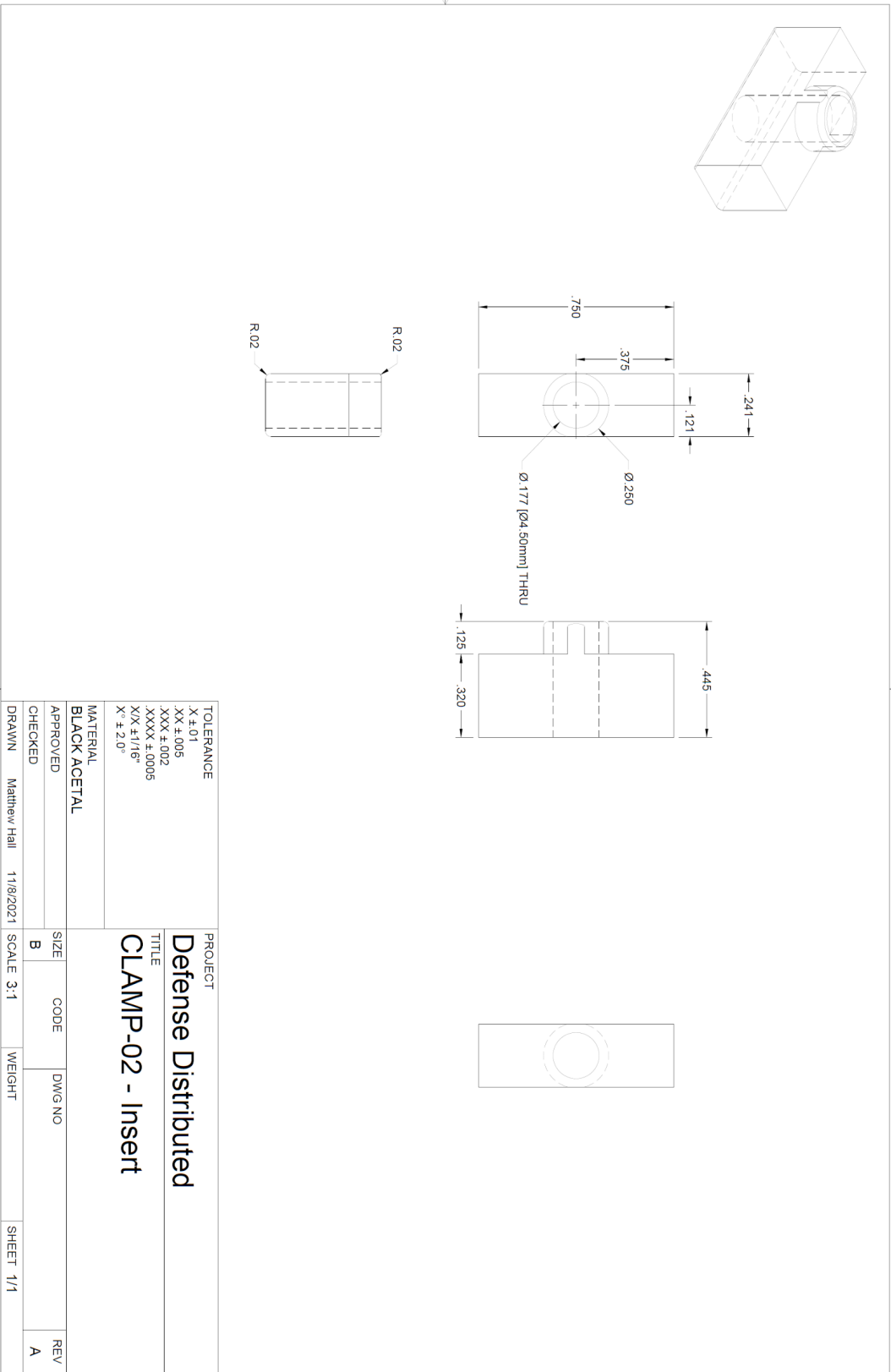
Blueprints for the upper-lower and chip fan will be uploaded in a future version of this guide. Individuals wishing to examine these objects may review the 3D models available for these on DEFCAD.

