FIRST ROBOTICS COMPETITION

REBUILT™

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2026 *FIRST*® Robotics Competition KitBot Instruction Guide

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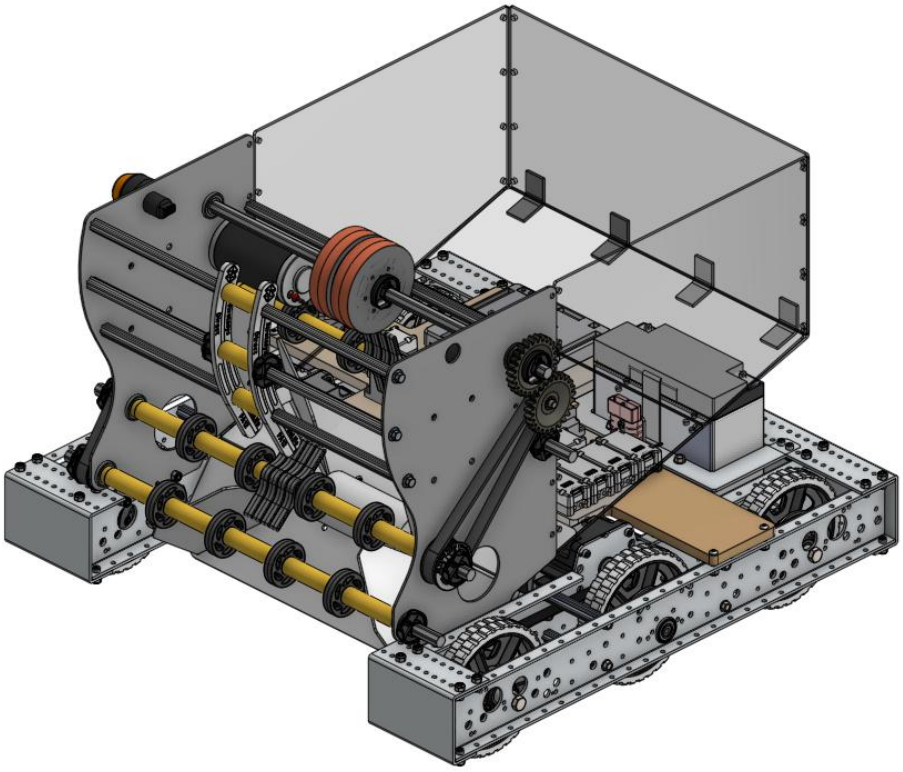
1 KitBot Overview

Figure 1: 2026 KitBot



The KitBot for REBUILT℠ presented by Haas is capable of completing the following actions.

- Drive around the FIELD using a differential drivetrain (also commonly referred to as “tank”) geared for a top achievable speed of ~12.7 feet per second (3.87 m/s).
- Traverse over the BUMP and under the TRENCH
- Pre-load 8 FUEL for use in AUTO
- Score FUEL into the HUB from a short distance away
- Collect FUEL from the OUTPOST and the floor
- Hold ~10-15 FUEL at a time
- Pass FUEL to partners by launching or reversing the floor intake
- Play defense

The KitBot has been designed to keep things simple, which means there are opportunities to iterate and improve on the existing capabilities it has. Teams may choose to add additional components to allow the robot to hold more FUEL, launch FUEL faster and more accurately, climb on the TOWER, or whatever else comes to mind! Teams can reference the KitBot Enhancement/Iteration Guide for a process to explore these improvements.

Thanks to *FIRST* Robotics Competition Team 118 and their Everybot project for providing inspiration and allowing us to utilize pieces of their previous documentation in these instructions. No details of the game, or this design, were shared with Team 118.

2 Before you get started

Note that the Drive Base (AM14U6 Integration), Fuel Mechanism, Intake Base, Bumper Assembly, and some of the Electronics & Wiring may be completed in parallel before they are all combined into a single assembly.

2.1 AM14U6 Integration

While the KitBot superstructure could feasibly be integrated with a variety of drivetrain shapes and types, it is designed to most easily integrate with the AM14U6 chassis constructed in the square orientation. If your team has sufficient resources, assembly of the AM14U6, electronics, and KitBot superstructure may all be done in parallel up to a certain point.

Older versions of the AM14U style chassis can also be used, but the length of the front and back rails will likely need to be modified, and there are some holes that will need to be drilled in the side rails as there are new holes in the AM14U6.

Follow the AM14U6 instructions for the Square Chassis. All of the work to assemble the KitBot superstructure can be done separately and completely before attaching it to the completed chassis.

2.2 Fasteners and Hole Sizes

There are a few locations on the KitBot superstructure where specific fasteners are required. See the Fasteners section for details on what is required.

All other fasteners are specified as #10-32 but may be modified based on team preference and fastener availability. The plates provided in the Black Tote have 0.201in holes suitable for 3/16in rivets or #10-32 bolts. These holes may also be a loose fit for a M4.5 bolt or a tight fit for M5 (may need to be opened with a slightly larger drill). For all through hole hardware, teams should drill the appropriate size based on the hardware they choose as noted in Table 1.

Table 1: Drill Bit Size for Common Fasteners

Hardware	Recommended	Tight Fit	Free Fit
#10-32 Bolts	#7 (0.201in)	#9 (0.196in)	#7 (0.201in)
3/16in Rivets	#7 (0.201in)	#11 (0.191in)	#9 (0.196in)
M5 Bolts	5.5mm	5.3mm	5.5mm
5mm Rivet	5mm	5mm	5.1mm
¼-20 Bolts	17/64in	F (0.257in)	17/64in
M6 Bolts	6.6mm	6.4mm	6.6mm

2.3 Precision Machining Tips

Here are some tools and tips to get more accurate parts in a modest shop:

- **Squares**: A combination square can be used to easily mark lines to cut perpendicular to the edge of a piece of material. The metal “handle” slides along a ruler and can be tightened in place and provide a perpendicular edge to mark along. A “scribe” for scratching cut lines is also

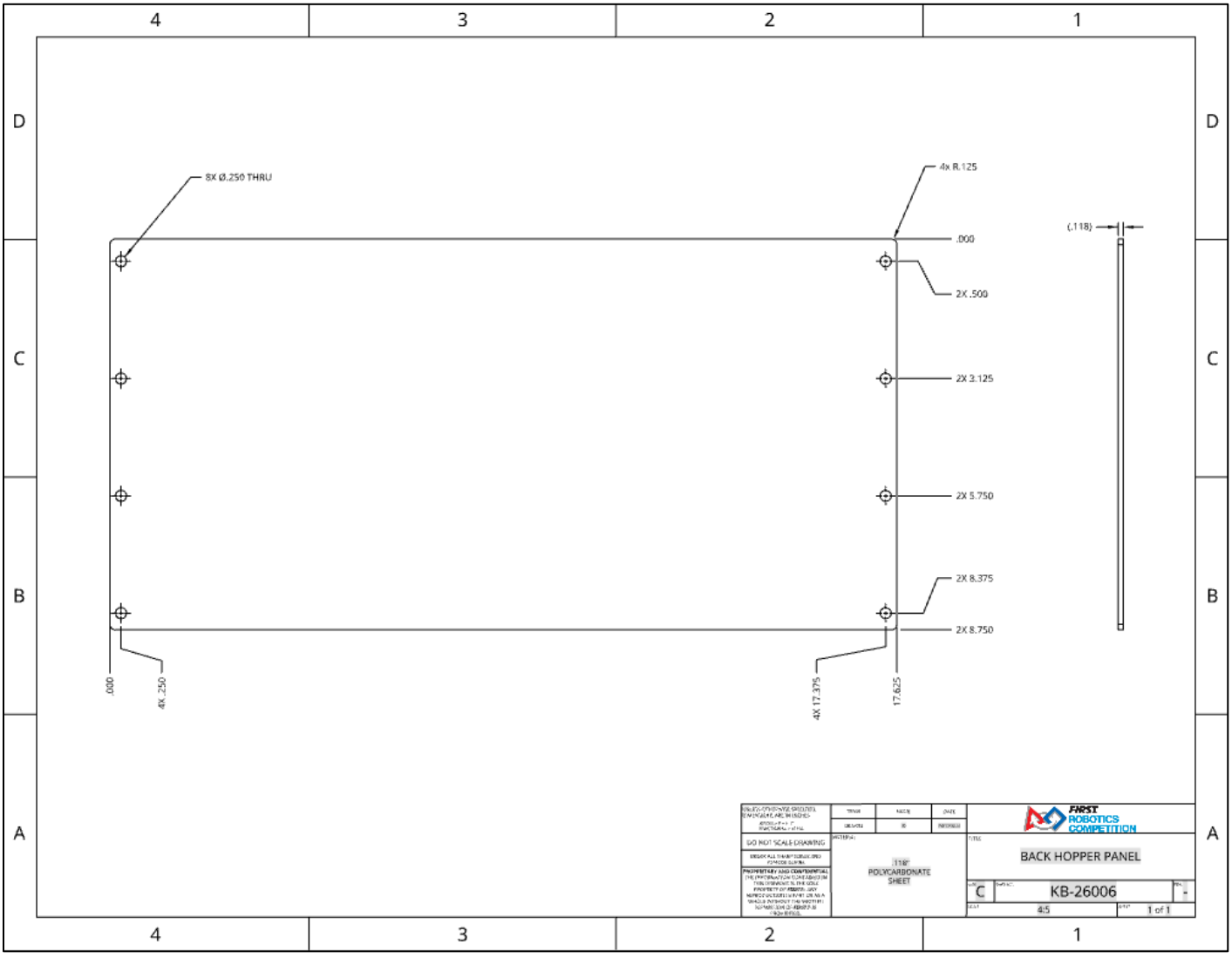
commonly screwed into the handle. A “speed” square or carpenter’s square can help to make sure two components are at perfect 90-degree angles to one another.

- **Marking Tools:** When marking measurements, a number of tools can be used for marking:
  - **Scribe –** A scribe or scratch awl is used to make a thin scratch line in the surface being marked. This scratch is generally smaller than most drawn lines and therefore can be more accurate. This can be used in conjunction with a sharpie (make the sharpie mark first) for increased visibility (this mimics the professional technique of using layout fluid).
  - **Pen or Mechanical Pencil –** These tools can often make fairly narrow lines but may not have the best visibility when used on metal or plastic components.
  - **Sharpie –** Shows up very well on all surfaces but generally draws thick lines. Make sure to align one edge of the wide line with the desired measurement, not the center.
- **Punch**: To make accurate holes, consider marking where you need to drill with a center punch, which will leave a small indentation that you can line a drill bit up with. Automatic punches are available which do not need to be struck to make an indentation. Always drill your holes as straight as possible. If available, teams can use a drill press to help ensure straight holes.
- **Calipers**: Calipers are sort of a very accurate ruler or tape measure – but only for shorter parts. They read the distance between the two “teeth” – if you are trying to mark a hole 4.25in inwards from the edge of a part, slowly slide the display section along the ruler until it reads 4.25. Then place one of the teeth against the edge of your part, and the other will measure to the point 4.25in from there. Use the teeth of the calipers to make a straight scratch in the metal, then change the distance to the 2nd dimension for the desired location and make a 2nd scratch. The center of the cross will be much more accurate than marking the location with a Sharpie, especially if you use a punch right where the marks cross before drilling.
- **Drill vs Drill Press**: Although the KitBot can be built with just a drill, many parts will appreciate a high degree of precision, and holes will turn out straighter and more accurately located if drilled out on a drill press. When using a drill press it is still important to use a punch as the drill bit can still wander when beginning a hole. Make sure your piece is clamped firmly and that the drill bit is lined up to come down directly at the mark from your punch.

2.4 Reading Part Drawings

This document uses engineering “drawings” like the one below to aid you in machining parts of the KitBot correctly.

Figure 2: Example Part Drawing



The name of the piece you are looking at is in the bottom right corner. For the purposes of this document, all dimensions directly provided will be shown in both imperial and metric units. All links to drawings within this document will be linked to the imperial version but there are also versions of the drawings using metric available.

Each drawing will generally show multiple views of the same part in order to show you all relevant dimensions and features. The overall 3D view (isometric view) can be used to help orient yourself when looking at the other (front, top, side) views.

The drawings use a few types of dimensioning:

- **Ordinate Dimensioning** – This is where dimensions are all indicated relative to a single origin. In a given view, the origin (generally on the left) will be marked with a dimension of "0". Subsequent features will be marked with leader lines pointing to them and a dimension measured from that origin point along a straight horizontal or vertical line.
- **Relative Dimensioning** - These dimensions are indicated by a pair of lines pointing to the features that define the dimension and a set of arrows, either inside or outside the line pair. The dimension indicated is the measurement between the two features marked by the line pair.
- **Diameter Dimensioning** - These dimensions are indicated by a ⌀ symbol and reflect the diameter of holes. Often only a single hole will be marked with a number followed by the letter 'X' indicating how many of that size hole are on that face (e.g., 6X 0.201).

