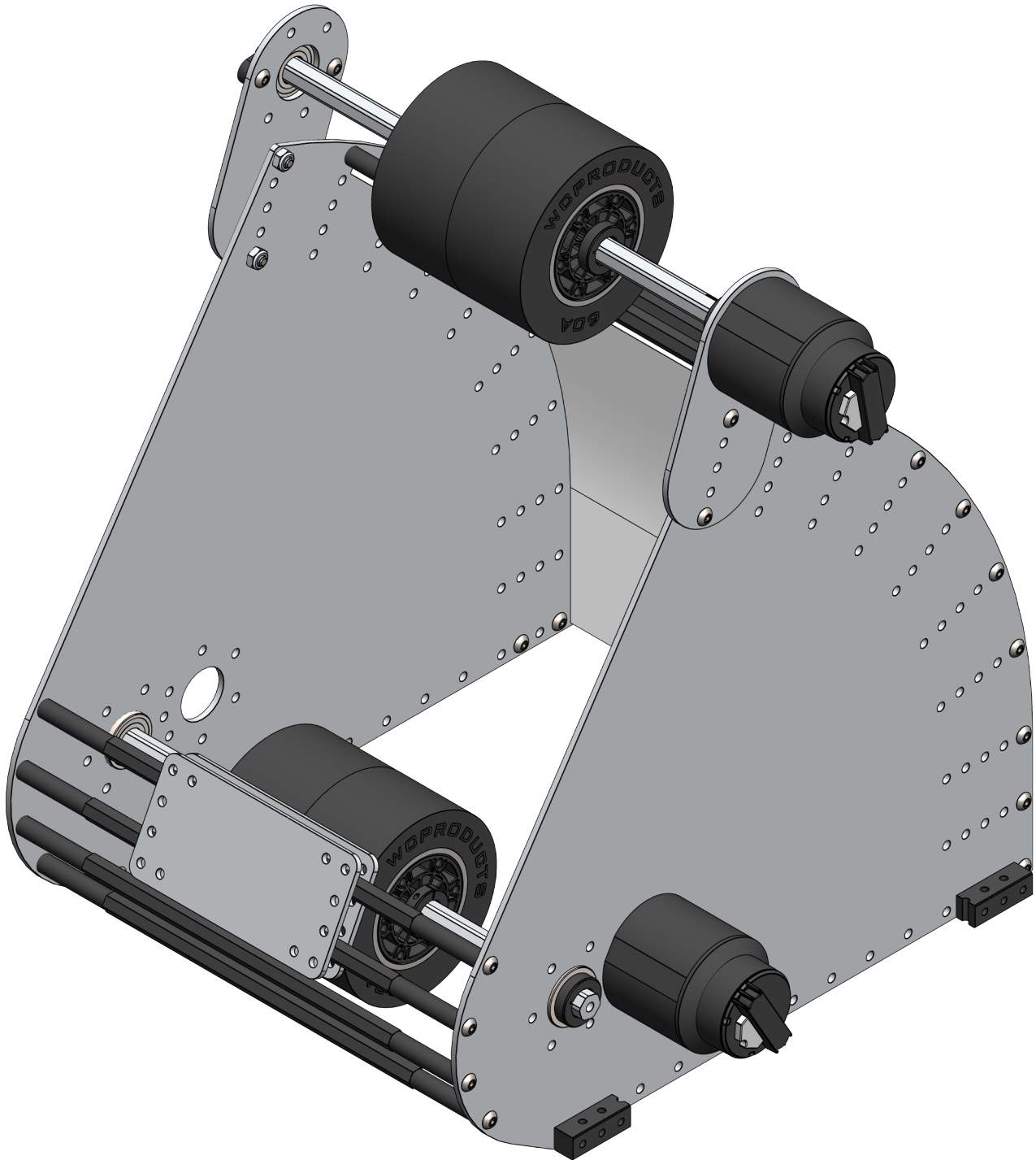


# GreyT Shooter (9.5") - User Guide (Rev 1)





## Table of Contents

What is the GreyT Shooter (9.5")?	4
Shooter Side Plate Guide	5
Direct Drive Guide	6
Shaft Cut Guide	7
General Assembly Instructions	9
Step 1	10
Step 2	11
Step 3	12
Step 4	13
Step 5	14
Belt Drive Assembly Instructions	15
Belt Drive Step 1	16
Belt Drive Step 2	17
Belt Drive Step 3	18
Direct Drive Assembly Instructions	19
Direct Drive Step 1	20
Direct Drive Step 2	21
Gear Drive Assembly Instructions	22
Gear Drive Step 1	23
Gear Drive Step 2	24
Gear Drive Step 3	25
Limelight Assembly Instructions	26
Limelight Step 1	27
Limelight Step 2	28

# GreyT Shooter (9.5") - User Guide (Rev 1)



Top Roller Assembly Instructions .....	29
Top Roller Step 1 .....	30
Top Roller Step 2 .....	31
Top Roller Step 3 .....	32
Available Kits .....	33
KIT-0039: GreyT Shooter (9.5") .....	33
KIT-0040: GreyT Shooter (9.5") Spur Gearbox (Falcon, 1.5:1, 1:1, 1:1.5) .....	33
KIT-0041: GreyT Shooter (9.5") Belt Gearbox (Falcon, 1:1) .....	34
WCP-0499: GreyT Shooter (9.5") .....	34
FAQ .....	35
Trouble Shooting .....	35
Revision Table .....	36



## What is the GreyT Shooter (9.5")?

The GreyT Shooter (9.5") is the next iteration of the GreyT Shooter. Originally designed for the 2020 FRC Game: Infinite Recharge, the GreyT Shooter is perfect for the most recent FRC Game: Rapid React when sized up appropriately. The new GreyT Shooter accepts 7.5", 8", 8.5", 9", and 9.5" distances from a 4" wheel to the hood.

Notable features:

- Easy adjustability of compression
- Compatible with Falcon 500, VersaPlanetaries
- Option for Direct Drive, Belt Drive, or Gear Drive
- Gear Drive option allows teams to really fine tune RPM during testing
- Compatible with GreyT Turret
- New Top Roller plate allows teams to alter the spin of the game piece and shoot further

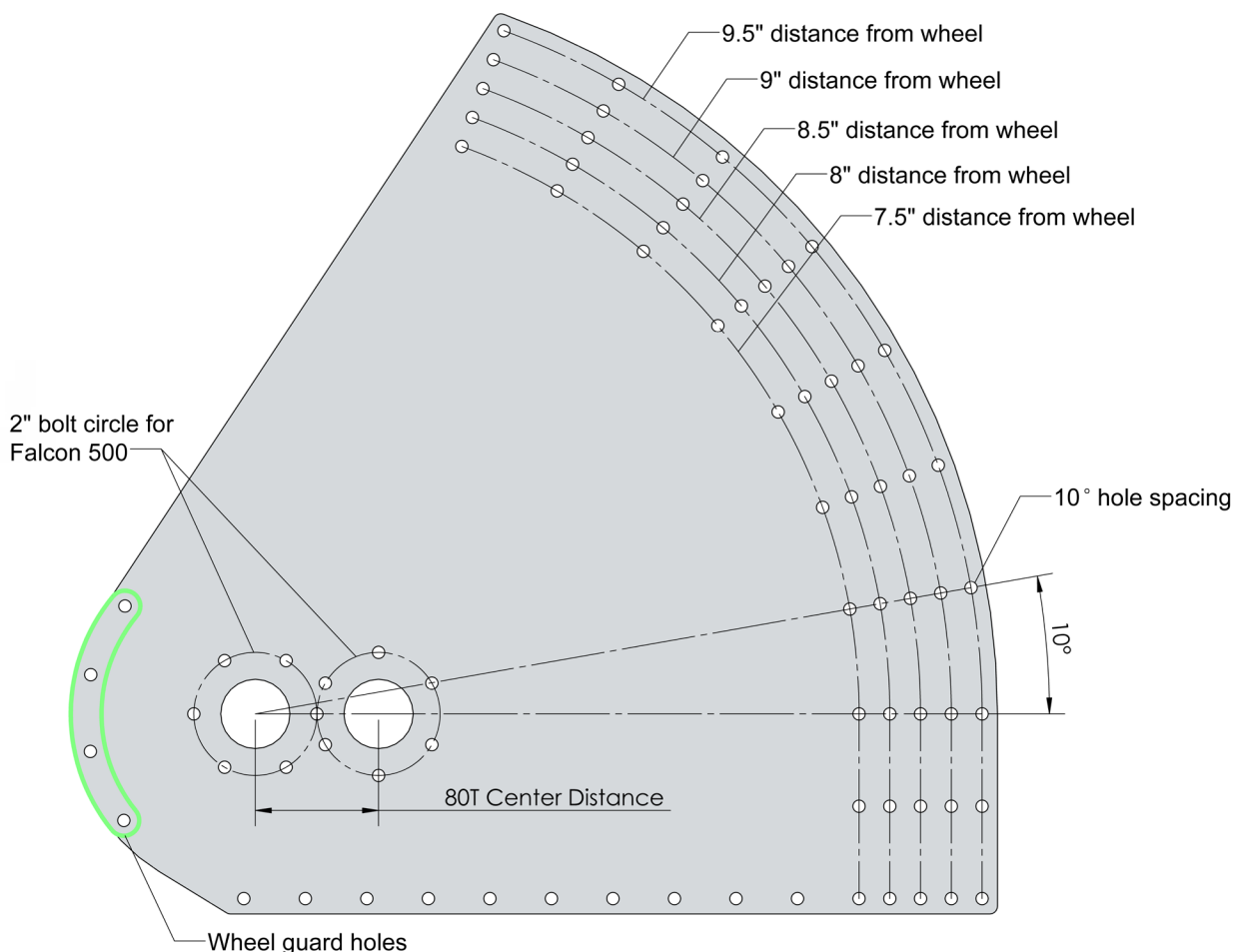




## Shooter Side Plate Guide

The GreyT Shooter is designed to support multiple object sizes and multiple compression values for a certain diameter. The side plates have hole patterns for 7.5", 8", 8.5", 9", and 9.5" distances from a 4" wheel to the hood.

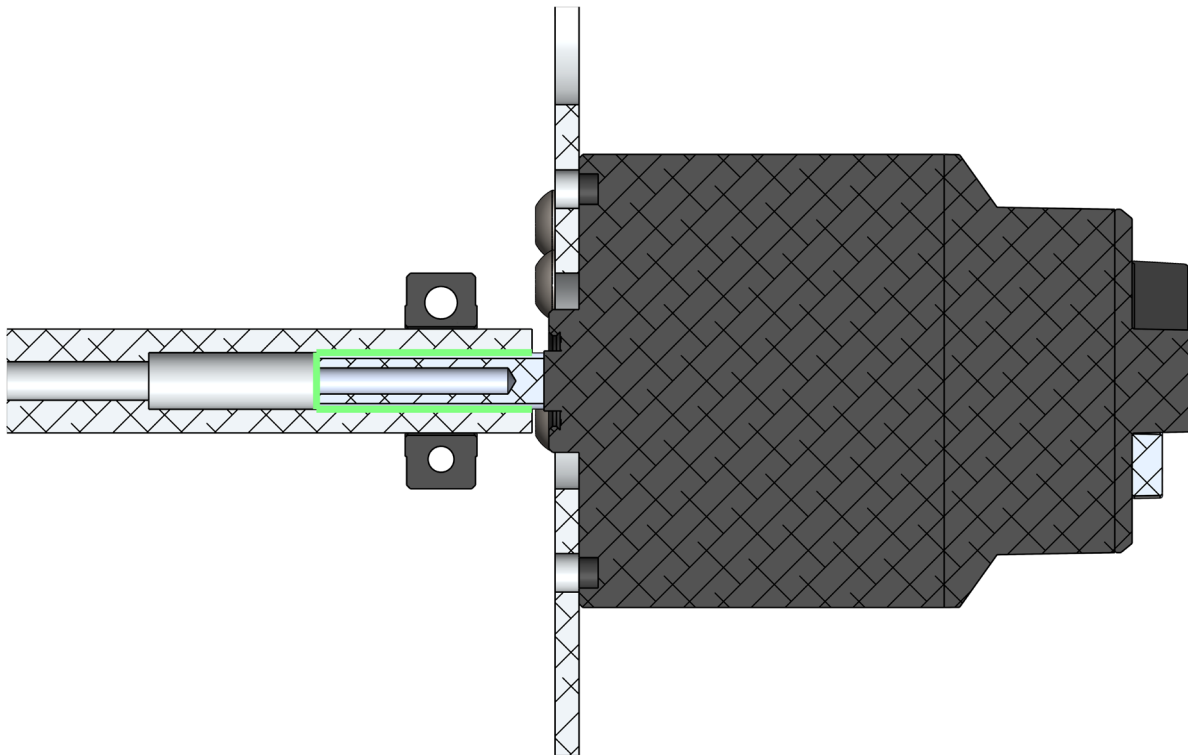
The holes have a 10 degree spacing, with the maximum angle being 70 degrees. The holes marked in green in the image below are for the wheel guard. They protect the wheel, provide the shooter with extra support, and provide the limelight with a spot to mount.





## Direct Drive Guide

The image below shows a section view of a shaft being direct driven by a Falcon 500. The Falcon output shaft is outlined in green. The hole for the shaft must be drilled deep enough for the falcon shaft. The split must be cut from one corner of the hex to the opposite one. This allows the shaft collar to clamp the shaft around the Falcon spline.