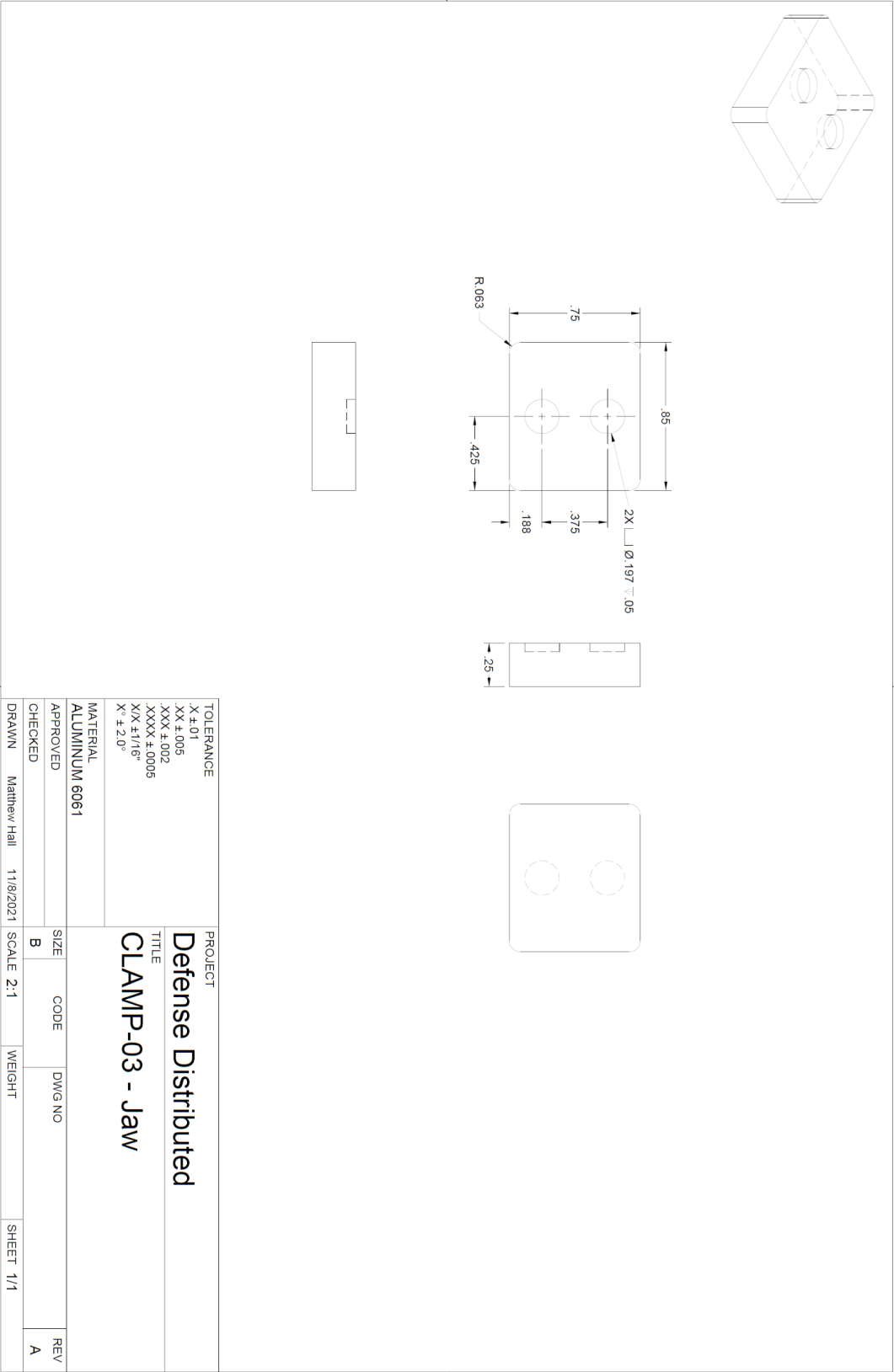


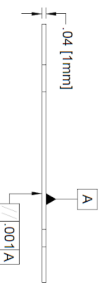
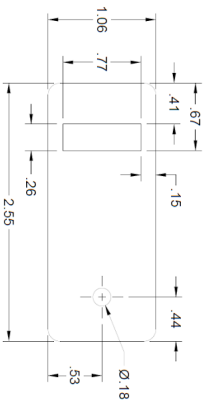
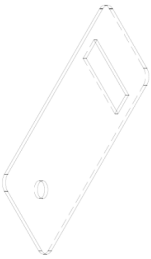






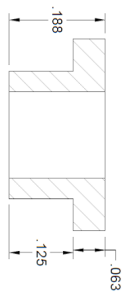
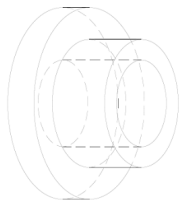




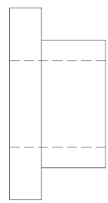
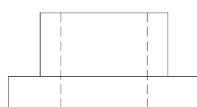
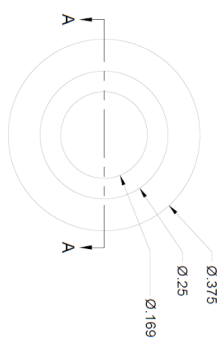


NOTES
LASER CUT FROM 1MM THICK PETG SHIM STOCK
REMOVE PROTECTIVE FILM

TOLERANCE		PROJECT	
X ± .01		Defense Distributed	
XX ± .005			
XXX ± .002			
XXXX ± .0005			
XX ± 1/16"			
X° ± 2.0°		CLAMP-04 - Insulating Pad	
MATERIAL			
1MM PETG SHIM STOCK			
APPROVED	SIZE	CODE	DWG NO
CHECKED	B		
DRAWN	SCALE	WEIGHT	SHEET
Matthew Hall	11/8/2021	1:1	1/1
		REV	
		A	



SECTION A-A
SCALE 5:1



TOLERANCE		PROJECT	
X ± .01		Defense Distributed	
XX ± .005		TITLE	
XXX ± .002		CLAMP-05 - Insulating Washer	
XXXX ± .0005			
XX ± 1/16"			
X° ± 2.0°			
MATERIAL			
POLYCARBONATE CLEAR			
APPROVED	SIZE	CODE	DWG NO
CHECKED	B		
DRAWN	Matthew Hall	11/8/2021	SCALE 5:1
		WEIGHT	SHEET 1/1
			REV
			A

Appendix B: Zero Percent Build Guide Changelog

Version 1.0.0: Initial release