Technical drawings can be complicated and hard to understand initially. We suggest trying to go through each drawing slowly and mark the parts you understand down onto your physical pieces as you go. **Don't forget to double check your work before you cut and drill!**

3 Materials

This section covers all the materials needed for the KitBot Structure.

3.1 Raw Materials

Table 2: Raw Materials List

Material	Qty	Info
2ft x 4ft Polycarbonate Sheet 0.118in thickness (61cm x 122cm, 3mm thickness)	1	It is okay to use 0.125in material instead if preferred. Make sure to use polycarbonate and not acrylic. Acrylic of this thickness is likely to shatter either when machined or when subjected to the shock of robot operation. Other materials (0.125in aluminum, 0.25in plywood, etc.) may be used but have not been tested and bolt lengths may be affected if modifying material thickness.
2 ft. x 4 ft. Sheet of ½in Plywood (61cm x 122cm, 19mm thickness)	1	Used for electronics board. Other materials may be used but have not been tested and bolt lengths may be affected if modifying material thickness.
(Optional) – ¾in Schedule 40 PVC Pipe (20mm DIN PVC pipe)	60in (153cm)	This material is used to make spacers for ½in hex shaft which can also be purchased as COTS parts or can be 3D Printed. (see Team Sourced Parts)

3.2 Black Tote

These items come in the Black Tote which is provided to teams along with their Kickoff Kit as long as they did not opt out of this tote.

Table 3: Black Tote Parts List

Part	Qty	Provided part and Info
Side Plate (KB-26001)	2	Laser-Cut Aluminum Plate
Roller Shaft (KB-26002)	4	Custom Part – Steel Rounded ½in Hex Shaft
Intake Baseplate (KB-26003)	1	Laser-Cut Aluminum Plate
Brace Shaft (KB-26007)	4	Cut to Length - Aluminum “Churro” Extrusion
Hood Plate (KB-26008)	2	3D Printed Part
Panel Lock (KB-26009)	1	Dual Lock
Launcher GearPulley (KB-26010)	2	3D Printed Part
Launcher Flywheel (KB-26012)	1	Laser-Cut Steel Plate
Intake Guide (KB-26013)	4	Laser-Cut Aluminum Plate
Transition Pulley (KB-26016)	1	3D Printed Part – 32 Tooth 5mm HTD Pulley + Gear
4in Stealth Wheels	2	am-2647_orange
2in Compliant Wheel, 60A Hardness	12	REV-21-2031-PK4
Intake Flap, 40A Hardness	8	REV-21-2705-PK4
24 Tooth 5mm HTD Pulley 15mm wide	2	Custom Part – 5mm HTD Pitch 24 Tooth Pulley
55 Tooth 5mm HTD Belt 15mm Wide	1	WCP-0165
105 Tooth 5mm HTD Belt 15mm Wide	1	TTB-0190
10 Tooth 20DP 8mm Bore Gear	1	WCP-0899
84 Tooth 20DP ½in Hex Gear	1	WCP-1439
½in Hex Shaft Collar	12	Custom Part
CIM Motor	2	am-0255
CIM Motor Hardware Pack	2	am-4843
½in Hex Bearing	8	TTB-0001
8mm to ½in Hex Adapter	1	WCP-0794

3.2.1 Fasteners

There are a few locations on the KitBot superstructure where specific fasteners are required. Everything listed in Table 4 is included in the Black Tote:

Table 4: Required Fasteners

Part	Qty	Provided Part	Alternative Parts
#10-32 1/2in long Button Head Cap Screw	40	WCP-0253	M5 ~13mm long
#10-32 1in long Button Head Cap Screw	20	WCP-0255	M5 ~25mm long
#10-32 Locknut	60	WCP-0326	M5 Locknut
¼-20 x 1.0in long Thread Forming Screw Hex Washer Head	10	custom part	

3.3 Team Sourced Parts

These are the parts needed for the KitBot that must be sourced by the team. Some items can be 3D printed or created from raw material rather than sourced directly. If 3D printed, this is a great opportunity to use your team colors!

Table 5: Team Sourced Parts List

Part	Qty	Info
¼in Long Hex Spacer (KB-26020)	6	Can be 3D Printed from provided files or made from PVC pipe as noted in KitBot Part Manufacturing. May be substituted with 5/8in or ¾in round (~15mm-20mm diameter, 50mm length) spacers that are available at many hardware stores, McMaster, MSC, etc. or hex spacers that are available at many common *FIRST* Robotics Competition suppliers. May be built up from smaller lengths.
½in Long Hex Spacer (KB-26018)	4	
2in Long Hex Spacer (KB-26019)	3	
3in Long Hex Spacer (KB-26011)	13	
Cable Ties	29	50lb, 8in Cable Ties (~5mm width, 20cm or greater length) These cable ties are available in the Rookie Tote.
Foam Noodle - 2.5in wide (6.35cm)	1	At least 5” is required. Can be created from leftover Bumper material. Rookies will have this material in the Rookie Tote

3.4 Electronics

The main electronic components for the KitBot are primarily provided in the Grey Tote or re-used from previous seasons. Some items are provided in the Black Tote.

Table 6: Electronics Parts Needed

Material	Qty	Info
VH-109 Robot Radio (OM5P Robot Radio in China)	1	Grey Tote/re-use from previous season
SPARK MAX motor controller	6	4x Grey Tote/re-use from previous season 2x Black Tote
RoboRIO	1	Grey Tote/re-use from previous season
Power Distribution Hub	1	Grey Tote/re-use from previous season
Robot Signal Light (RSL)	1	Black Tote (Rockwell Automation 855PBB12ME522)
120A Main Circuit Breaker	1	Black Tote
40A Circuit Breakers	6	Black Tote
6 AWG Wire (Red and Black)	18in	Black Tote
12 AWG Wire (Red and Black)	15’	Black Tote
18 AWG Wire (Red and Black)	10’	Black Tote
Electrical Tape (Red and Black)	2	Black Tote
Wago 221 Connectors	16	Black Tote
Battery Connector	1	Black Tote

3.5 Bumpers

These materials are needed to create 2 sets of bumpers following our recommended steps as noted in the Bumper Assembly section.

Table 7: Bumper Materials

Material	Qty	Info
4ft x 4ft Sheet of ¾in Plywood (122cm x 122cm, 19mm thickness)	1	May also use two 2ft x 4ft (~61cm x 122cm) sheets or a 5ft x 5ft (~152cm x 152cm) sheet. Other materials may be used but have not been tested and tweaks may need to be made with the instructions in order to use different materials.
(Recommended) Corner Brackets	4	Brackets are only needed if teams are making L Bumpers as described in Bumper Assembly. Teams can source any bracket similar to the Bumper Wood Corner Brackets (am-3233a) or can manufacture similar brackets out of aluminum angle.
Foam Noodles, 2-½in nominal diameter (6.3cm), ~47in long (122cm)	~10	6 Foam Noodles are provided in the Rookie Tote. Rookie teams can either source additional foam noodles or do swappable bumper covers. 10 foam noodles assumes ~2 longer segments constructed from 2 smaller remnants, 12 noodles are required to avoid this. Teams may optionally choose to use other padding if preferred as noted in the Game Manual.
(optional) ½in Foam Tiles (~13mm)	~5ft^2 (~0.5m^2)	Frequently sold as 2ft x 2ft tiles, 2 tiles will back one set of bumpers.
Red Fabric	1-½ yards (1.4m^2)	18in x 160in of each color is included in the Rookie Tote and is sufficient for a set of Bumpers. If buying in a standard width (60in), 1-½ yards are needed of each color.
Blue Fabric	1-½ yards (1.4m^2)	
Tape	1 roll	For securing noodles to plywood to ease assembly and for temporarily securing bumper brackets to bumper to line everything up correctly. For the bumper bracket step, a thick foam double sided tape works best, but one or more loops of something like duct tape or gaffer's tape will also work.
(Optional) White Paint	1	1 small paint container should be sufficient. Teams may use other materials to add numbers to Bumpers.

4 Tools

The following tools are needed to prepare & assemble the KitBot Structure:

- Safety Glasses
- Tape Measure
- Punch
- Marking tool
- Jigsaw or Bandsaw
- Drill + Drill Bits
  - #7 (or 5.5mm for metric hardware) Drill Bit
  - ¼in (or ~6mm) Drill Bit
  - See Table 1: Drill Bit Size for Common Fasteners for alternate sizes
- Clamps
- Flush Cutters/Diagonal Cutters
- Needle-nose pliers
- Fastener Tools
  - 5/32in (or 4mm for metric hardware) Allen key
  - 1/8in (or 3mm for metric hardware) Allen Key
  - 3/8in (or 8mm for metric hardware) Open Ended Wrench or Socket
  - 1/2in Open Ended Wrench
  - 9/16in Open Ended Wrench or Socket
  - Other tools may vary based on chosen hardware
- Serrated blade for foam noodles
- For Bumpers
  - Staples
  - Staple Gun
  - Scissors or box cutter for fabric
  - Phillip's screwdrivers and/or drill drivers
  - Serrated blade for foam noodles (e.g. hacksaw, bandsaw, bread knife, etc.)
- (optional) Circular or Table Saw
- (optional) Deburring Tools
- (optional) Calipers
- (optional) Square
- (optional) Pop Rivet Tool
- (optional) Rubber Mallet

5 KitBot Part Manufacturing

The first step in building the KitBot superstructure is to gather all the Raw Materials needed and to prepare pieces for assembly. Teams can reference the Drawings for additional details.

> Cutting and drilling holes can leave sharp edges and burrs on both wood and polycarbonate. Teams should take care around machined holes and edges and may wish to use a file or deburring tool to remove this hazard.

5.1 Part Manufacturing:

Step 1 Using the drawing for the Hopper Bottom Panel (KB-26004, appended to this document), cut the Hopper Bottom Panel out of a sheet of .118in (3mm) polycarbonate, and drill 6 holes with a .201in (or 5.5mm for metric hardware) drill bit. And 11 holes with a 1/4in (or ~6mm) drill bit. The 8 holes on the bottom section of the part should be match drilled to the Intake Baseplate (KB-26003) provided in the Black Tote.

Step 2 Using the drawing for the Side Hopper Panel (KB-26005, appended to this document), cut the **2x** Side Hopper Panels out of a sheet of .118in (3mm) polycarbonate, and drill all 10 holes with a 1/4in (or 6mm) drill bit.

Step 3 Using the drawing for the Back Hopper Panel (KB-26006, appended to this document), cut the Back Hopper Panel out of a sheet of .118in (3mm) polycarbonate, and drill all 8 holes with a 1/4in (or 6mm) drill bit.

Step 4 Using the drawing for the Battery Access Panel (KB-26014, appended to this document), cut the Battery Access Panel out of a sheet of .118in (3mm) polycarbonate, and drill all 5 holes with a 1/4in (or 6mm) drill bit.

Step 5 Make the following spacers using a 3D Printer (provided files) or cut them from 3/4in (20mm) PVC pipe. **Do not use a miter saw or other high-speed rotary saw to cut these small PVC parts as it is dangerous**; Instead use a PVC pipe cutter, hand saw (such as hacksaw) or oscillating/reciprocating saw (such as a jigsaw). These can also be made by combining COTS hex spacers. If 3D printed, this is a great location to incorporate your team colors! The recommended material for these 3D printed spacers is PLA+ (or a similar “tougher” blend of PLA), but lots of materials can work, such as PETG, TPU, ABS or Nylon.

Table 8: Spacer Lengths

Part	Length	Quantity
KB-26011	3in (7.62cm)	13
KB-26018	½in (1.27cm)	4
KB-26019	2in (5.08cm)	3
KB-26020	¼in (.063cm)	6

6 KitBot Assembly

Before beginning assembly, be sure you have the parts from Table 3 & Table 5 and the materials that you manufactured as noted below in Table 9. Be sure to complete all items in the KitBot Part Manufacturing before attempting to assemble the KitBot.