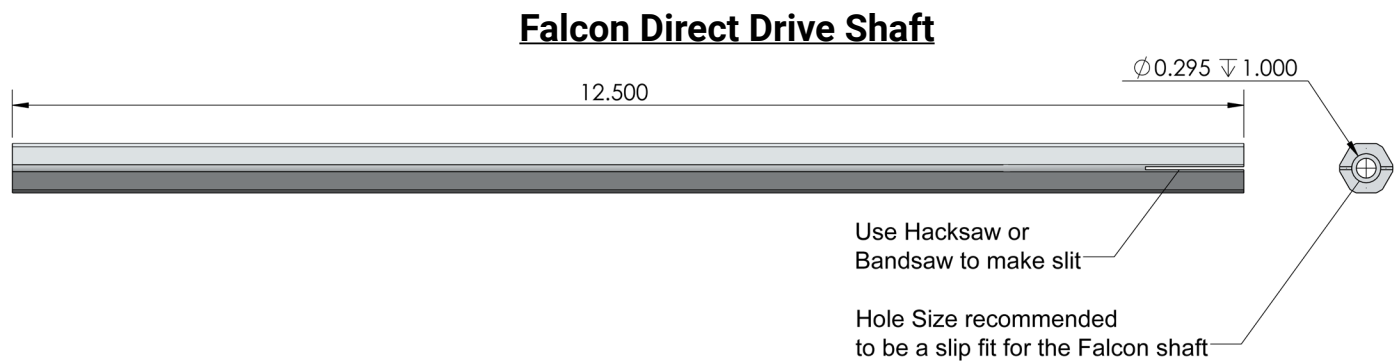




## Shaft Cut Guide

The overall length for the hex shafts does not need to be precise. Cutting to length with a hacksaw is acceptable if that is the only available option. However, cutting to length and then using a lathe to clean up both ends is the recommended method.

When cutting the slit on the ["Falcon Direct Drive Shaft"](#), the slit needs to be cut from one point of the hex to the point on the opposite side. This is so the clamping collar can properly compress the shaft.

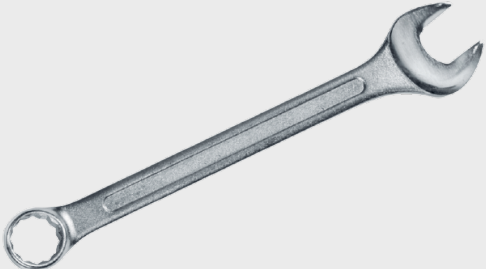




**Gear Drive & Belt Drive Shaft**





## Recommended Tools

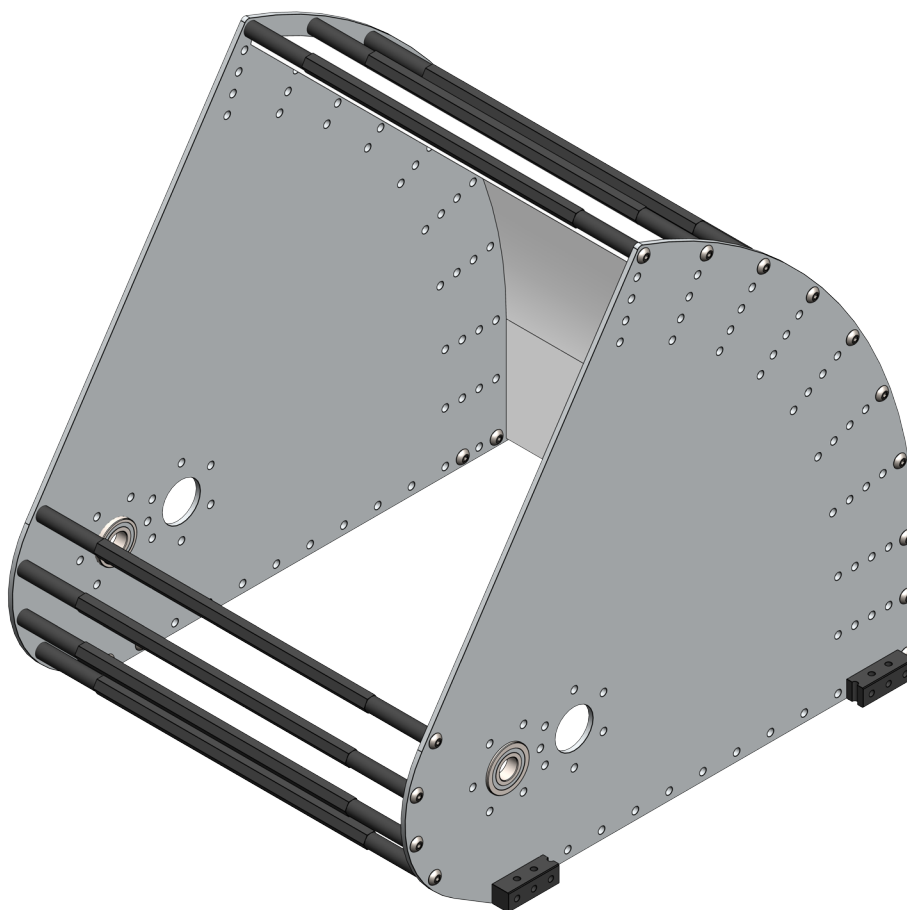
Picture	Name
	3/8" Wrench
	SAE/Inch Allen Set
	Drill and Drill Bit Set



## General Assembly Instructions

The following instructions detail how to assemble the basic frame for the GreyT Shooter (9.5").

**Note:** Blue Loctite (McMaster P/N 1004A12) is recommended on all bolts that thread into a tapped hole.

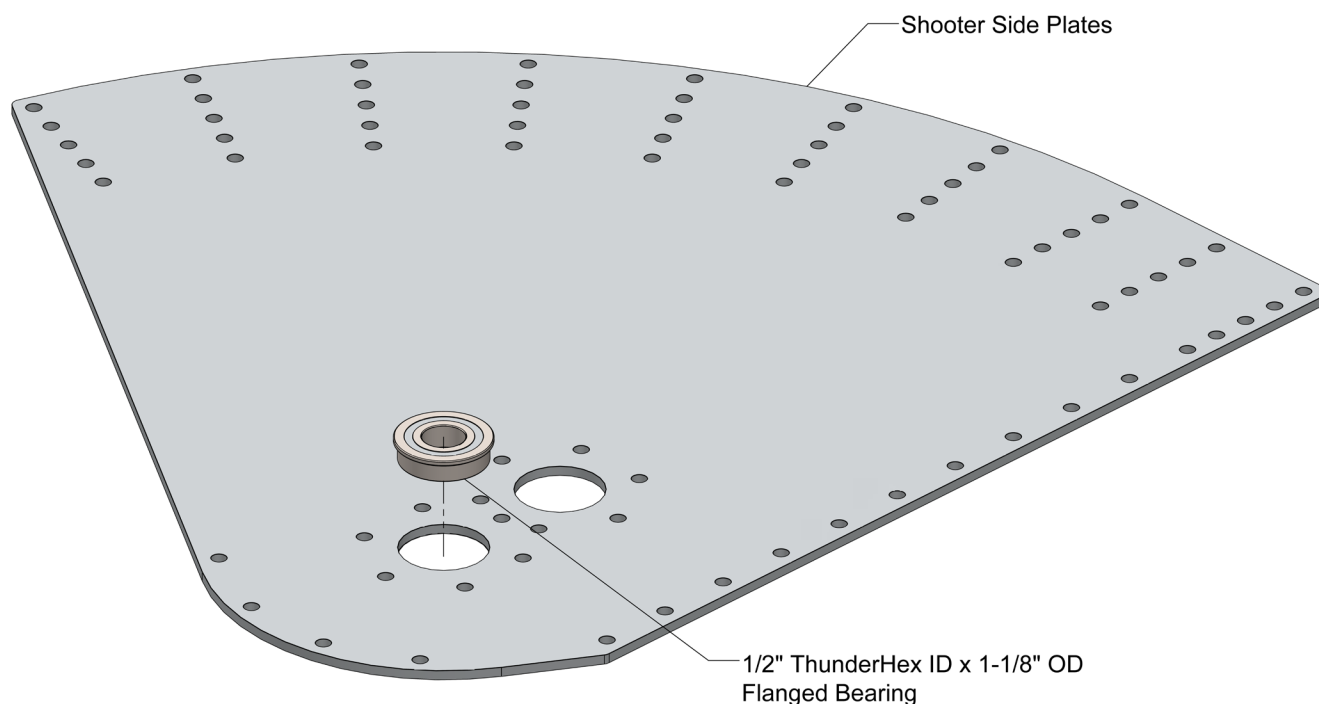




## Step 1

Press the 1/2" ThunderHex ID x 1-1/8" OD Flanged bearing into the Shooter Side Plates. The bearing will be installed from the opposite side for the other Shooter Side Plate.

**Note:** If you plan on assembling the GreyT Shooter (9.5") in the Direct Drive configuration, you can omit one bearing from one of the two Shooter Side Plates.





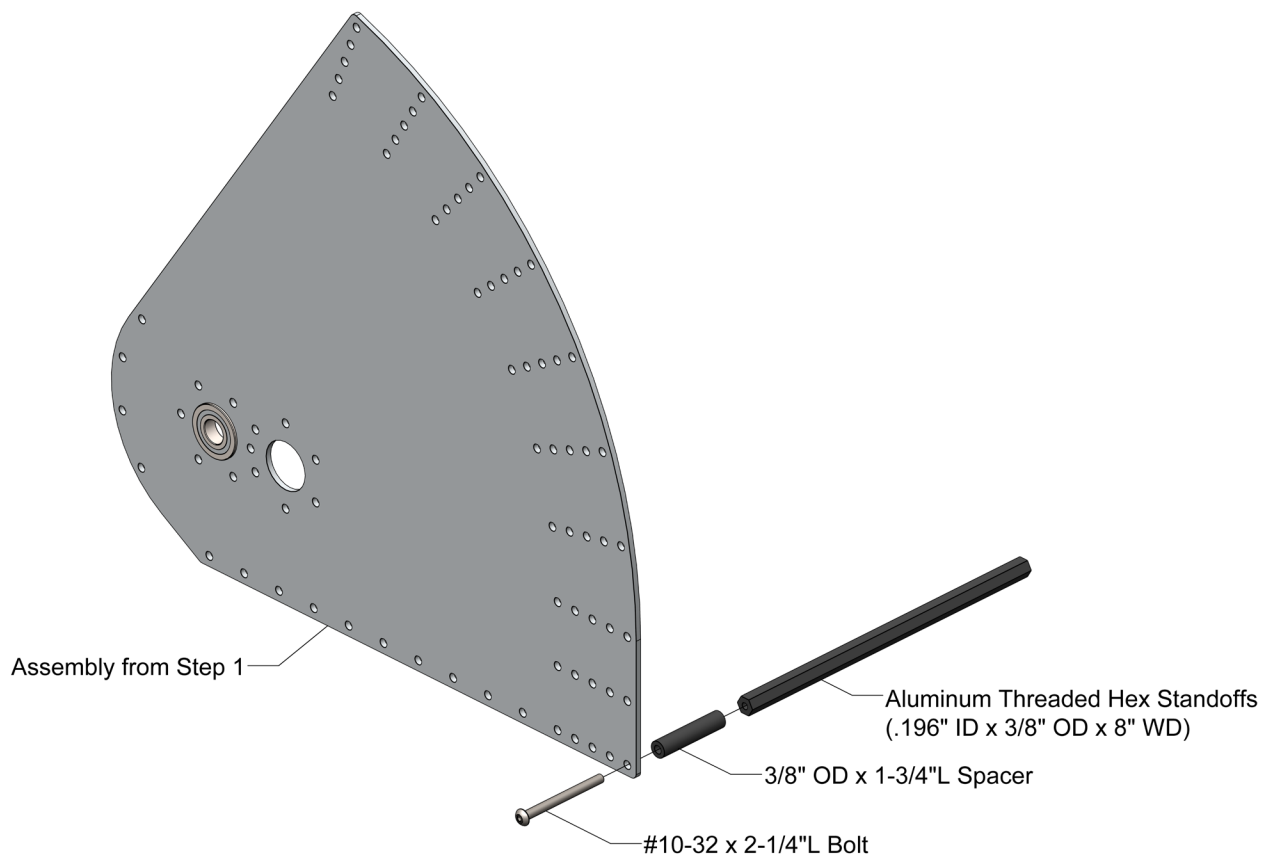
## Step 2

The standoff and spacers used are shown in the image below. Install them in the correct set of holes to achieve the desired compression and exit angle. See the page labeled "Shooter Side Plate Guide" for more information.

It is recommended not to skip any standoffs between the first and last holes used on the plate.

Bolt all four standoffs into the holes for the wheel guard at the front of the shooter.

**Note:** This standoff and spacer combo will make the shooter the right width to be compatible with the GreyT Turret (11" ID). If you plan on mounting the Shooter to something else, these can be modified to get whatever spacing is desired.

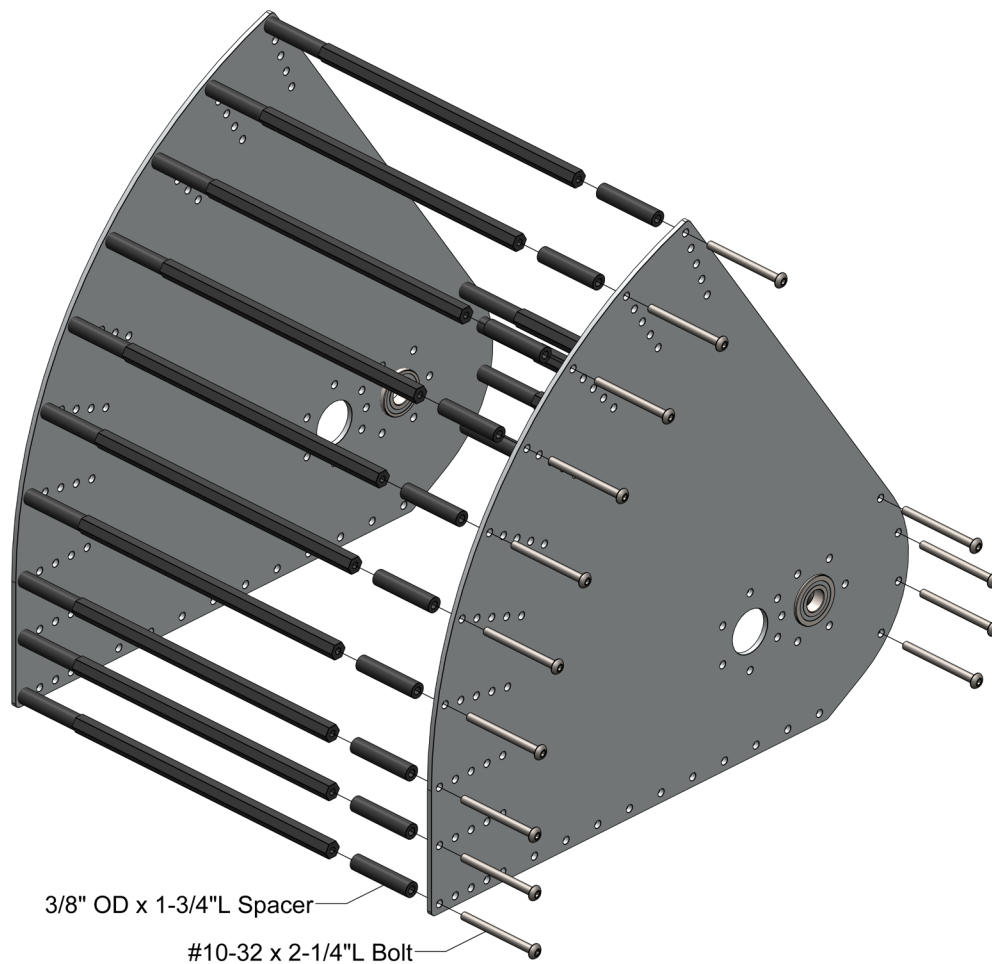




## Step 3

Use the remaining #10-32 x 2-1/4" L Bolts and 3/8" OD x 1-3/4" L Spacers to attach the other Shooter Side Plate.

**Note:** When this step is completed, check that the ThunderHex Bearings are oriented correctly. The bearing flanges should be on the outside of the assembly.



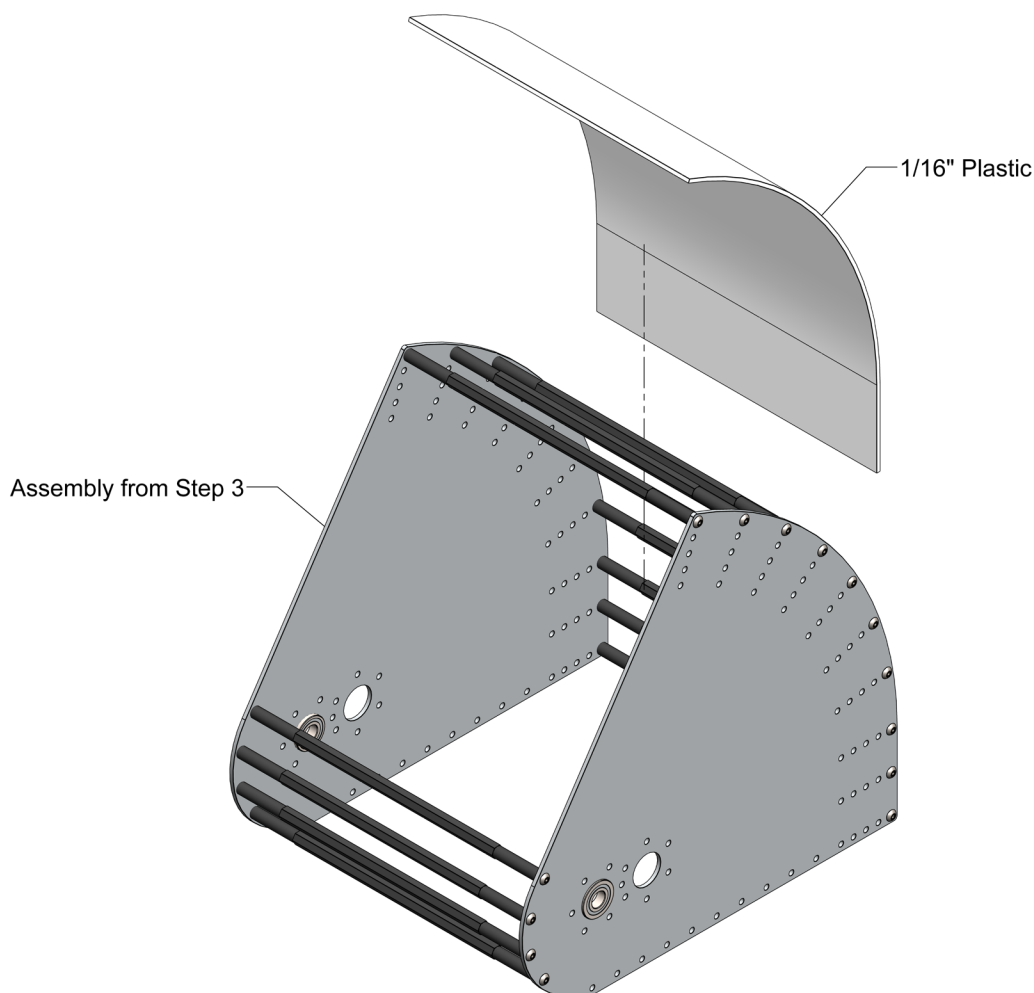




## Step 4

Cut a piece of 1/16" Polycarbonate Plastic for the backing of the shooter hood. It is recommended to cut this piece of plastic roughly 1" longer so you can wrap the plastic underneath the lowest standoff. This prevents the game object from being caught on the plastic as it feeds through the shooter.

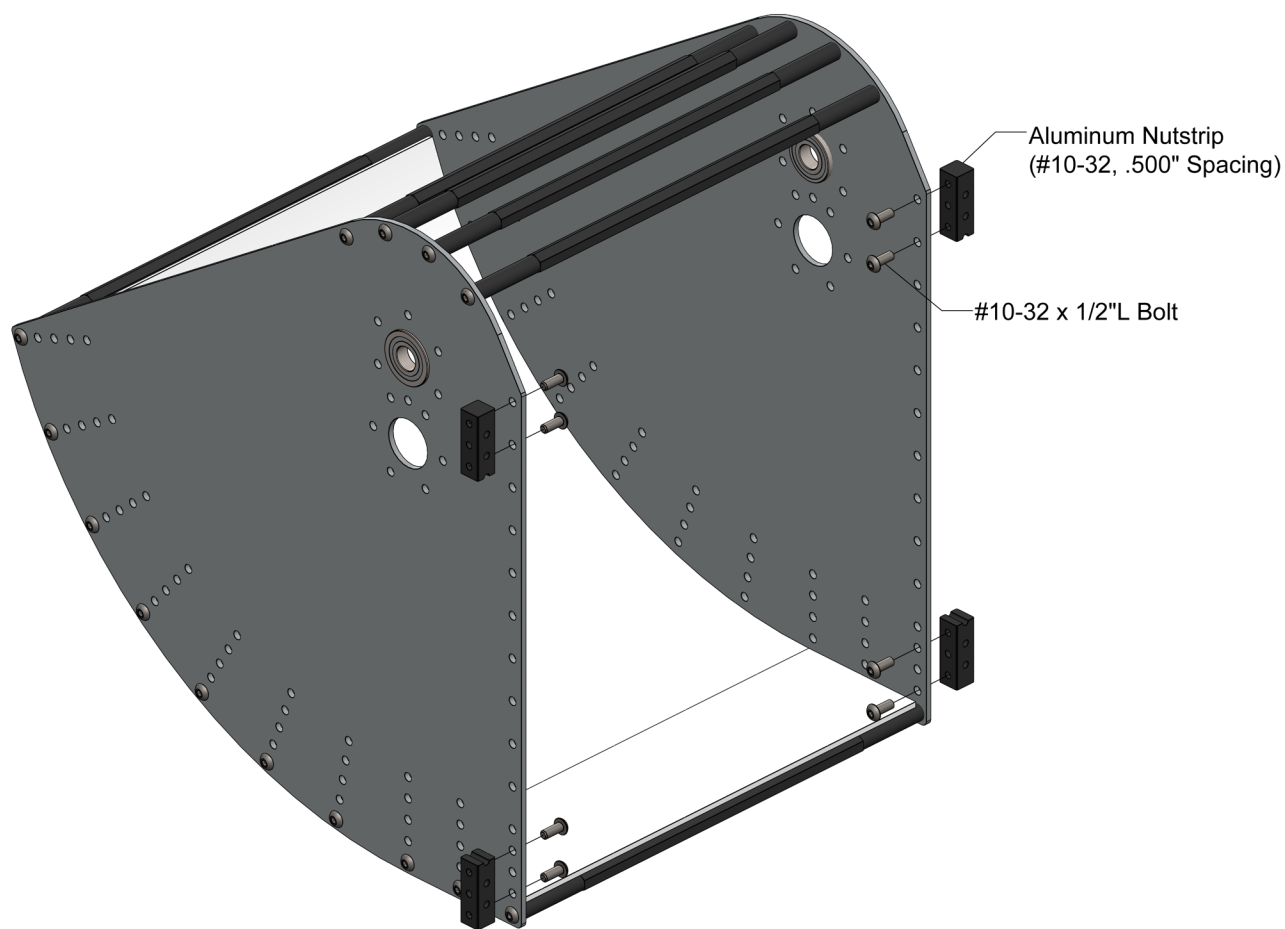
Zip ties are the recommended means of attaching the plastic backing. Start from the first standoff and work your way up. Drill one set of holes and then secure with the zip tie before moving on to the next standoff.





## Step 5

Install the Aluminum Nutstrips to the bottom of the shooter. The Nutstrip that comes with the shooter can be cut into four 1-1/2" long pieces for the shooter. These pieces can be installed with #10-32 x 1/2"L Bolts.

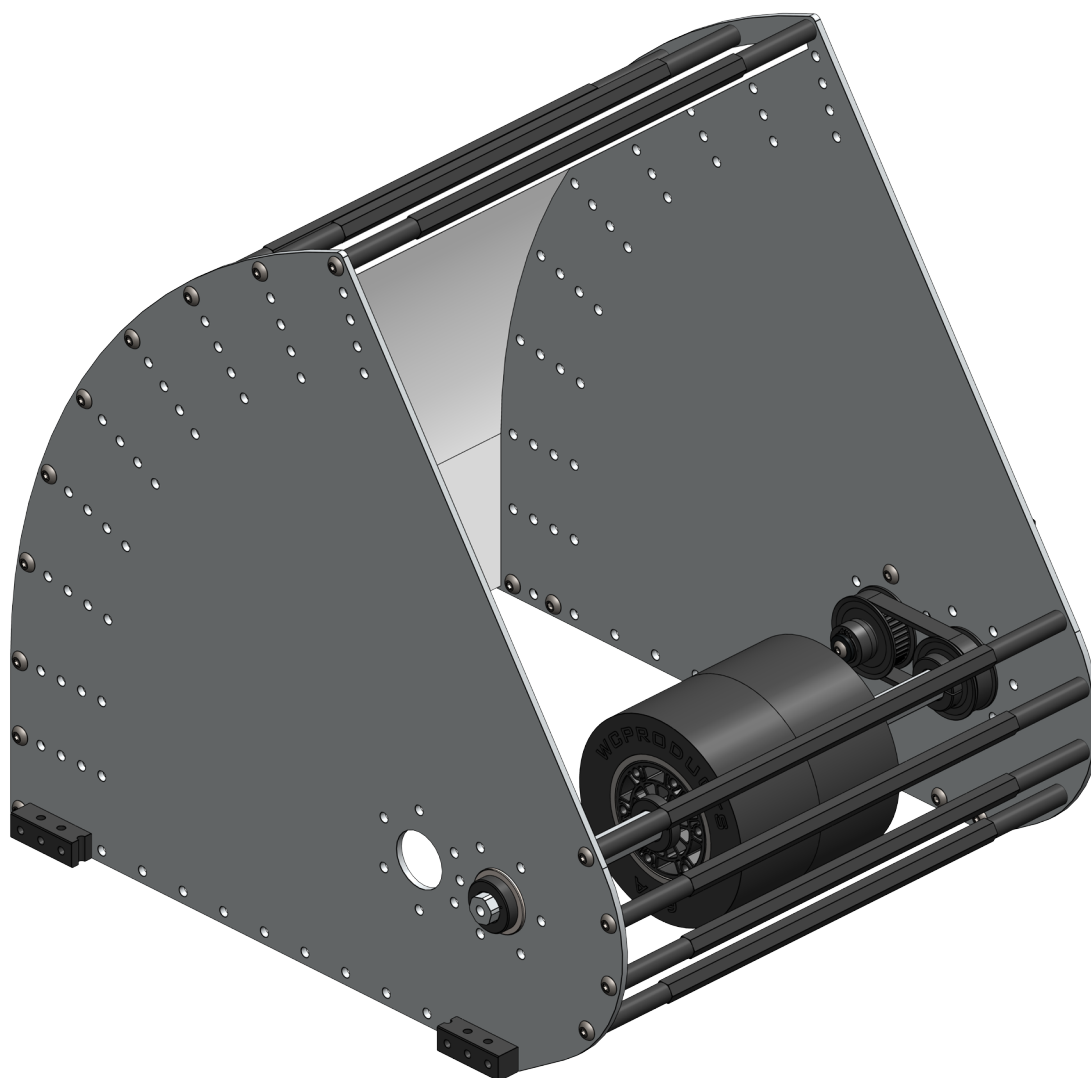




## Belt Drive Assembly Instructions

The following pages detail the assembly instructions for the Belt Drive configuration. This configuration provides the shooter with a 1:1 ratio from the Falcon 500 motor.