Table 9: Fabricated Parts List

Part	Qty	Part Number	Info
Bottom Hopper Panel	1	KB-26004	.118in Polycarbonate
Side Hopper Panel	2	KB-26005	.118in Polycarbonate
Back Hopper Panel	1	KB-26006	.118in Polycarbonate
Battery Access Panel	1	KB-26014	.118in Polycarbonate
Intake Shaft Long Spacer (if not sourced)	13	KB-26011	3in long ½in Hex Spacer
Intake Shaft Small Spacer (if not sourced)	4	KB-26018	½in long ½in Hex Spacer
Hood Plate Spacer (if not sourced)	3	KB-26019	2in long ½in Hex Spacer
¼in Long Hex Spacer (if not sourced)	6	KB-26020	1/4in long ½in Hex Spacer

6.1 Assembly Notes

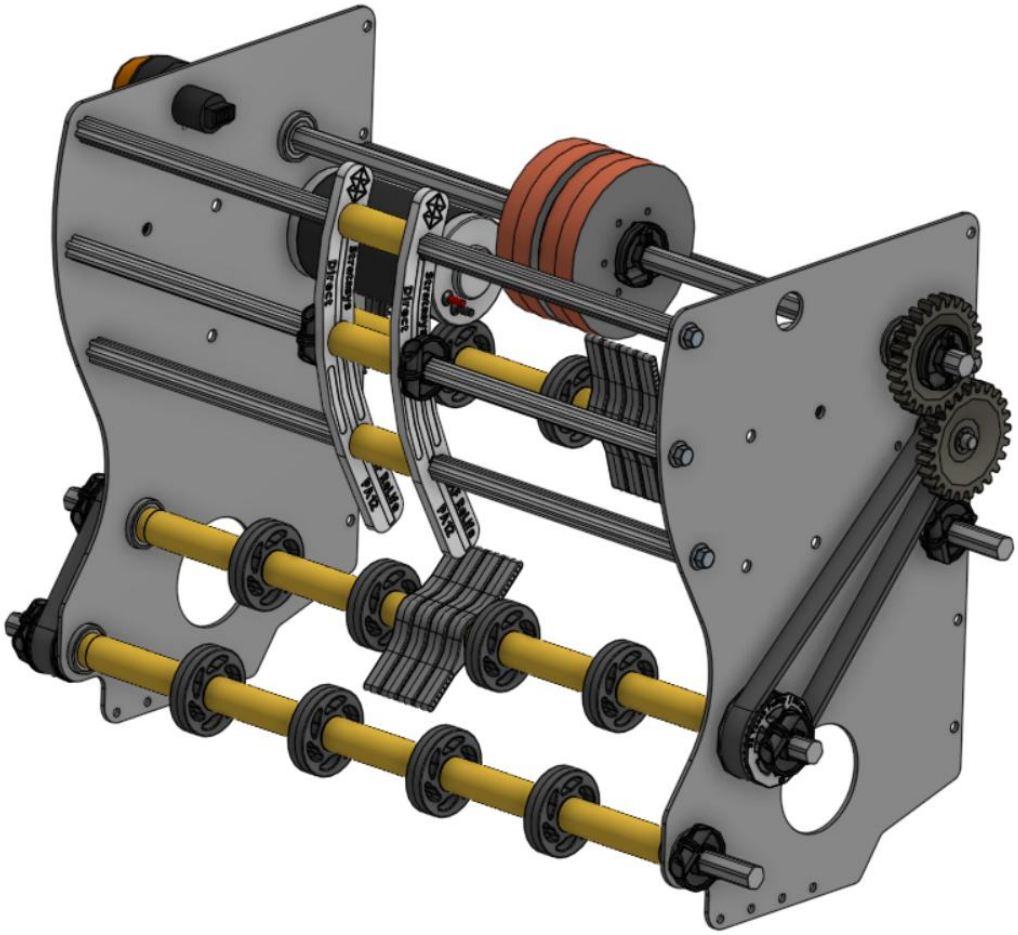
All assembly instructions are written assuming teams are using the provided items from the Black Tote and imperial sized team sourced parts. If assembling using alternate hardware, substitute the equivalent alternate parts in each step, referring to the tables in Materials if needed to determine the equivalent. Some alternatives may also require teams to make minor adjustments such as drilling larger holes, leaving some holes unbolted, etc.

Need help? Watch the 2026 KitBot Build Video for a walkthrough of building the KitBot.

6.2 Assembly Instructions

6.2.1 Build the Fuel Mechanism

Figure 3: Fuel Mechanism



Parts needed:

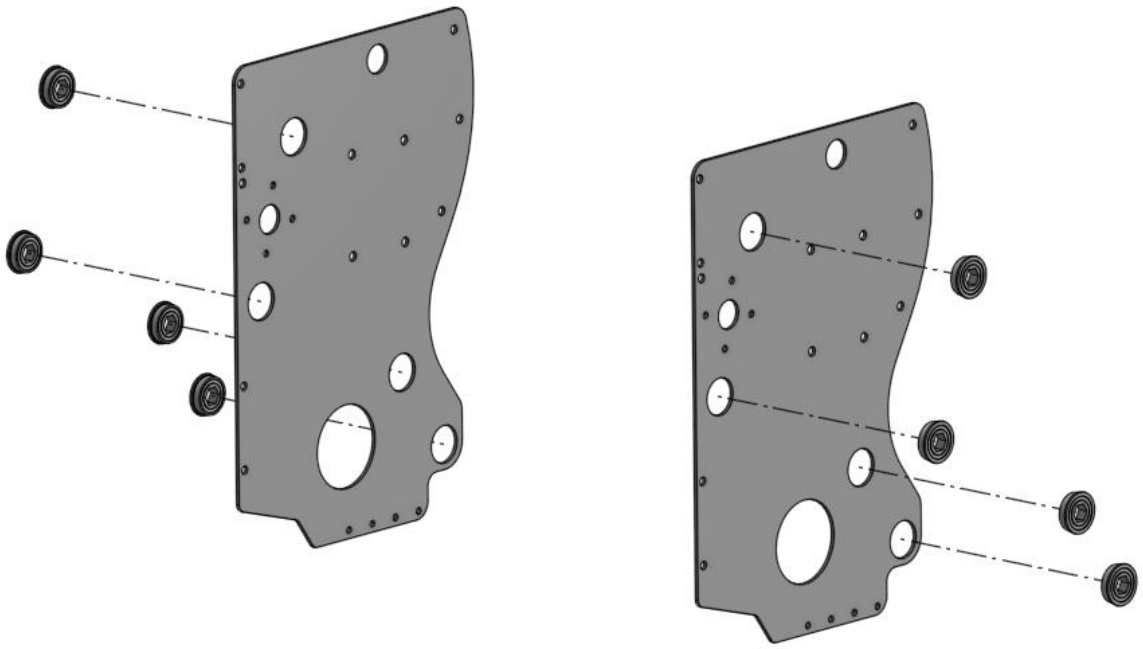
- Side Plate (KB-26001) - qty 2
- Roller Shaft (KB-26002) – qty 4
- Brace Shaft (KB-26007) – qty 4
- Hood Plate (KB-26008) – qty 2
- Launcher GearPulley (KB-26010) – qty 2
- 3in long hex spacer (KB-26011) – qty 13
- Launcher Flywheel (KB-26012) – qty 1
- Transition Pulley (KB-26016) – qty 1
- ½in long hex spacer (KB-26018) – qty 6
- Hood Plate Spacer (KB-26019) – qty 3
- ¼in long hex spacer (KB-26020) – qty 4
- ½in Hex Bearings – qty 8

- 4in Orange Stealth Wheel – qty 2
- 2in Compliant Wheel – qty 12
- Intake Flap – qty 8
- 24 Tooth 5mm HTD Pulley – qty 2
- 55 Tooth 5mm HTD Belt – qty 1
- 105 Tooth 5mm HTD Belt – qty 1
- 10 Tooth Motor Pinion Gear – qty 1
- 84 Tooth Gear – qty 1
- 8mm to ½in Hex Adapter – qty 1
- ½in Hex Shaft Collar – qty 12
- CIM Motor – qty 2
- CIM Motor Hardware Pack – qty 2
- VH-109 Radio – qty 1
- Robot Signal Light – qty 1
- ¼-20 x 1in long Thread Forming Screws – qty 8

Step 1 **Install Bearings** - Insert the hex bearings into the Side Plates as shown in Figure 4, with the flange of the bearing ending up on the same side throughout the part. This should be a light press fit. If you are unable to insert them by hand, you may use an arbor press, tabletop vice, or lightly tap with a rubber mallet. The two plates need to end up being mirror images of each other (the bearing flanges need to be on the "left" of one plate and the "right" of the other plate).

> Support the plates as close to the bearing hole as possible while pressing them to avoid bending the plate.

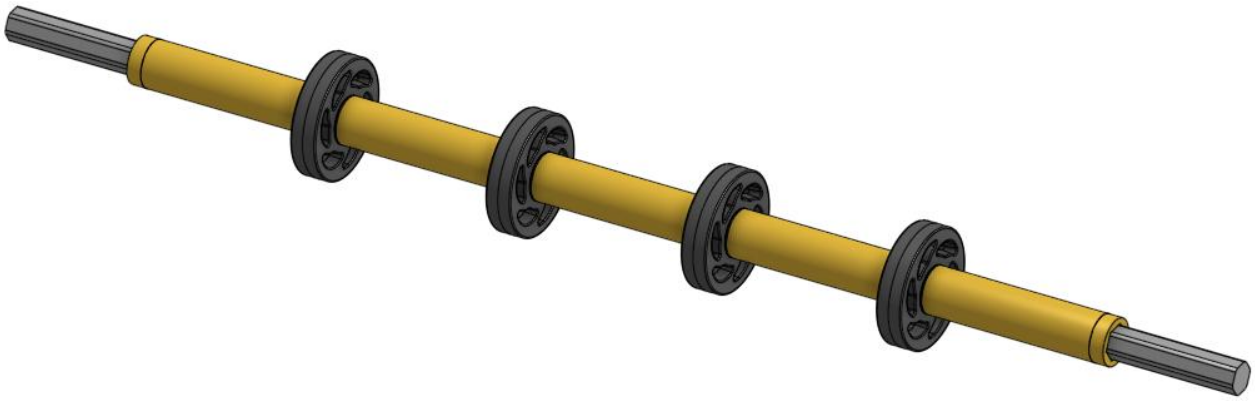
Figure 4: Install Bearings



Step 2 **Build Lower Intake Shaft** – Starting with a Roller Shaft (KB-26002), slide the following parts on to the shaft in the following order (wheels may be a little tight to slide on):

- ¼in long hex spacer (KB-26020)
- 3in long hex spacer (KB-26011)
- 2in Compliant Wheel
- 3in long hex spacer (KB-26011)
- 2in Compliant Wheel
- 3in long hex spacer (KB-26011)
- 2in Compliant Wheel
- 3in long hex spacer (KB-26011)
- 2in Compliant Wheel
- 3in long hex spacer (KB-26011)
- ¼in long hex spacer (KB-26020)

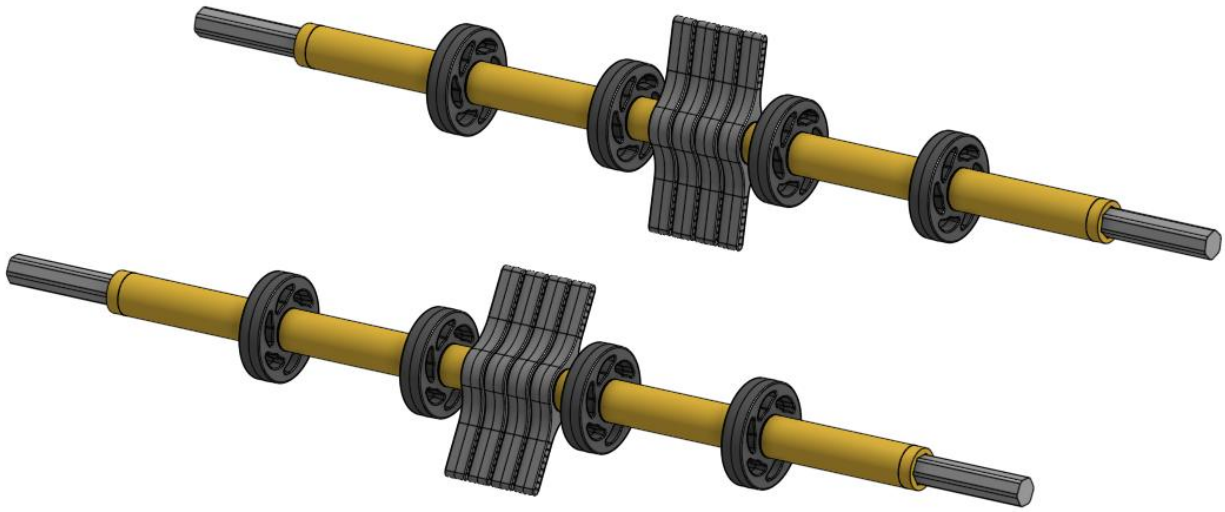
Figure 5: Build the Lower Intake Shaft



Step 3 **Build the Upper Intake and Feeder Shafts** – Take two Roller Shafts (KB-26002) and slide the following parts on to them in the following order so you end up with two identical components:

- ¼in long hex spacer (KB-26020)
- 3in long hex spacer (KB-26011)
- 2in Compliant Wheel
- 3in long hex spacer (KB-26011)
- 2in Compliant Wheel
- ½in long hex spacer (KB-26018)
- Intake Flap
- Intake Flap
- Intake Flap
- Intake Flap
- ½in long hex spacer (KB-26018)
- 2in Compliant Wheel
- 3in long hex spacer (KB-26011)
- 2in Compliant Wheel
- 3in long hex spacer (KB-26011)
- ¼in long hex spacer (KB-26020)

Figure 6: Build the Upper Intake and Feeder Shafts



Step 4 **Build the Launcher Shaft** – Take the last Roller Shaft (KB-26002) and slide the following parts on in the following order:

- Shaft Collar (leave it loose)
- 4in Orange Stealth Wheel
- Launcher Flywheel (KB-26012)
- 4in Orange Stealth Wheel
- Shaft Collar (leave it loose)

Shaft collars may be a tight fit on hex shafts, even if the bolts are completely loose. It is still important to tighten shaft collars to ensure components stay in place under robot vibration.

Figure 7: Build the Launcher Shaft

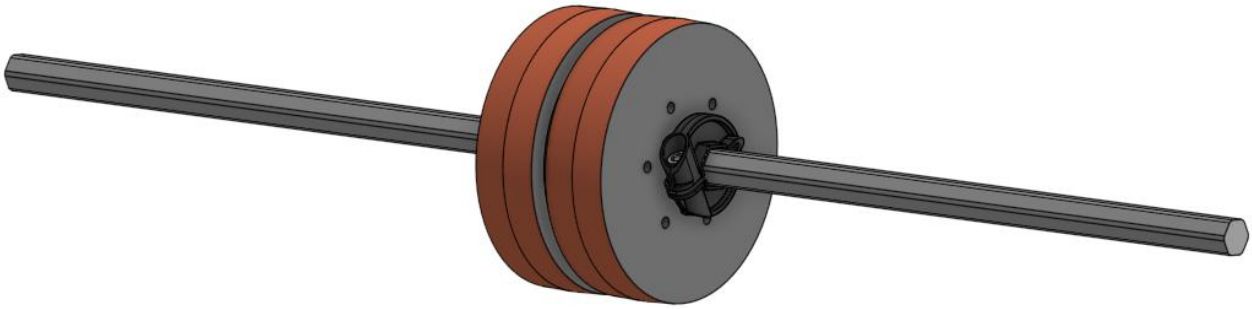
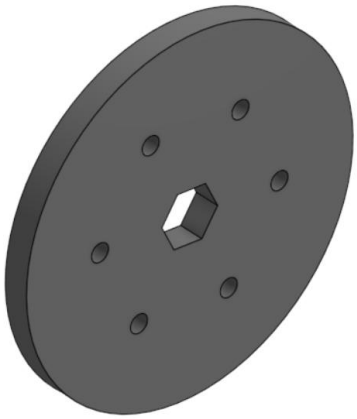


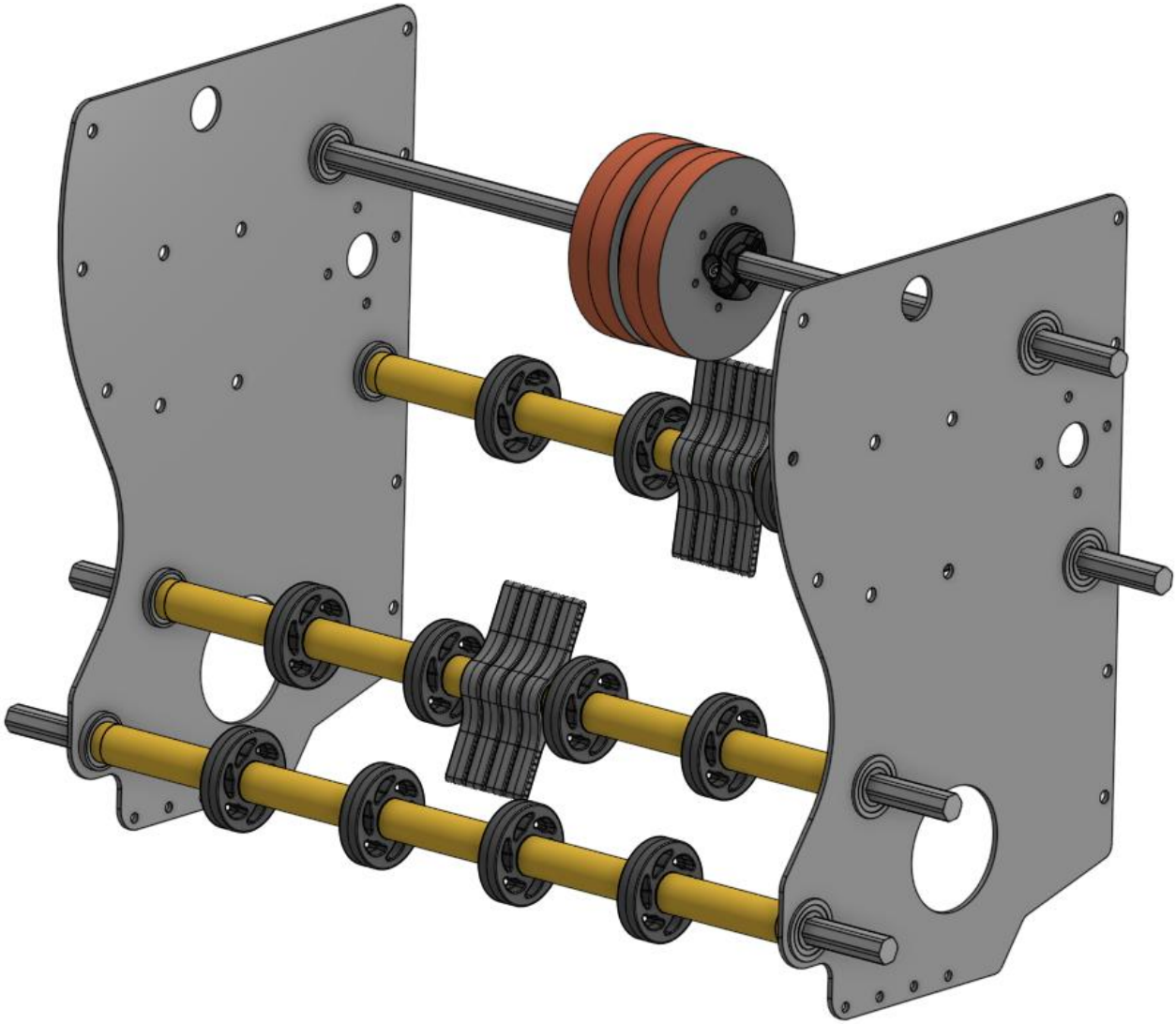
Figure 8: Launcher Flywheel (placed in between stealth wheels)



Step 5 **Slide the Plates on** – Take the two Side Plates with installed bearings from Step 1 and slide them around the two ends of the four assembled shafts such that it matches Figure 9. Make sure that the flanges of the bearings are on the outside of the assembly.

Leave an even amount of extra shaft sticking out on each side of the plates. This should create a structure that can stand up on its own.

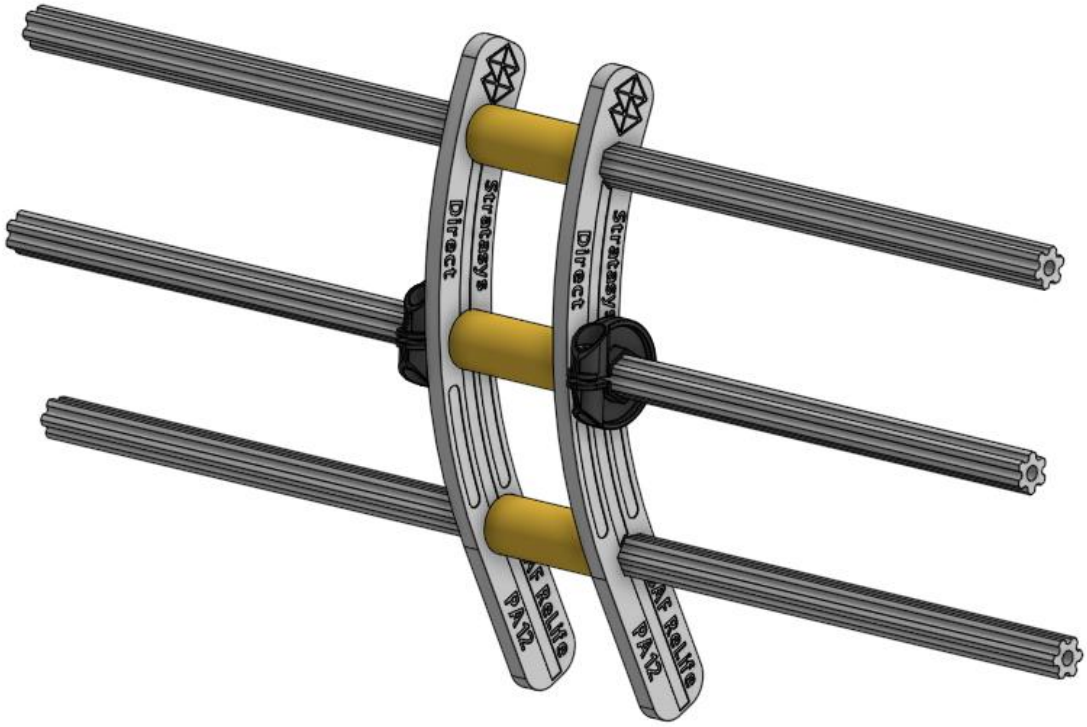
Figure 9: Slide the Plates on



Step 6 **Build the Launcher Hood** – Take 3 of the pieces of Churro (KB-26007) and slide on the two Hood Plates (KB-26008) with 2in long hex spacers (KB-26019) in between them on each shaft. Slide a shaft collar on to each side of the hood on the middle shaft and leave them loose.

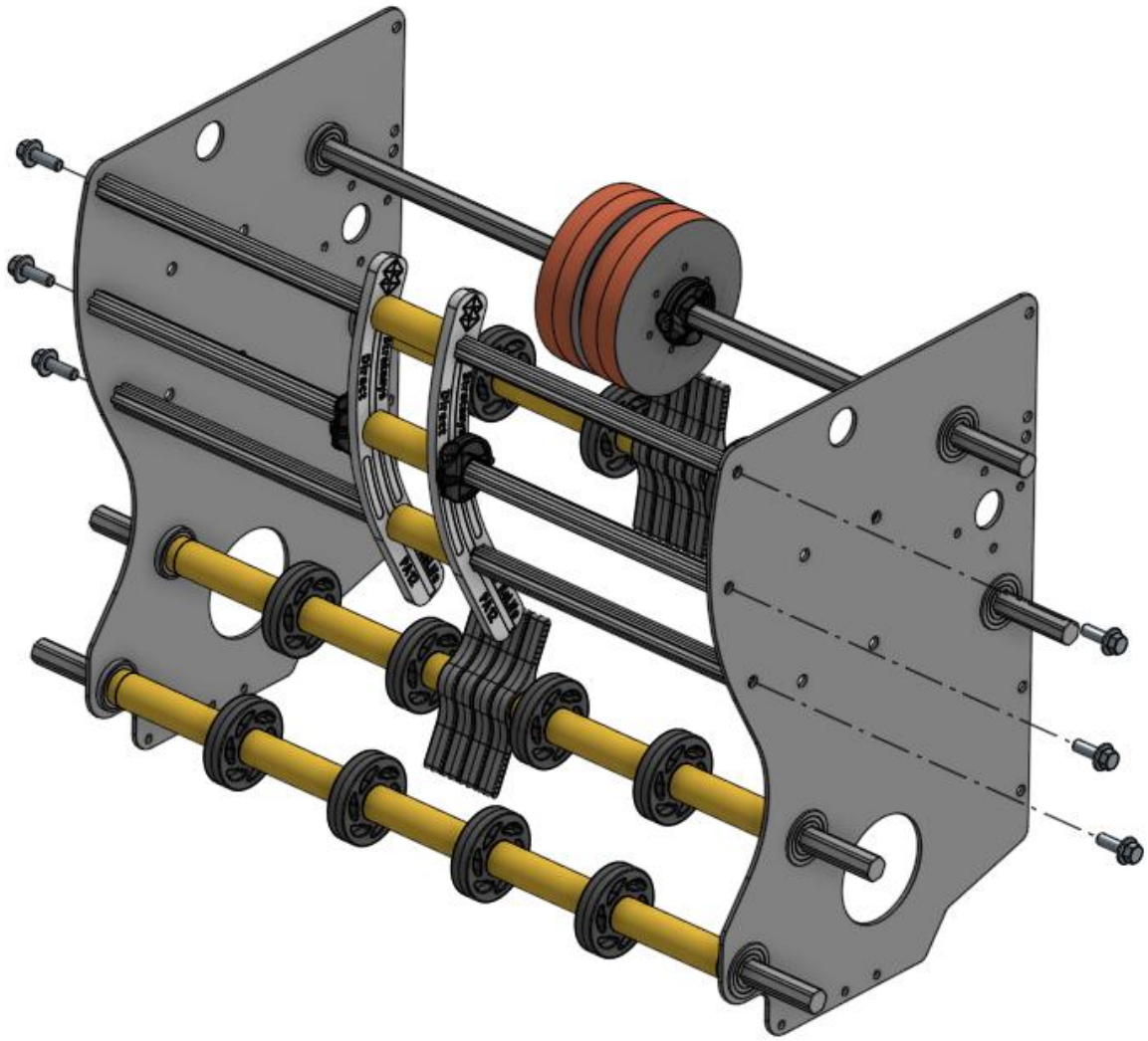
> Forming the threads with the thread forming screws in the next step can be a bit difficult. Teams may want to individually thread the screws into each end of each shaft and then back them out before assembling, or use a ¼-20 tap if available.