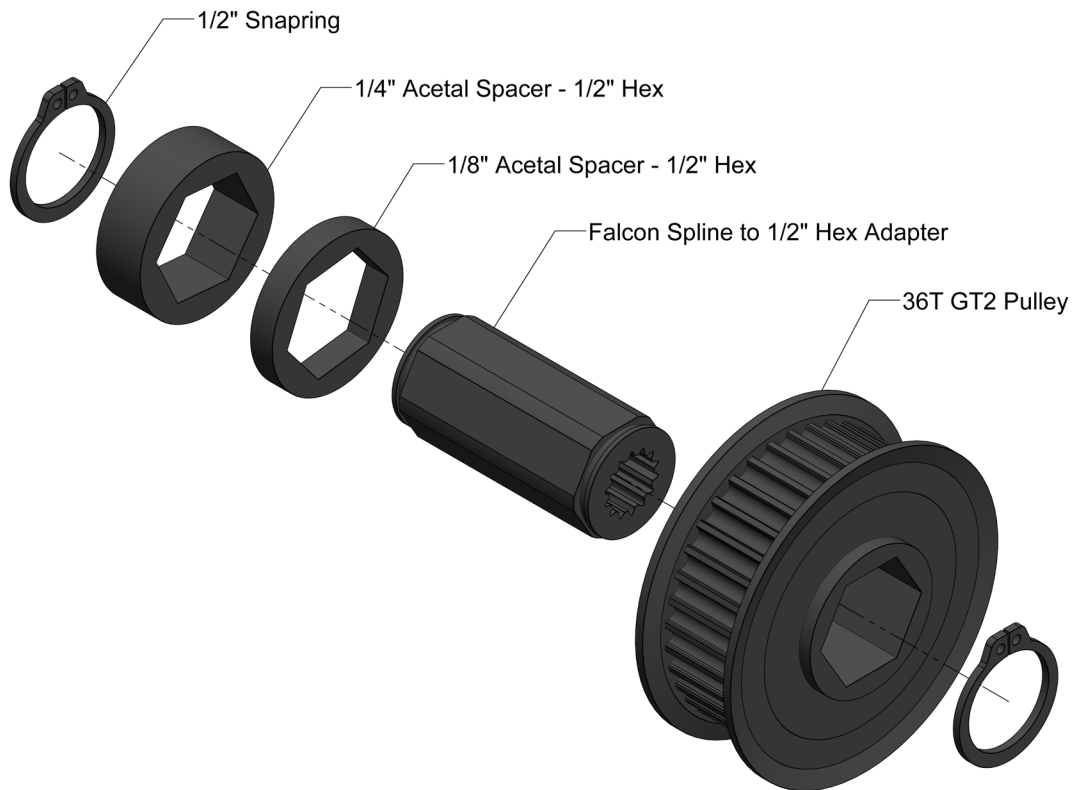
**Note:** Blue Loctite (McMaster P/N 1004A12) is recommended on all bolts that thread into a tapped hole.





## Belt Drive Step 1

Slide the components on to the Falcon Spline to 1/2" Hex Adapter in the order shown in the image below. Use the two 1/2" Snaprings to secure the Pulley and Spacers on the Falcon Spline to 1/2" Hex Adapter.



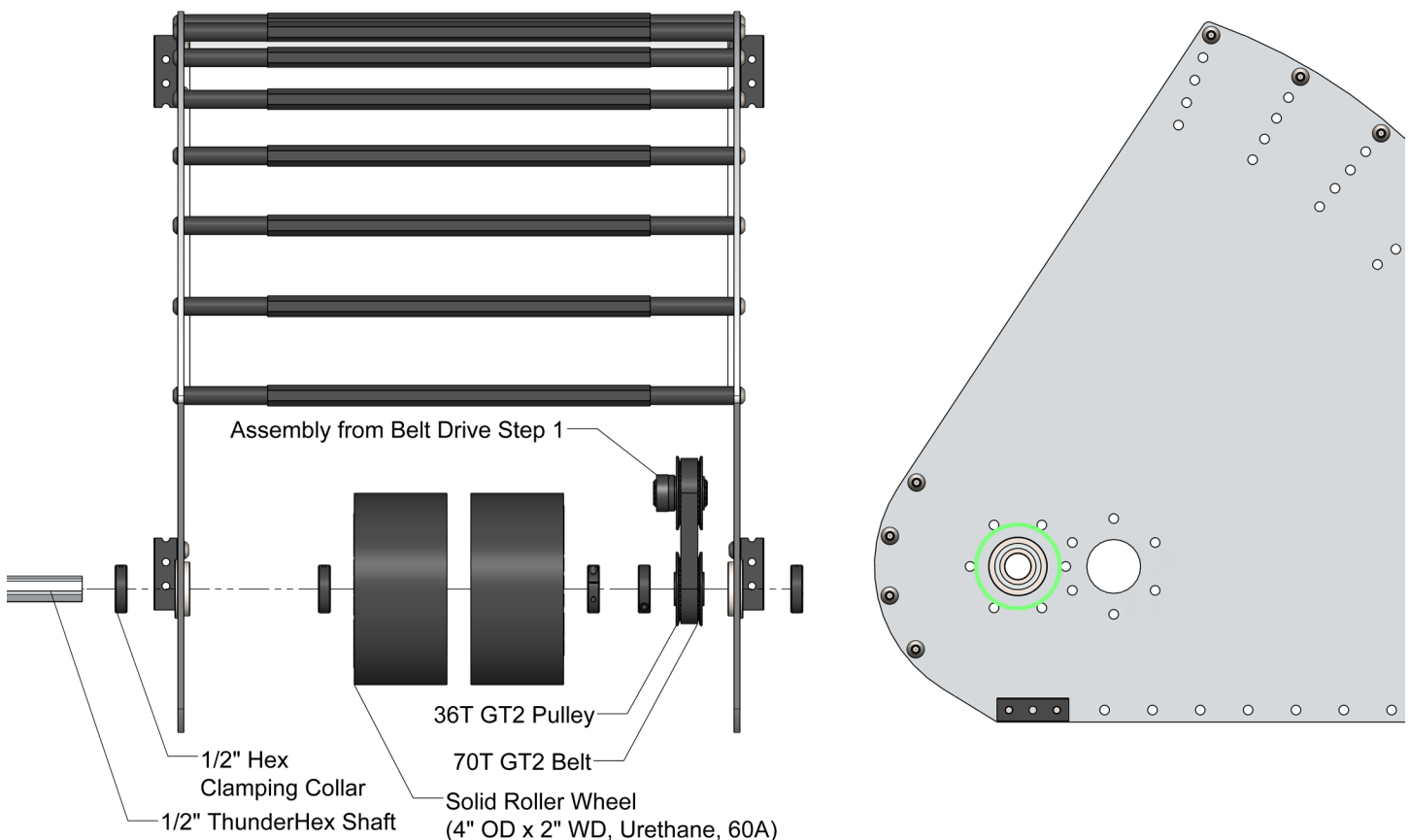


## Belt Drive Step 2

Install the components in the order shown in the image below. They will be cocentric with the bearing hole marked in green in the image below. The 70T GT2 Belt must be installed during this step.

Constrain the 1/2" ThunderHex Shaft with two 1/2" Hex Clamping Collars. The Collars should be flat with the ThunderHex Bearing flanges.

**Note:** The wheel guard standoffs were removed to help clarify the image below. They do not have to be removed in order to complete this step.

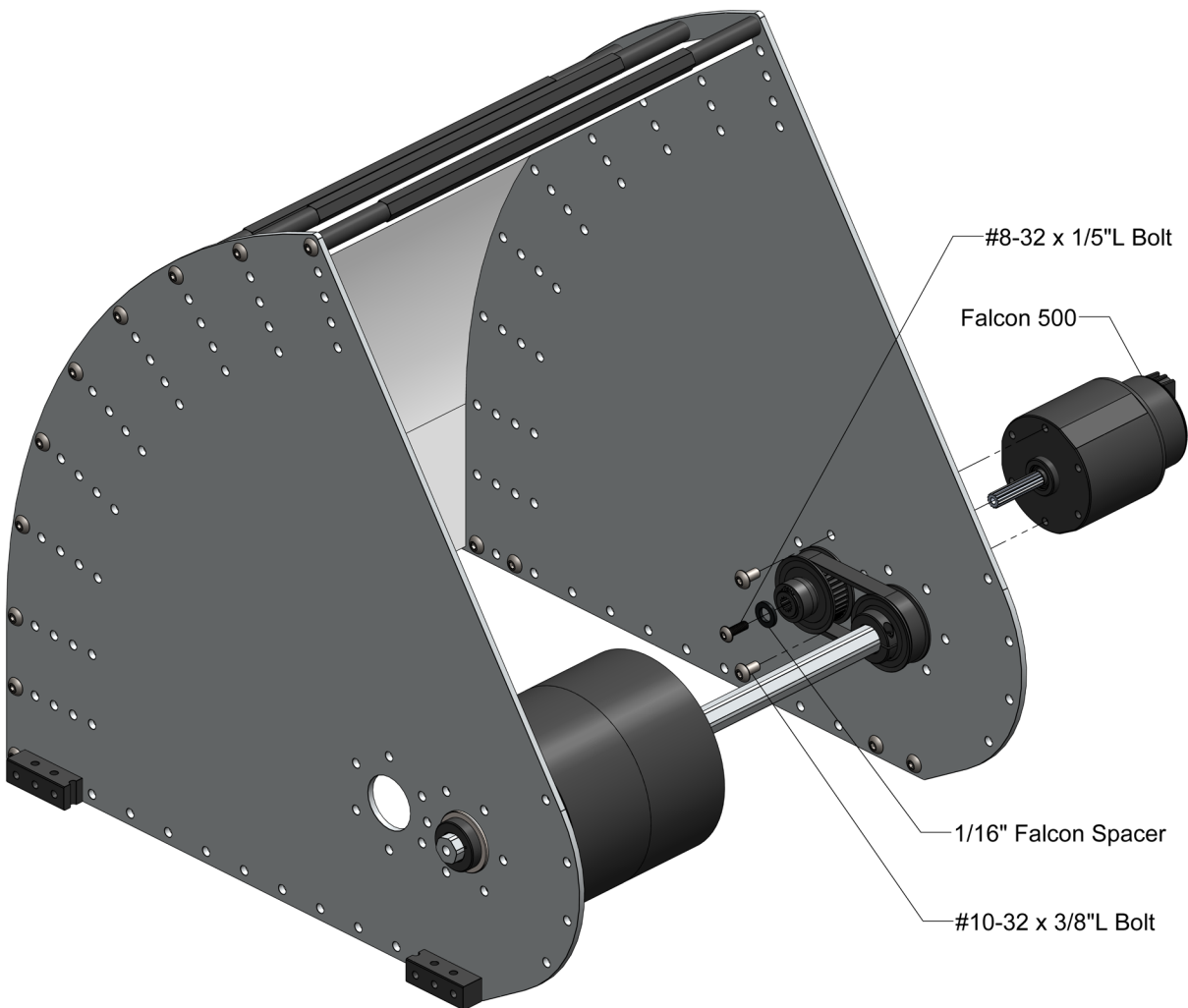




## Belt Drive Step 3

Install the Falcon 500 using #10-32 x 3/8" L Bolts. The Solid Roller Wheels can be shifted to the other side of the Shooter to help with this step. When the motor is installed, slide the Solid Roller Wheels back to the center of the shooter. Use the 1/2" Hex Clamping Collars to constrain the wheels.

**Note:** The wheel guard standoffs were removed to help clarify the image below. They do not have to be removed in order to complete this step.