Figure 10: Build the Launcher Hood



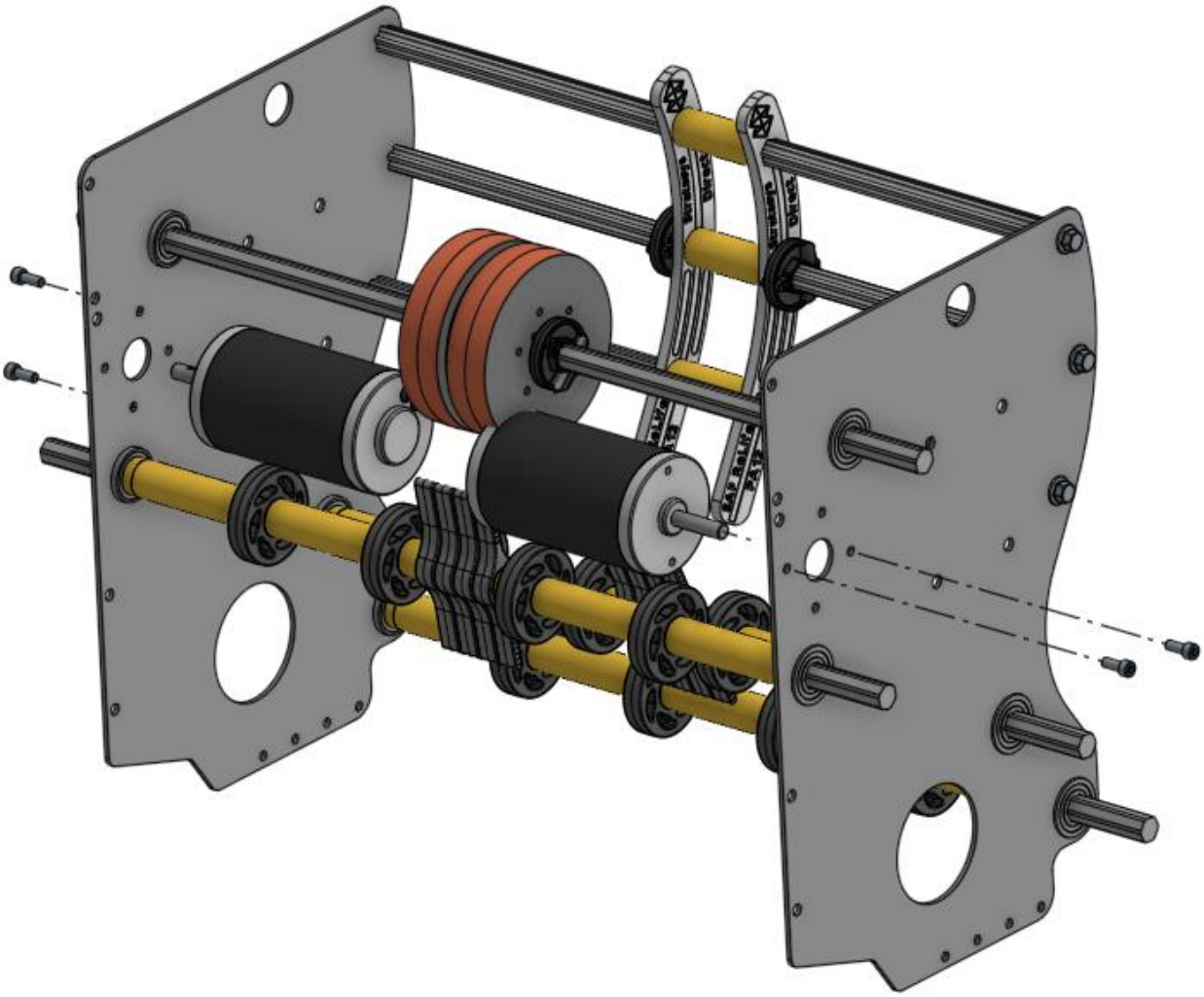
Step 7 **Attach the Launcher Hood** – Take the Launcher Hood from Step 6 and attach to the structure by lining it up with the holes shown in Figure . Make sure that the side of the Launcher Hood with the writing (longer “tail” extending beyond the churro) points downward toward the Intake Shafts,. Attach the Launcher Hood to both Side Plates with six ¼-20 thread forming screws.

Figure 11: Attaching the Launcher Hood



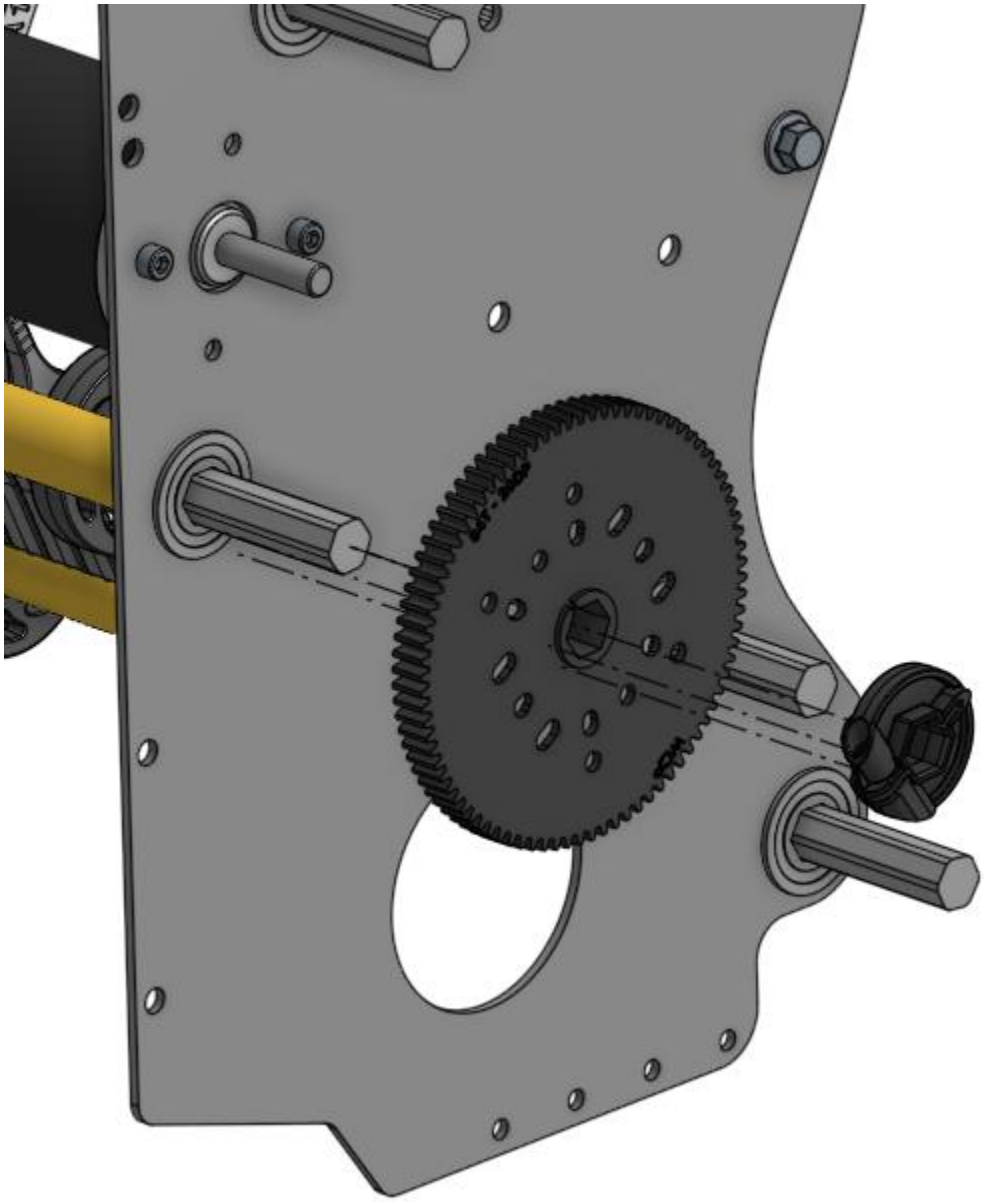
Step 8 **Attach the Motors** – Attach the CIM motors to the insides of the Side Plates as shown in Figure 12. Attach each CIM with two ½in long #10-32 Socket Head Bolts (found in the CIM Hardware Pack). These bolts have a nylon patch on the threads to keep them from coming loose due to vibration. Bolts should be put into the holes shown below.

Figure 12: Attaching the Motors



Step 9 **Attach the Feeder Gear** – Looking at the structure, with the Launcher Shaft on your left, slide the 84-tooth gear onto the shaft below the motor, followed by a shaft collar. Leave the shaft collar loose for now.

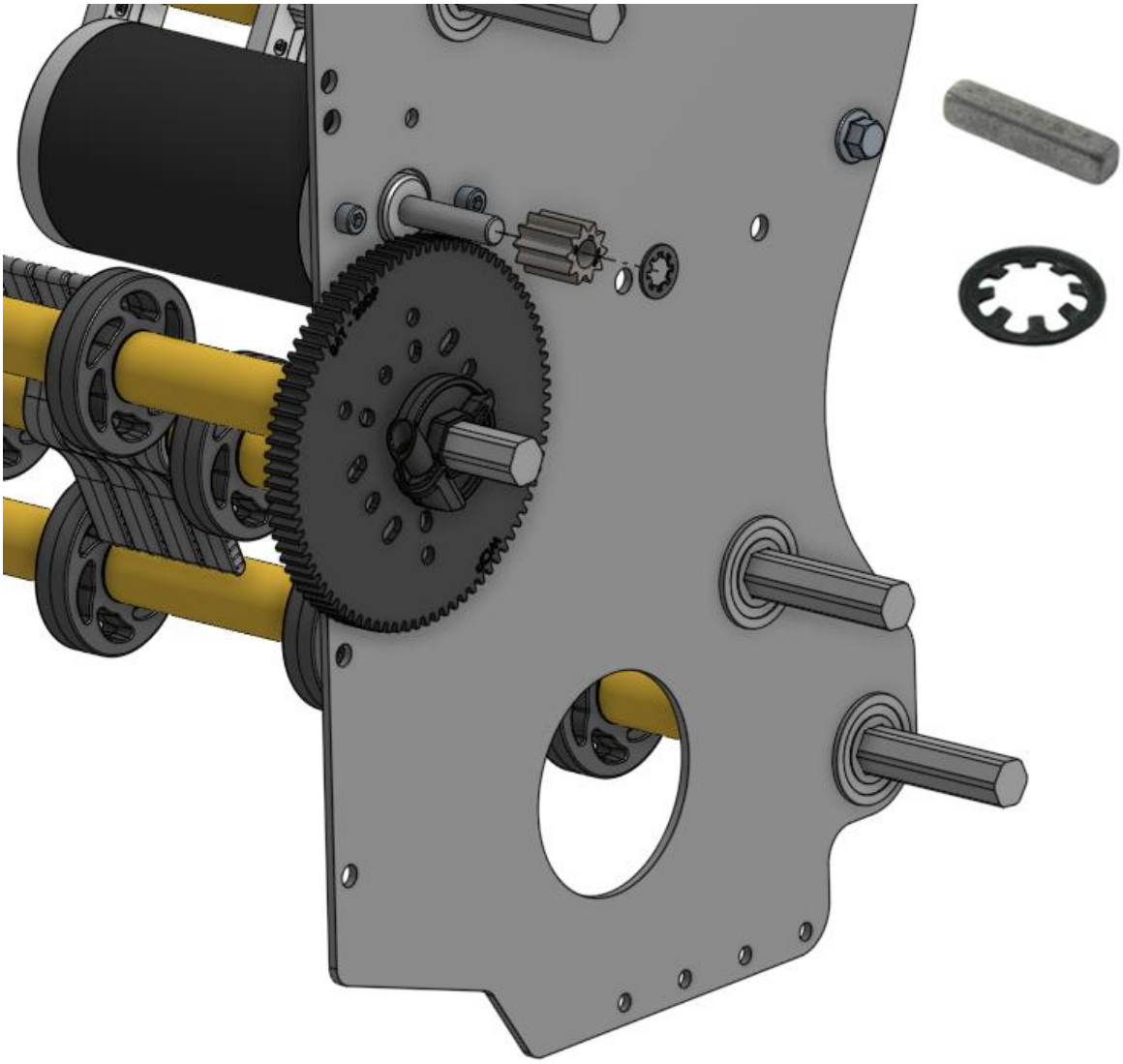
Figure 13: Attach the Feeder Gear



Step 10 **Attach the Motor Pinion** – On the side of the assembly shown in Figure 14, insert the 2mm x 2mm x 10mm Machine Key into the keyway on the CIM Motor shaft, biased towards the motor side of the slot (this may require pliers to press into the keyway). Then slide the 10-tooth pinion gear onto the motor shaft, making sure to align the keyway over the recently installed Machine Key. Then, slide the Push-On Retaining Ring (am-0033) onto the shaft to keep the gear from sliding off. This takes a decent amount of force to push the ring into place, a 3/8in socket or wrench may be used to help by going around the motor shaft and pushing on the ring. The gears should mesh together and allow you to spin the motor by spinning the Feeder Shaft. If everything looks correct, tighten the shaft collar from Step 9.

> Be sure to attach the pinion on the correct side of the assembly. With the motor shaft pointing directly towards you, the Launcher Hood should be on the right side of the assembly.

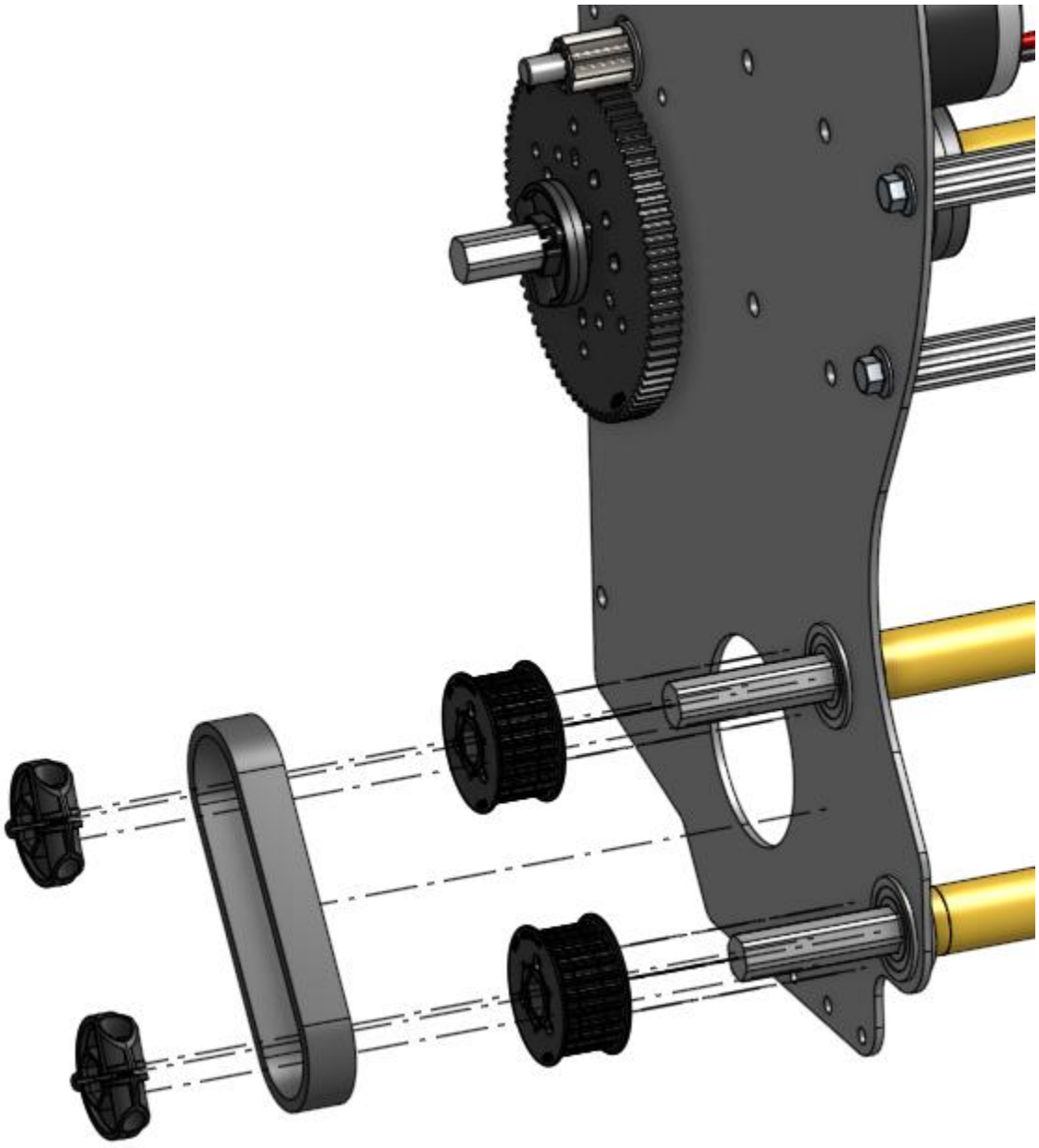
Figure 14: Attaching the Motor Pinion, with closeups of the Machine Key and Retaining Ring



Step 11 **Attach the Intake Belt** – On the same side of the assembly as the Feeder Gears, slide a 24-tooth pulley on to each intake shaft with the 55-tooth belt connecting them. Once the belt and pulleys are on, confirm that the two intake shafts spin together. Once confirmed, slide a shaft collar on to each shaft up against the pulleys and tighten them.

> Another method to attach the belt is placing both 24 tooth pulleys in place and then stretching the belt over them. You may need to "walk" the belt on to a pulley by rotating slowly and pushing the belt sideways on to it.

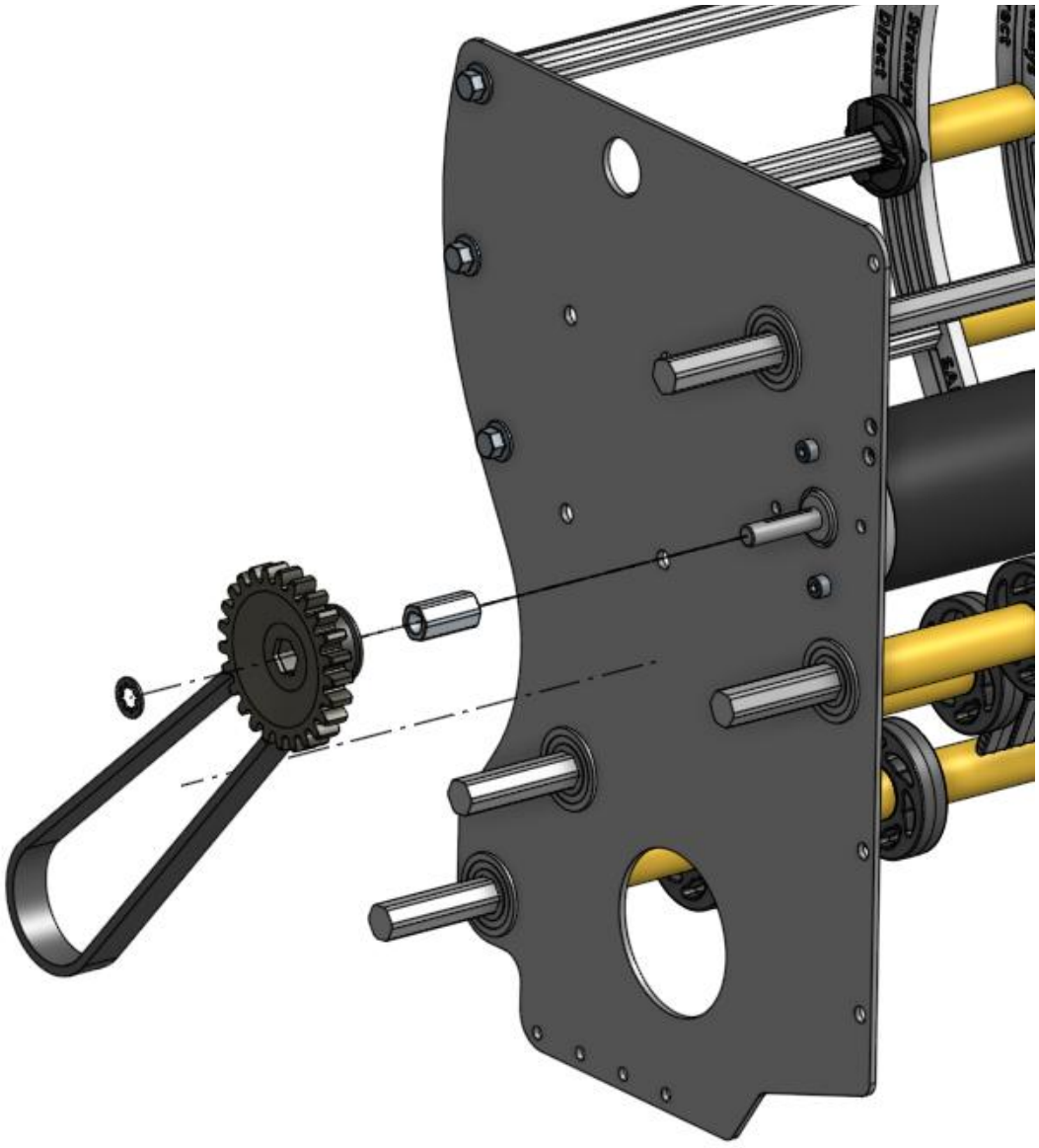
Figure 15: Attach the Intake Belt



Step 12 **Attach the Motor GearPulley** – On the opposite side of the assembly, locate the unused motor shaft. Insert the 2mm x 2mm x 10mm Machine Key into the keyway on the CIM Motor shaft (this may require pliers to press into the keyway). Then slide the 8mm to ½in hex adapter on to the motor shaft, noting to align the keyway over the recently installed Machine Key. Next, slide one of the Launcher GearPulleys (KB-26010) on to the adapter. Then, slide the Push-On Retaining Ring (am-0033) onto the shaft to keep the gear from sliding off. This takes a decent amount of force to push the clip into place. Put the 105-tooth belt around the pulley loosely now to avoid it being harder to install in the future.

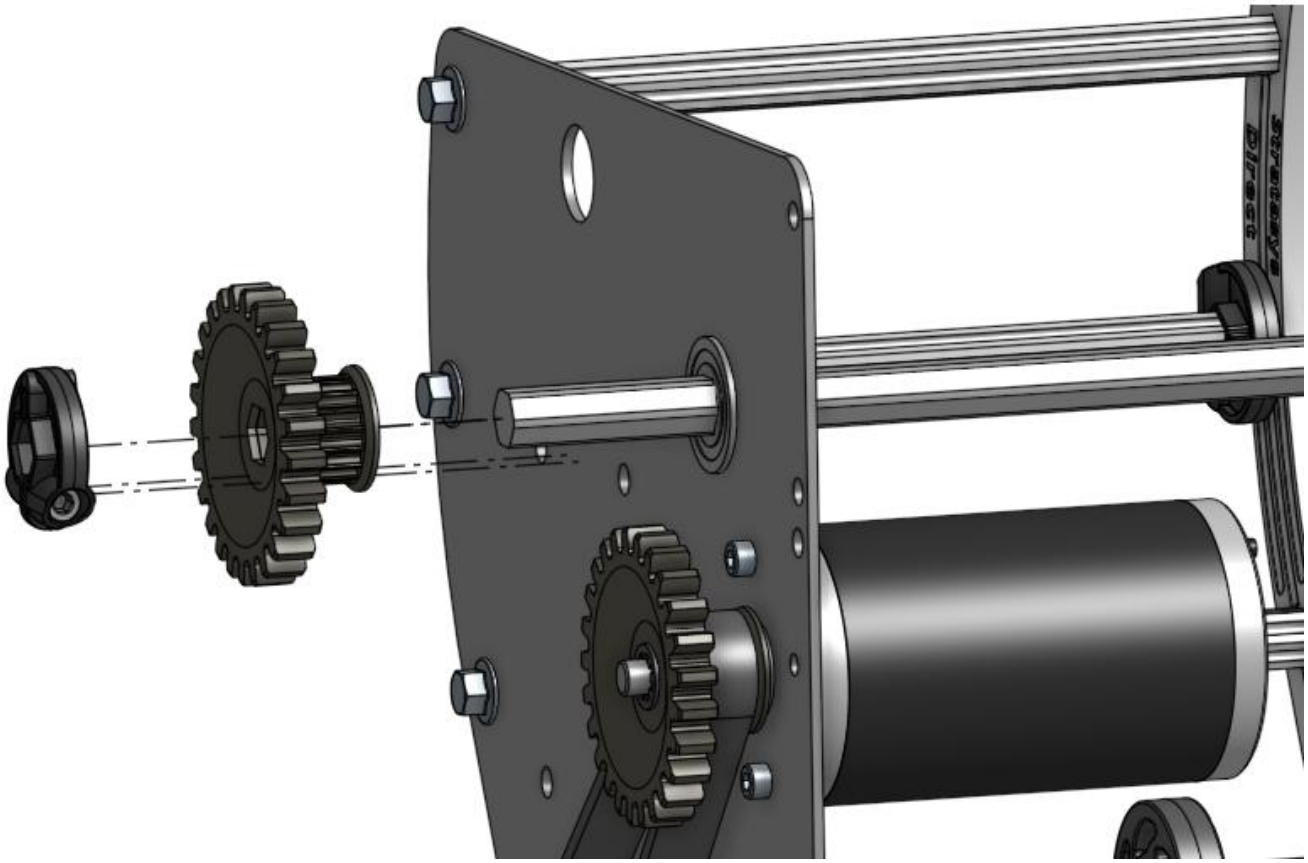
> **Note**: The gear section of this part should be on the outside edge.