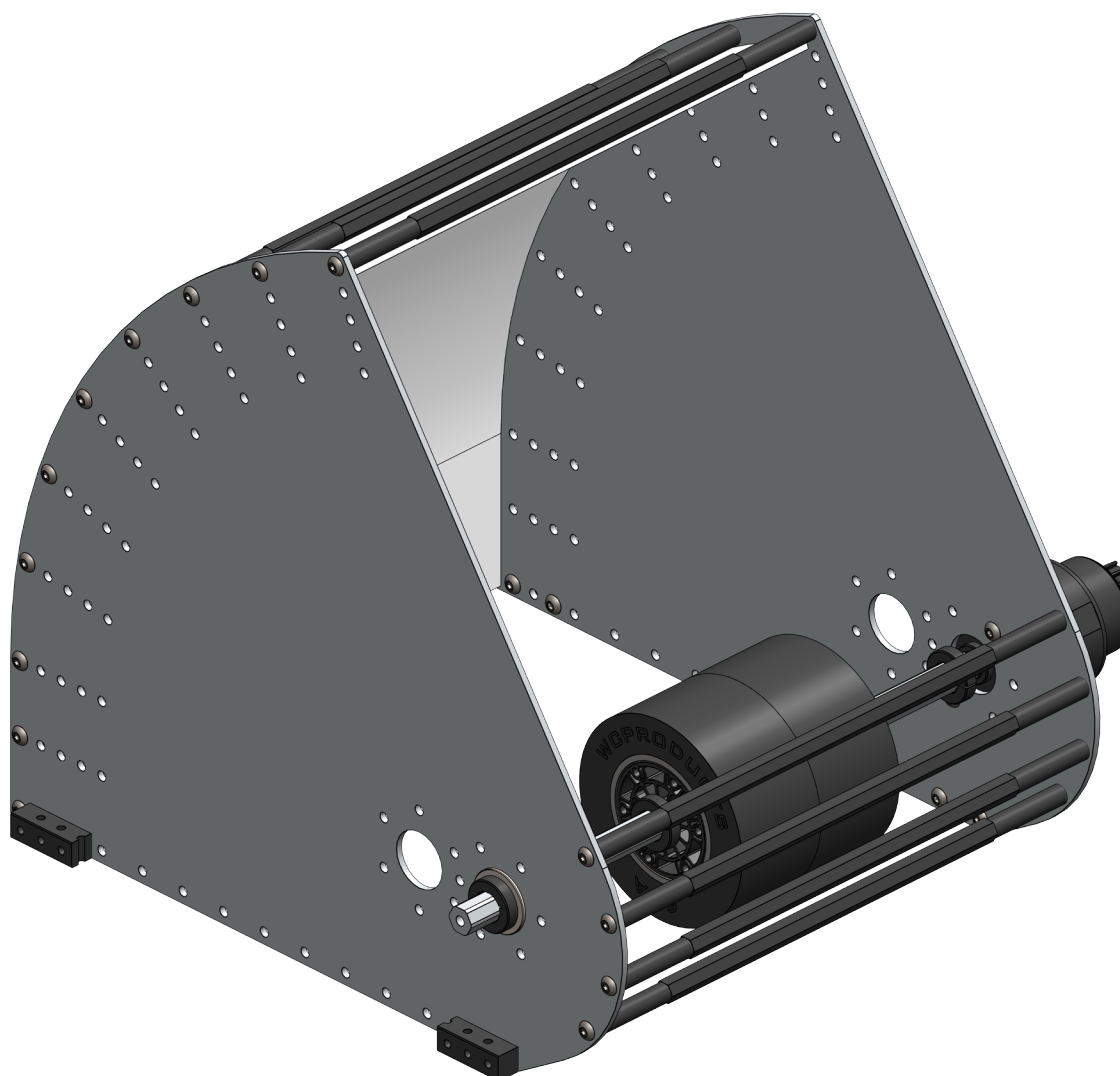


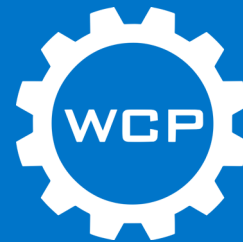


## Direct Drive Assembly Instructions

The following pages detail the assembly instructions for the Direct Drive configuration. This configuration provides the shooter with a 1:1 ratio from the Falcon 500 motor.

**Note:** Blue Loctite (McMaster P/N 1004A12) is recommended on all bolts that thread into a tapped hole.

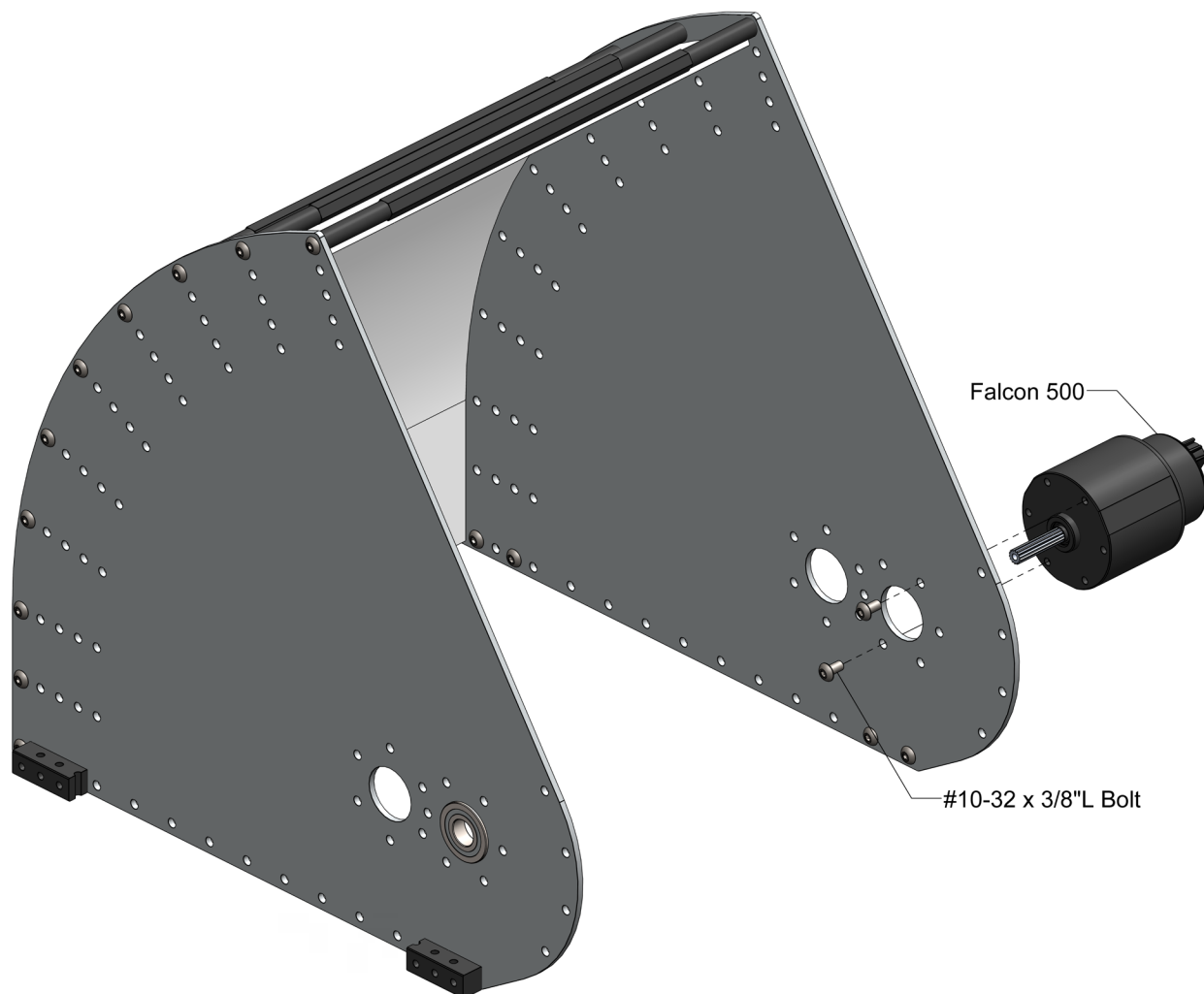




## Direct Drive Step 1

Install the Falcon 500 using #10-32 x 3/8"L Bolts.

Note: The wheel guard standoffs were removed to help clarify the image below. They do not have to be removed in order to complete this step.







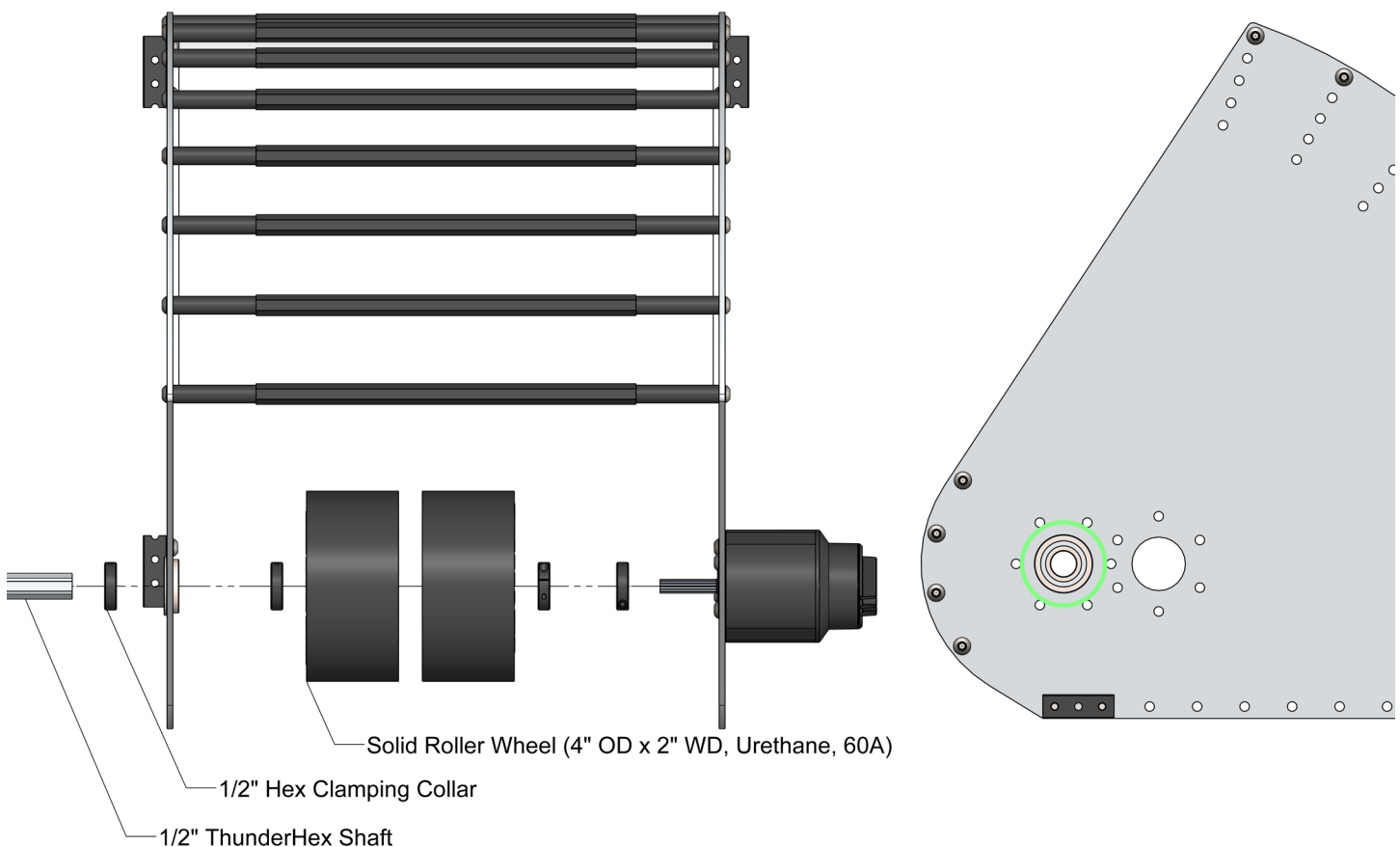
## Direct Drive Step 2

Install the components in the order shown in the image below. They will be cocentric with the bearing hole marked in green in the image below.

Slide the 1/2" ThunderHex Shaft on to the Falcon 500 output shaft. Then slide the 1/2" Hex Clamping Collar over the Falcon shaft and tighten it down.

For more information regarding direct driving a shaft using a Falcon 500, see the page labeled Direct Drive Guide.

**Note:** The wheel guard standoffs were removed to help clarify the image below. They do not have to be removed in order to complete this step.



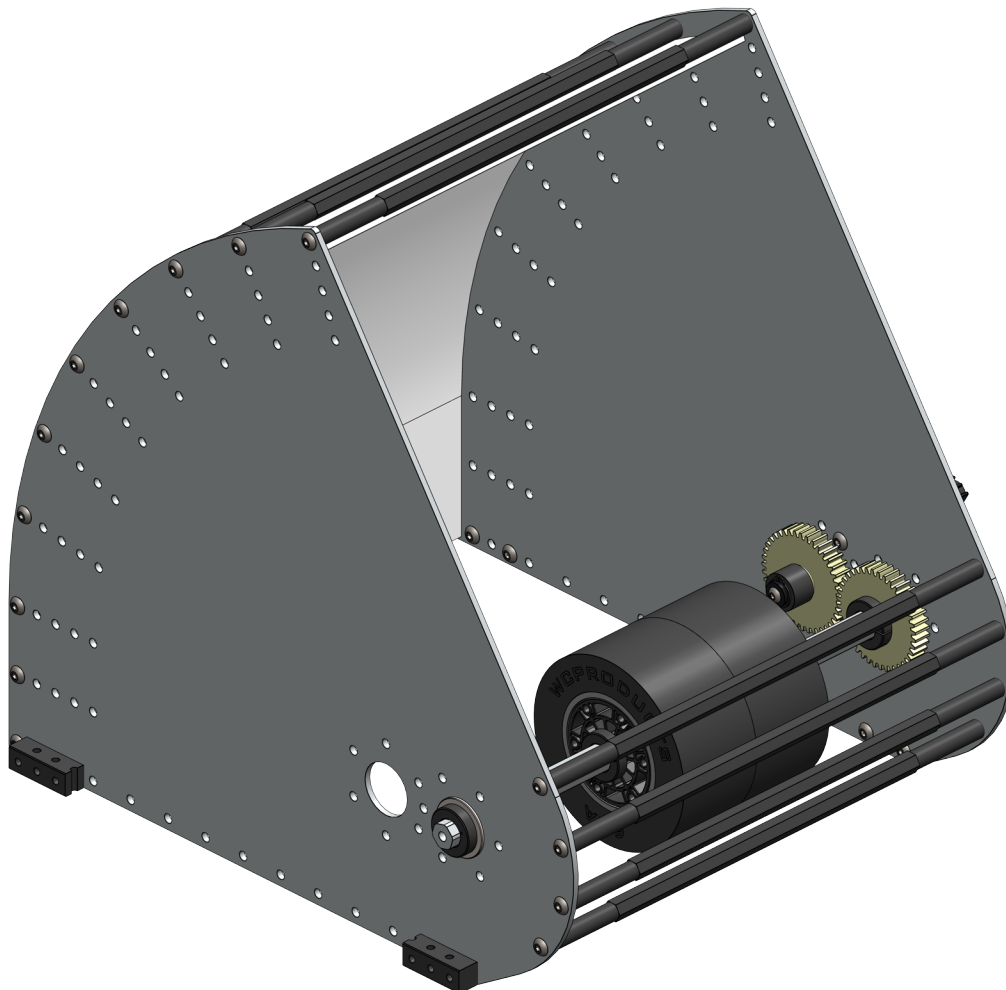


## Gear Drive Assembly Instructions

The following pages detail the assembly instructions for the Gear Drive configuration. This configuration has 3 ratio options that are listed in the table below.