Figure 16: Attach the Motor GearPulley



Step 13 **Attach the Launcher GearPulley** – On the shaft above the motor shaft, slide the other Launcher GearPulley (KB-26010) on so that it meshes with the one from Step 12. This should allow the motor and the Launcher Shaft to spin together. If this is the case, slide on a shaft collar and tighten it in place.

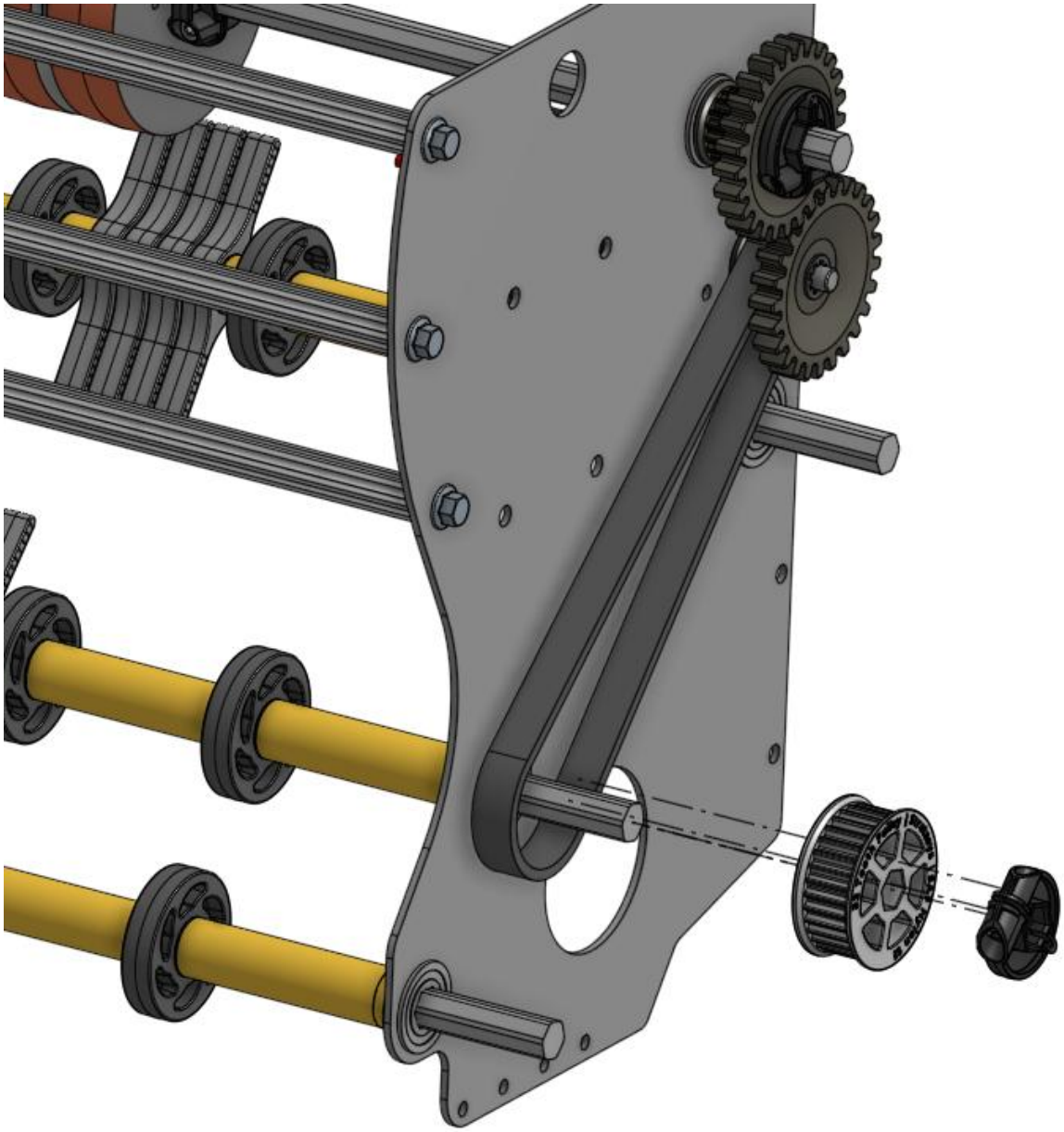
Figure 17: Attach the Launcher GearPulley



Step 14 **Attach the Transition Pulley** – On the same side of the assembly, locate the upper intake shaft. Slide the 32-tooth pulley on to the end of this shaft, connecting it to the 105-tooth belt from Step 12 as you do so. This should allow the motor, launcher shaft, and both intake shafts to all spin together. If this is the case, slide a shaft collar next to the 32-tooth pulley and tighten it in place.

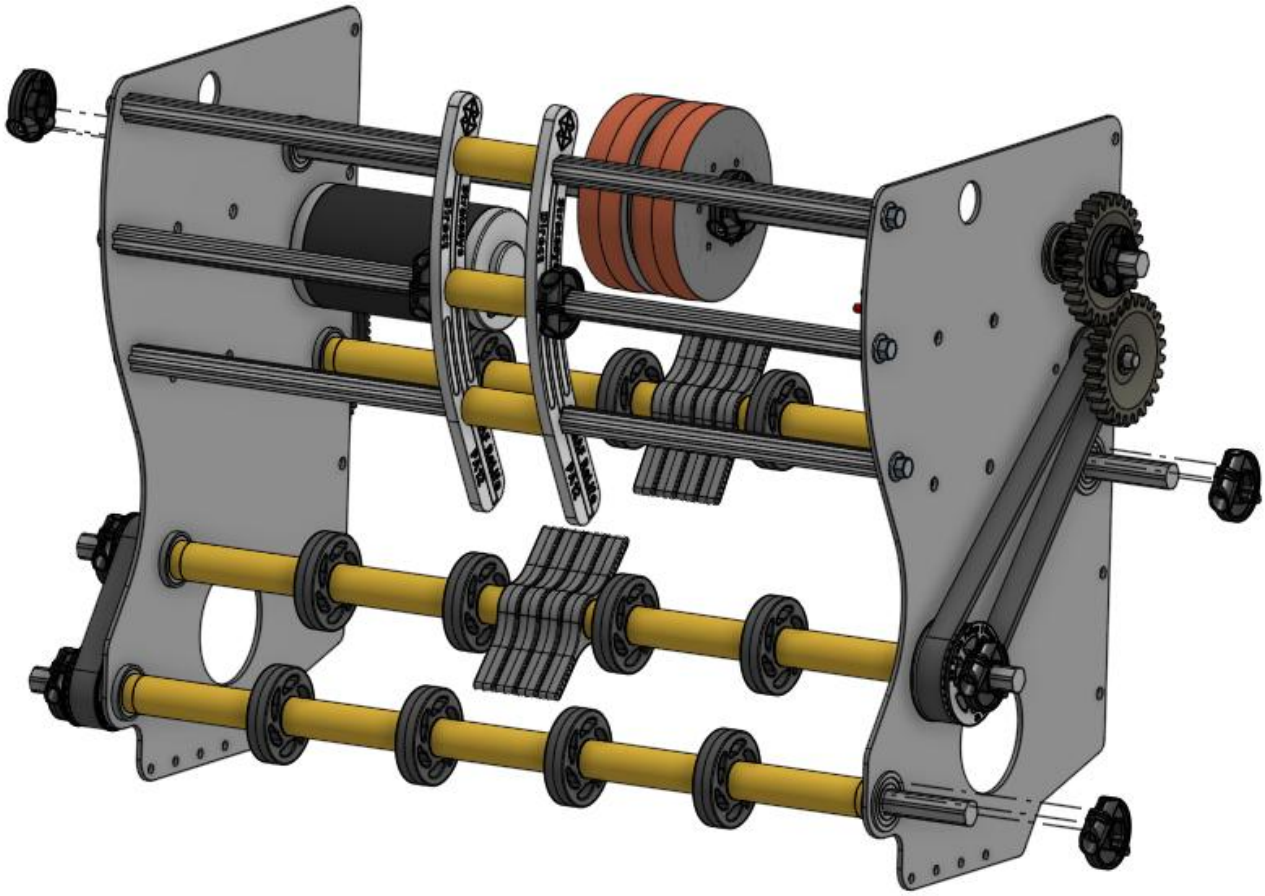
> This may be challenging, and another method of assembling this can be to put the pulley in place first, and then "walk" the belt on to the pulley by pushing it over the side while rotating the pulley.

Figure 18: Attach the Transition Pulley



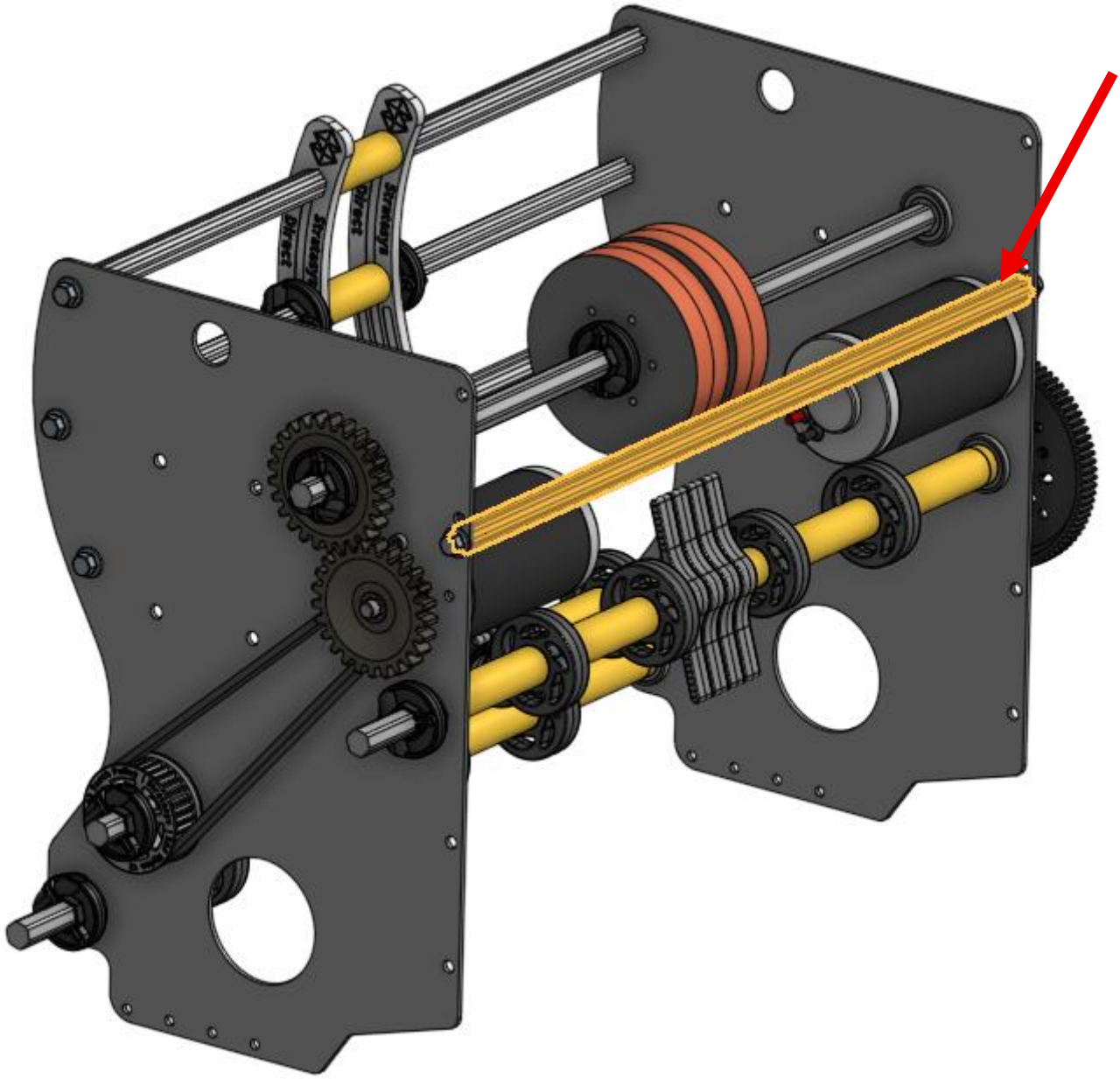
Step 15 **Attach the Remaining Shaft Collars** – There should be three remaining shaft collars. Locate the three shaft ends sticking out that do not have a shaft collar and add them on as noted in Figure 19Figure . For the 2 shafts with spacers, make sure the shafts are all pressed together as much as possible, and then tighten all 3 shaft collars.