**Note:** Blue Loctite (McMaster P/N 1004A12) is recommended on all bolts that thread into a tapped hole.

Ratio	Driving Gear	Driven Gear	Output RPM (Falcon)
1:1	40T	40T	6380
1.5:1	32	48	4253
1:1.5	48	32	9570

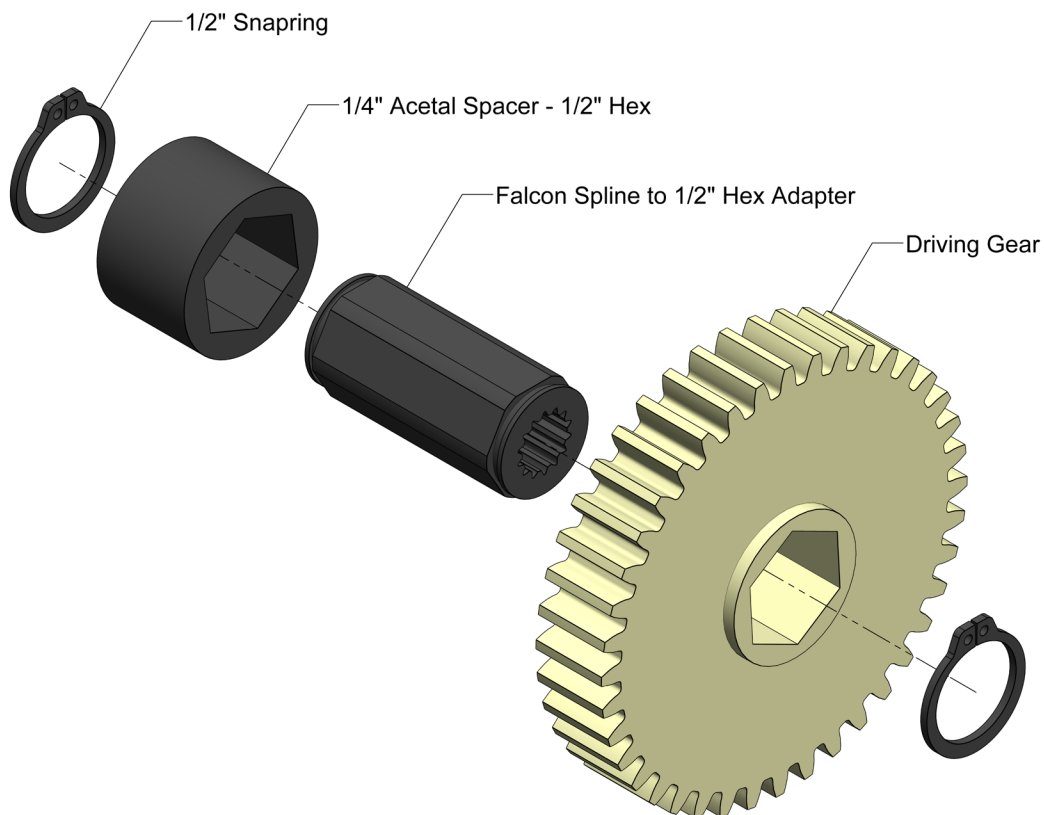




## Gear Drive Step 1

Slide the components on to the Falcon Spline to 1/2" Hex Adapter in the order shown in the image below.

Note: If you do not have a gear ratio selected already, there is a table on the previous page with the included ratios that you can pick from.



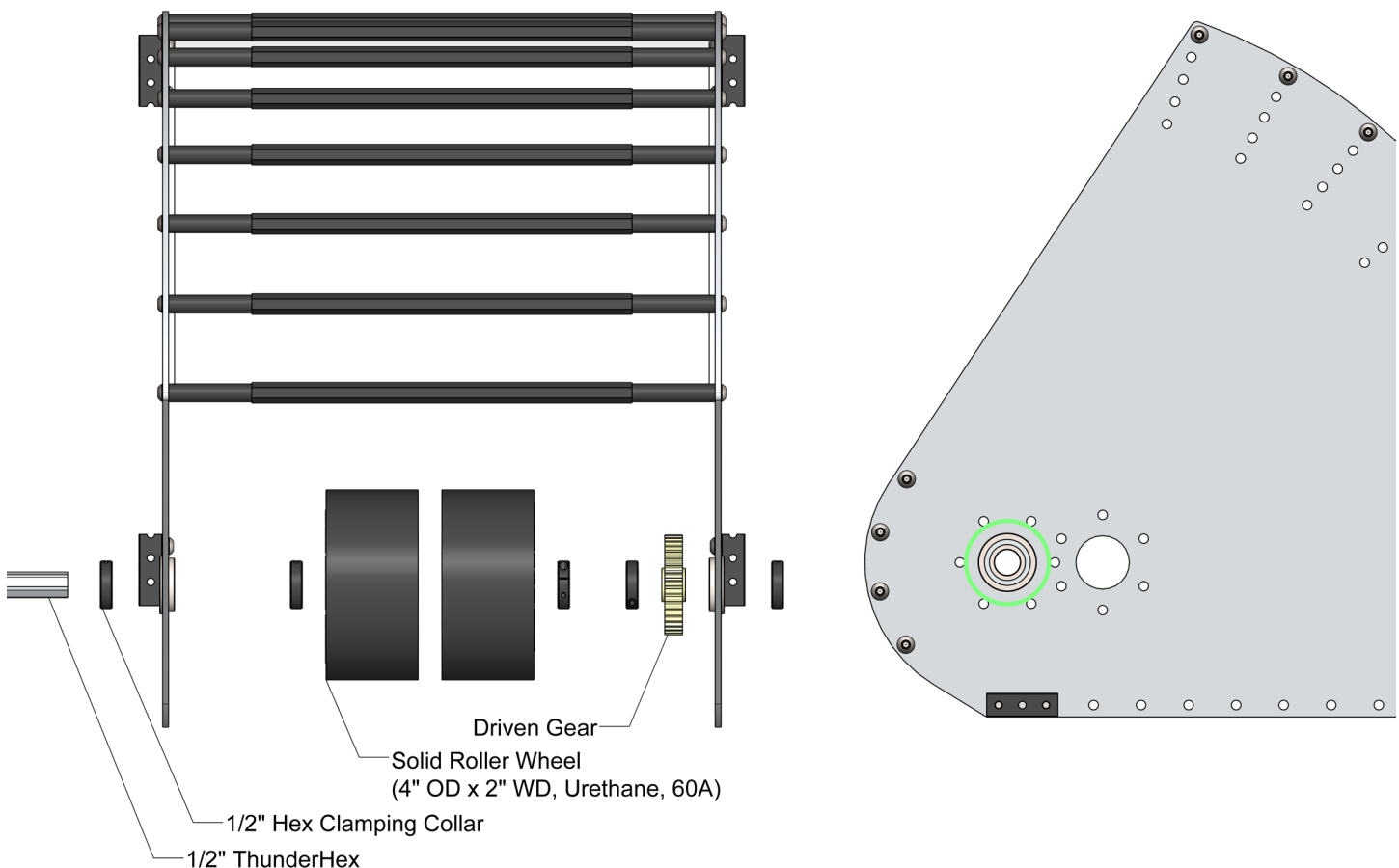


## Gear Drive Step 2

Install the components in the order shown in the image below. They will be cocentric with the bearing hole marked in green in the image below. The Driven Gear must be installed during this step.

Constrain the 1/2" ThunderHex Shaft with two 1/2" Hex Clamping Collars. The Collars should be flat with the ThunderHex Bearing flanges.

**Note:** The wheel guard standoffs were removed to help clarify the image below. They do not have to be removed in order to complete this step.



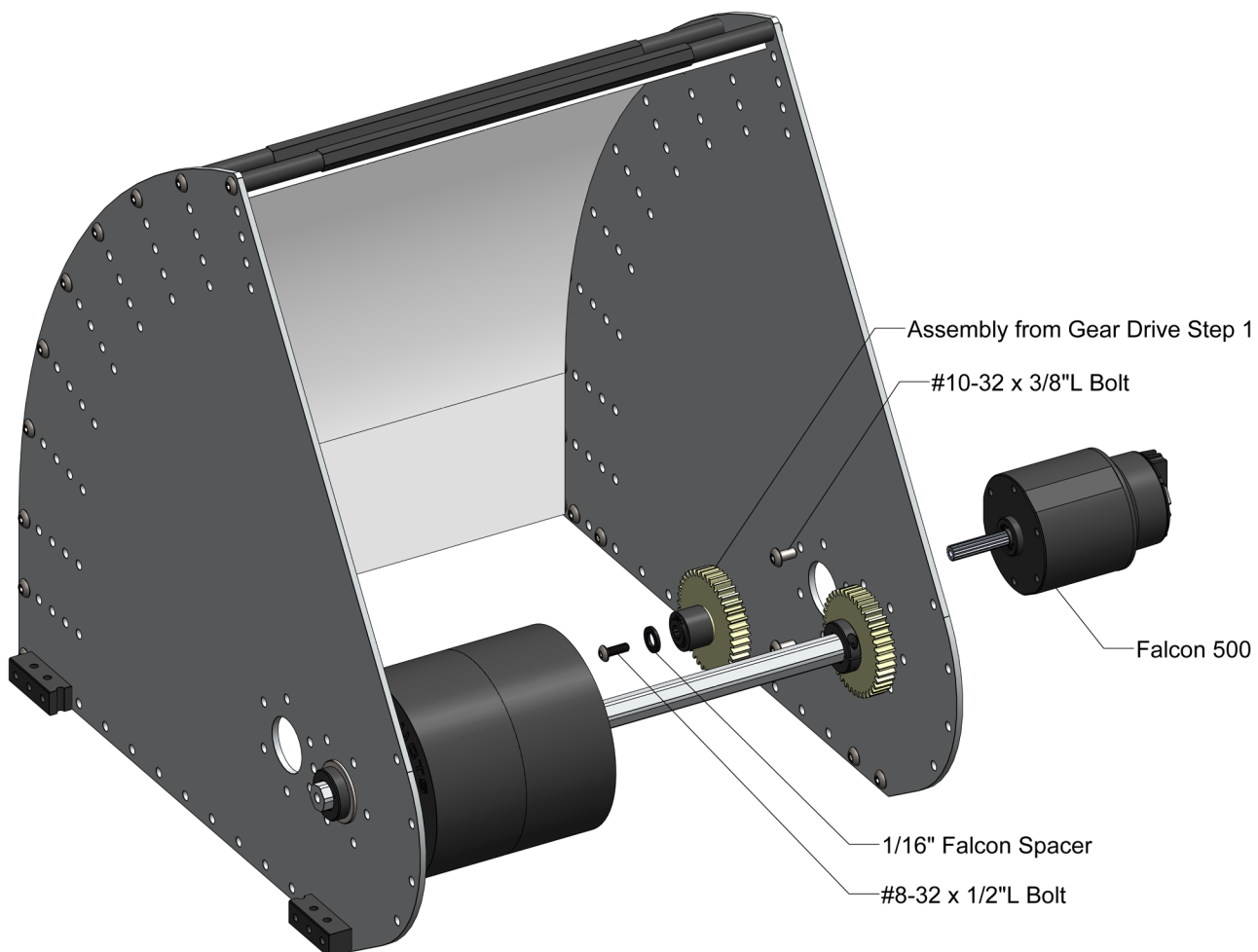


## Gear Drive Step 3

Install the Falcon 500 using #10-32 x 3/8" L Bolts. The Solid Roller Wheels can be shifted to the other side of the Shooter to help with this step. When the motor is installed, slide the assembly from Drive Step 1 onto the Falcon Output shaft.

Slide the Solid Roller Wheels back to the center of the shooter. Use the 1/2" Hex Clamping Collars to constrain the wheels.

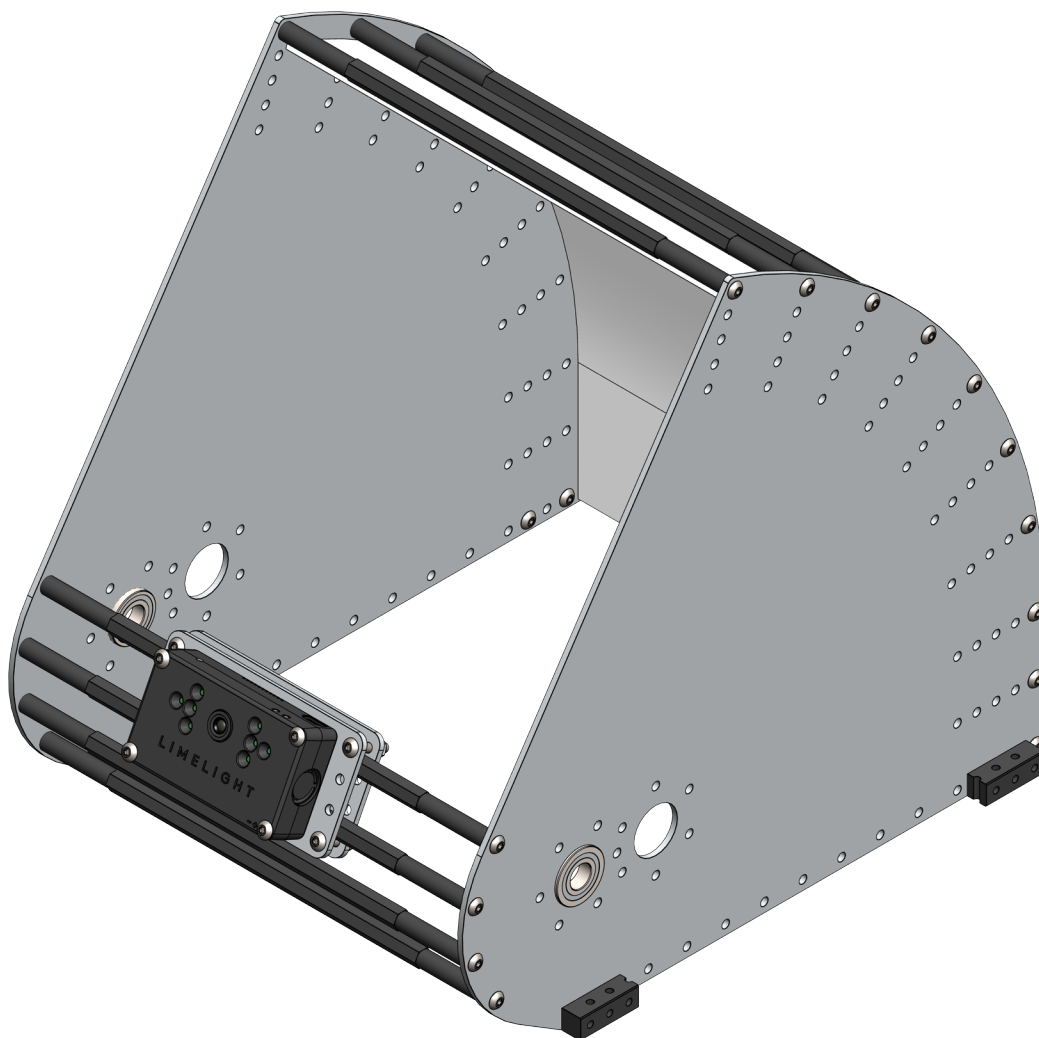
**Note:** The wheel guard standoffs were removed to help clarify the image below. They do not have to be un-bolted in order to complete this step.





## Limelight Assembly Instructions

The following pages detail the assembly instructions for the Limelight. The Limelight provides the shooter with vision tracking, and can be used in tandem with the GreyT Turret (11" ID) to greatly increase the accuracy of the overall system.

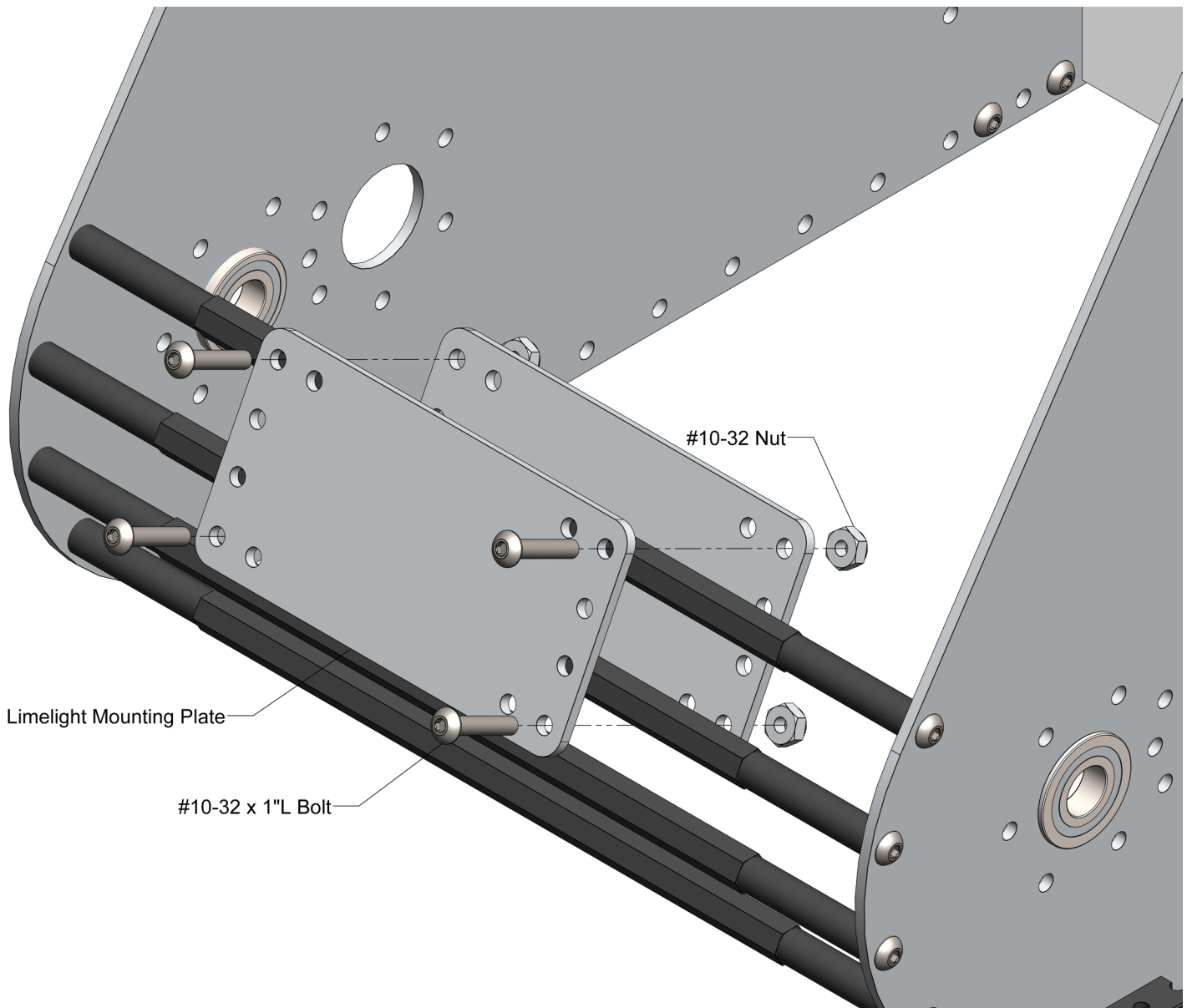




## Limelight Step 1

Center the Limelight Mount between the Shooter Side Plates. Secure the Limelight Mount to the two top most standoffs using four #10-32 x 1"L bolts and nuts.

**Note:** Do not over tighten the bolts as this will cause the plates to bend.

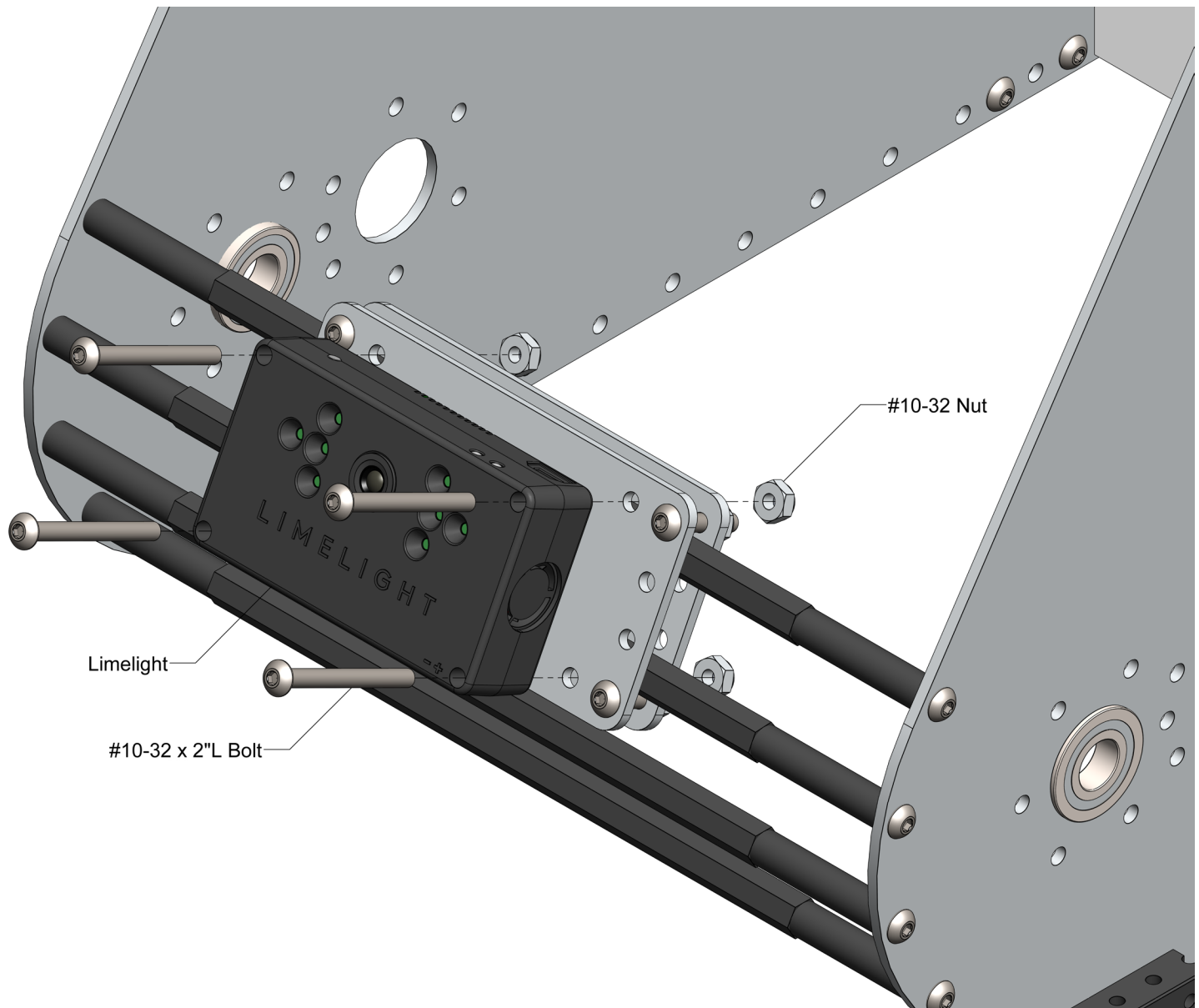




## Limelight Step 2

Attach the Limelight to the Limelight mount using four #10-32 x 2"L bolts and nuts.

**Warning: The bolts need only be tightened so that the Limelight is not loose on the plate. Over tightening the bolts may cause damage to the case or the electronics inside.**

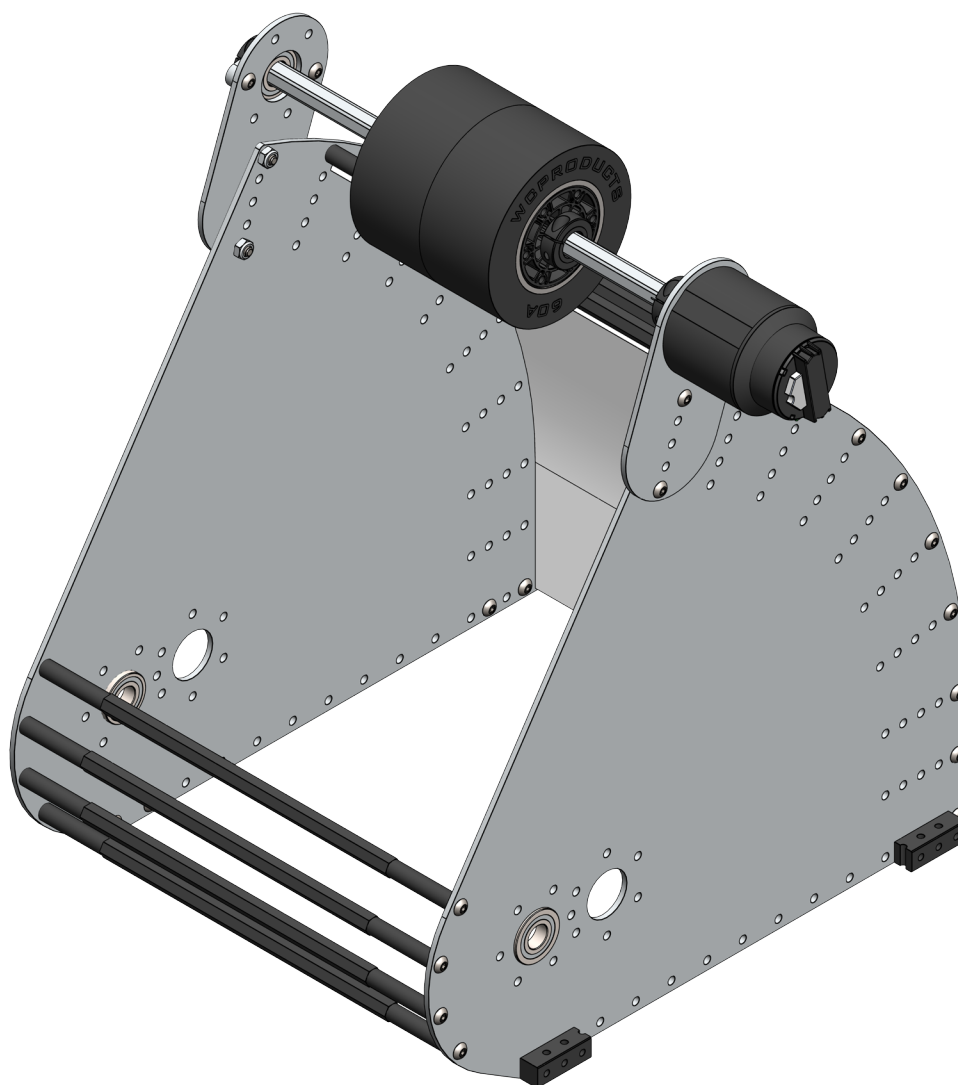






## Top Roller Assembly Instructions

The following pages detail the assembly instructions for the Top Roller. This assembly can help control the spin of the game object, and can even help the shooter launch the object further than with just one roller.

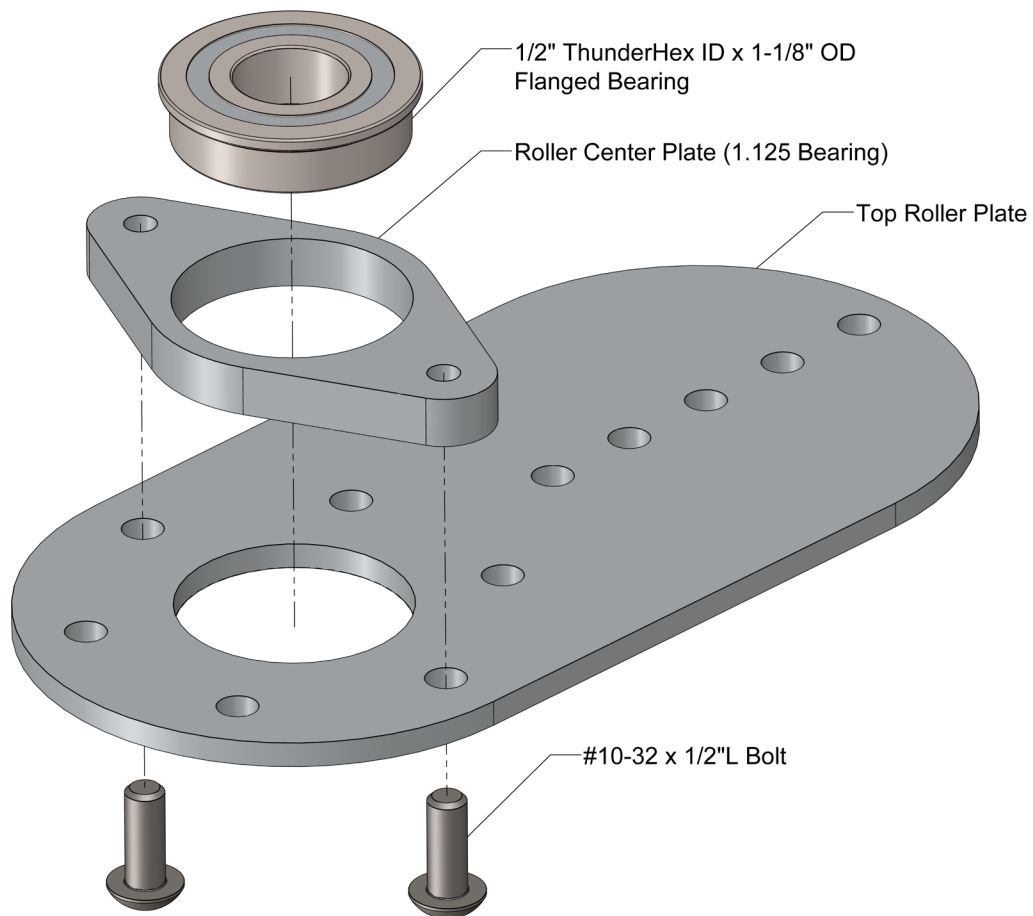




## Top Roller Step 1

Press the 1/2" ThunderHex ID x 1-1/8" OD Flanged Bearing into the Roller Center Plate. Bolt the Roller Center Plate to the Top Roller Plate using two #10-32 x 1/2"L Bolts.

The other Top Roller Plate will be left open, since that is where the Falcon 500 motor will mount.

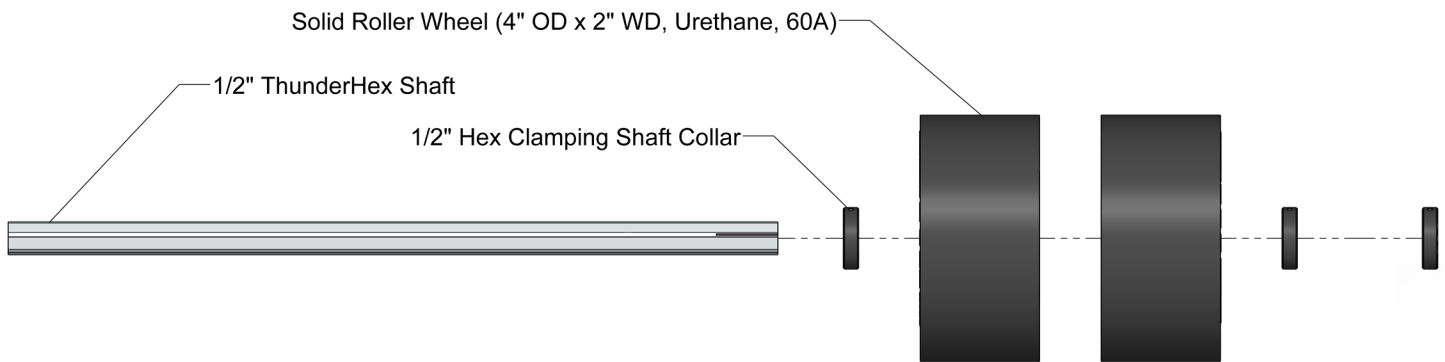




## Top Roller Step 2

Slide all the components on to the 1/2" ThunderHex Shaft in the order shown in the image below.

Two of the 1/2" Hex Clamping Collars will be used to constrain the Solid Roller Wheels in the center of the shooter, and the third one will be used to tighten the shaft around the falcon output shaft. Leave that third one loose.

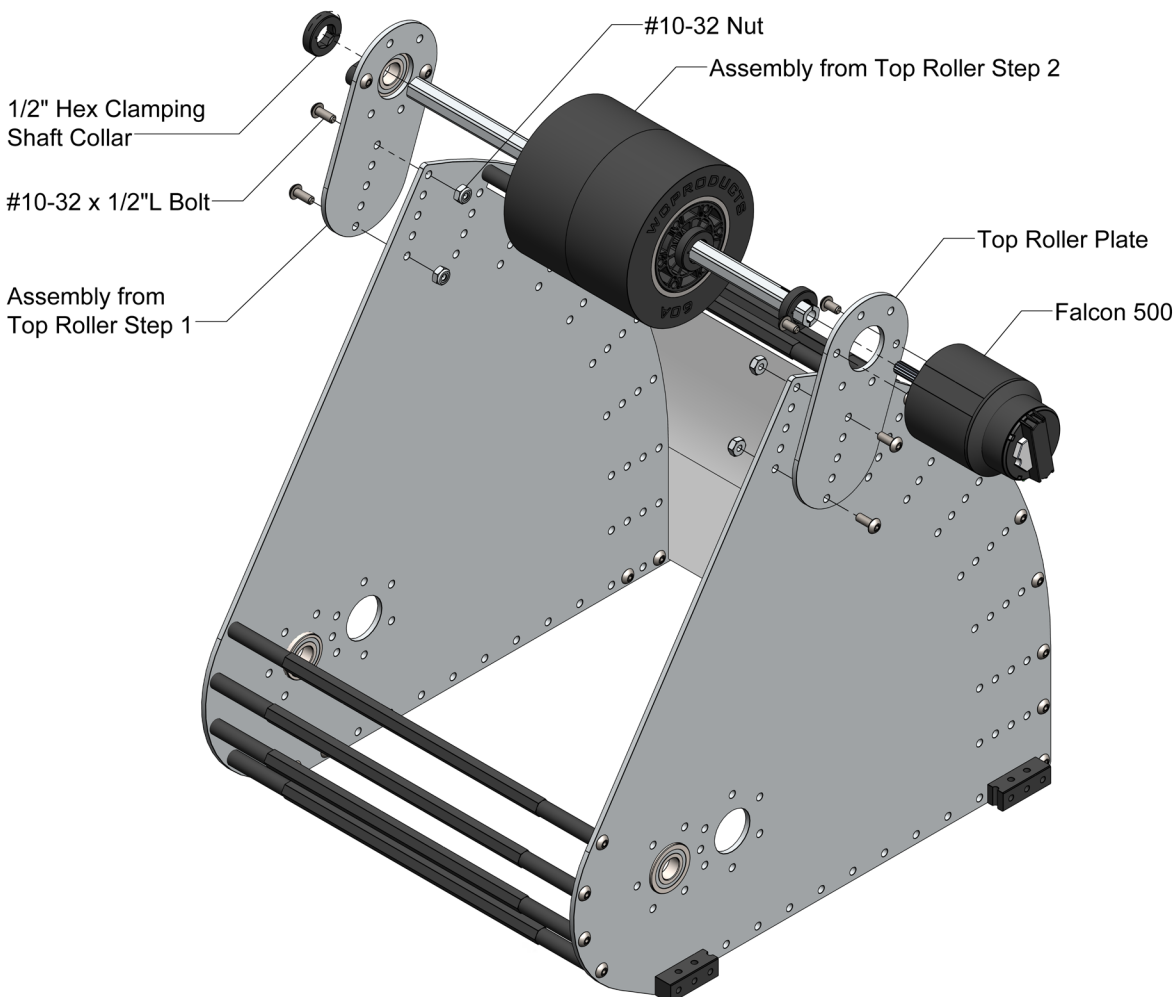




## Top Roller Step 3

The components will be installed in the order shown in the image below. The Top Roller will be direct driven. For more information regarding direct driving a hex shaft with a falcon, see the page labeled Direct Drive Guide.

Once both Top Roller Plates are bolted in the correct position and the shaft is installed, slide the Solid Roller Wheels over to the center of the shooter. Use the two 1/2" Hex Clamping Collars to constrain the wheels.



# GreyT Shooter (9.5") - User Guide (Rev 1)



## Available Kits

Kit Number	Name
KIT-0039	GreyT Shooter (9.5")
KIT-0040	GreyT Shooter (9.5") Spur Gearbox (Falcon, 1.5:1, 1:1, 1:1.5)
KIT-0041	GreyT Shooter (9.5") Belt Gearbox (Falcon, 1:1)

## KIT-0039: GreyT Shooter (9.5")

Part Number	Name	QTY
WCP-0499	GreyT Shooter (9.5")	1
217-4006	1/2" ThunderHex ID x 1.125" OD x 0.313" WD (Flanged Bearing)	3
217-4017	1/2" Hex x 0.201" ID ThunderHex Stock (36")	1
WCP-0336	6" Aluminum Nutstrip (#10-32, .500" Spacing)	1
217-2737	Clamping Shaft Collar - 1/2" Hex ID	8
WCP-0317	Aluminum Threaded Hex Standoffs (#10-32 ID x 3/8" OD x 8" WD) (5-Pack)	3
WCP-0206	Aluminum Spacers (.196" ID x 3/8" OD x 1-3/4" WD) (5-Pack)	6

## KIT-0040: GreyT Shooter (9.5") Spur Gearbox (Falcon, 1.5:1, 1:1, 1:1.5)

Part Number	Name	QTY
WCP-0282	Falcon Spline to 1/2" Hex Adapter	1
217-2737	Clamping Shaft Collar - 1/2" Hex ID	1
217-2708	40t Aluminum Spur Gear (20 DP, 1/2" Hex Bore)	2
217-5470	32t Aluminum Spur Gear (20 DP, 1/2" Hex Bore)	1
WCP-0188	48t Aluminum Spur Gear (20 DP, 1/2" Hex Bore)	1

Note: The 1/2" Hex x .201" ID ThunderHex Stock (36") will be shipped cut in half.

# GreyT Shooter (9.5") - User Guide (Rev 1)



## KIT-0041: GreyT Shooter (9.5") Belt Gearbox (Falcon, 1:1)

Part Number	Name	QTY
WCP-0282	Falcon Spline to 1/2" Hex Adapter	1
217-2737	Clamping Shaft Collar - 1/2" Hex ID	1
217-5873	36t x 9mm Wide Double Flange Aluminum Pulley (GT2 3mm, 1/2" Hex Bore)	2
217-5885	70t x 9mm Wide Timing Belt (GT2 3mm)	1

## WCP-0499: GreyT Shooter (9.5")

Part Number	Name	QTY
WCP-0499-001	Shooter Sideplate	2
WCP-0499-007	Limelight Plate	2
WCP-0499-005	Top Roller Plate	2
WCP-0253	#10-32 x .500" L BHCS (Steel, Black Oxide)	14
WPC-0255	#10-32 x 1.000" L BHCS (Steel, Black Oxide)	4
WCP-0260	#10-32 x 2.250" L BHCS (Steel, Black Oxide)	28
WCP-0326	Thin Lock Nut (#10-32, Zinc)	8
WCP-0229	External SnapRing (1/2")	2
WCP-0476	Roller Center Plate (1.125 Bearing)	1



## FAQ

**Q: What wheels are recommended?**

A: The 4" WCP Solid Roller Wheels are the recommended wheel to use.

**Q: What size game objects does the shooter support?**

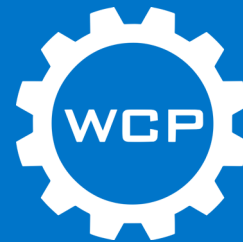
A: This GreyT Shooter was designed with a 9.5" game object in mind. Other sizes may be used, but the performance may vary as smaller or larger game objects were not taken into consideration.

## Trouble Shooting

**Issue: Not shooting far enough.**

Possible Solutions:

1. The RPM may not be high enough. Try increasing the RPM to gain distance.
2. The compression on the game object is not enough. Try increasing the compression by moving the standoffs that support the plastic hood backing forward to the next set of holes.
3. If both of the previous suggestions do not work, then you may have to either gear the shooter faster, or add the top roller.



## Revision Table

Revision Date	Revision #	Description
1/13/2022	1.0	First revision created.