Figure 19: Attach the Remaining Shaft Collars



Step 16 **Attach the Launcher Wheel Guard** – Locate the final piece of Churro shaft and the set of holes just above the CIM motors. Hold the Churro in place and attach it to the side plates with ¼-20 thread forming screws. The Churro location is highlighted gold with the red arrow in Figure .

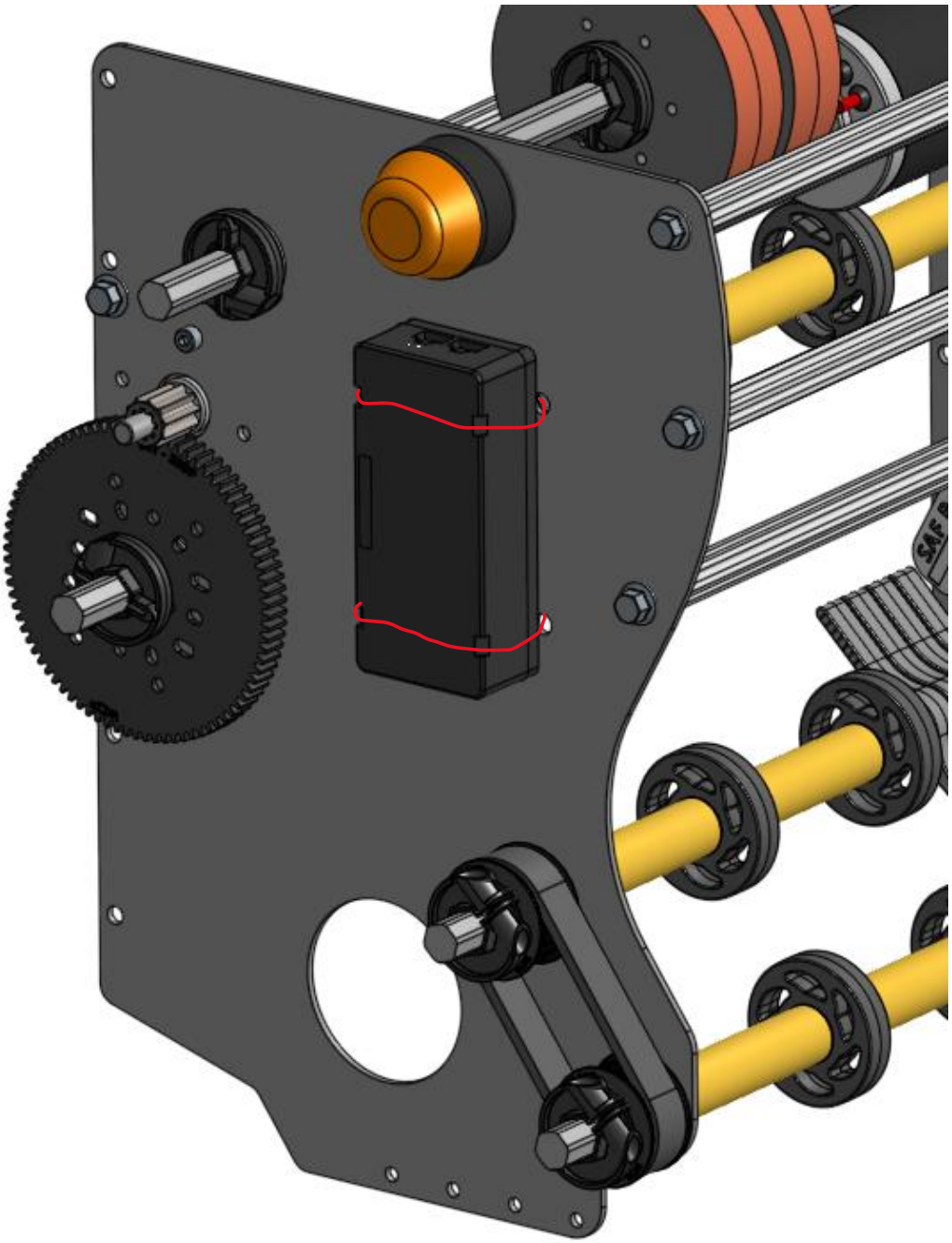
Figure 20: Attach the Launcher Wheel Guard



Step 17 **Attach the RSL and Radio** – On the opposite side, locate the mounting hole for the Robot Signal Light (RSL). Attach the RSL to the plate so the light is on the outside of the robot, then use the plastic nut to attach the RSL to the plate. Then attach the Robot radio using two 50lb cable ties as shown.

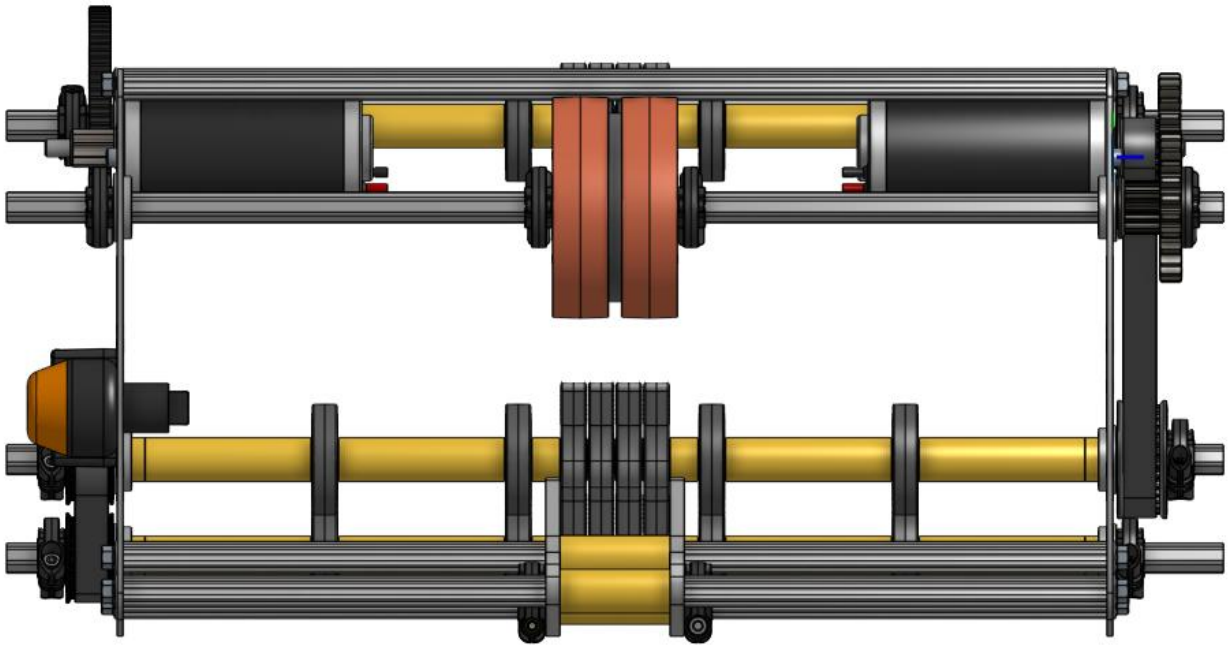
The Radio should be orienting so the 12V power is facing down.

Figure 21: Attaching the RSL and Radio



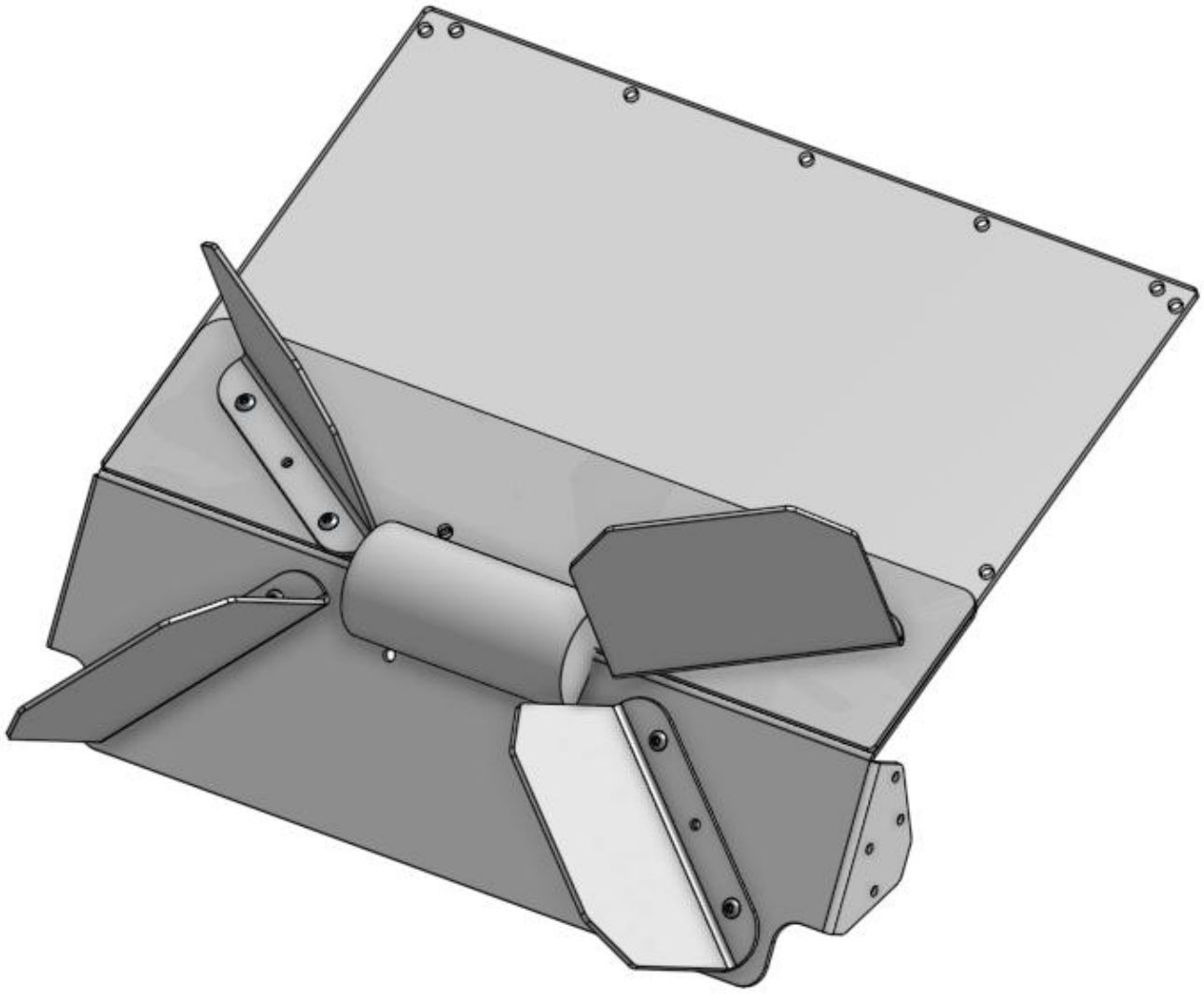
Step 18 **Align Everything** – Looking from the top down, align the Launcher Wheels and Launcher Hood to be centered, using the intake flaps to help as a visual. Once everything is aligned, slide the 4 shaft collars up against the Launcher Wheels and Launcher Hood and tighten them to lock them in place.

Figure 22: Align Everything



6.2.2 Build the Intake Base

Figure 23: Intake Base



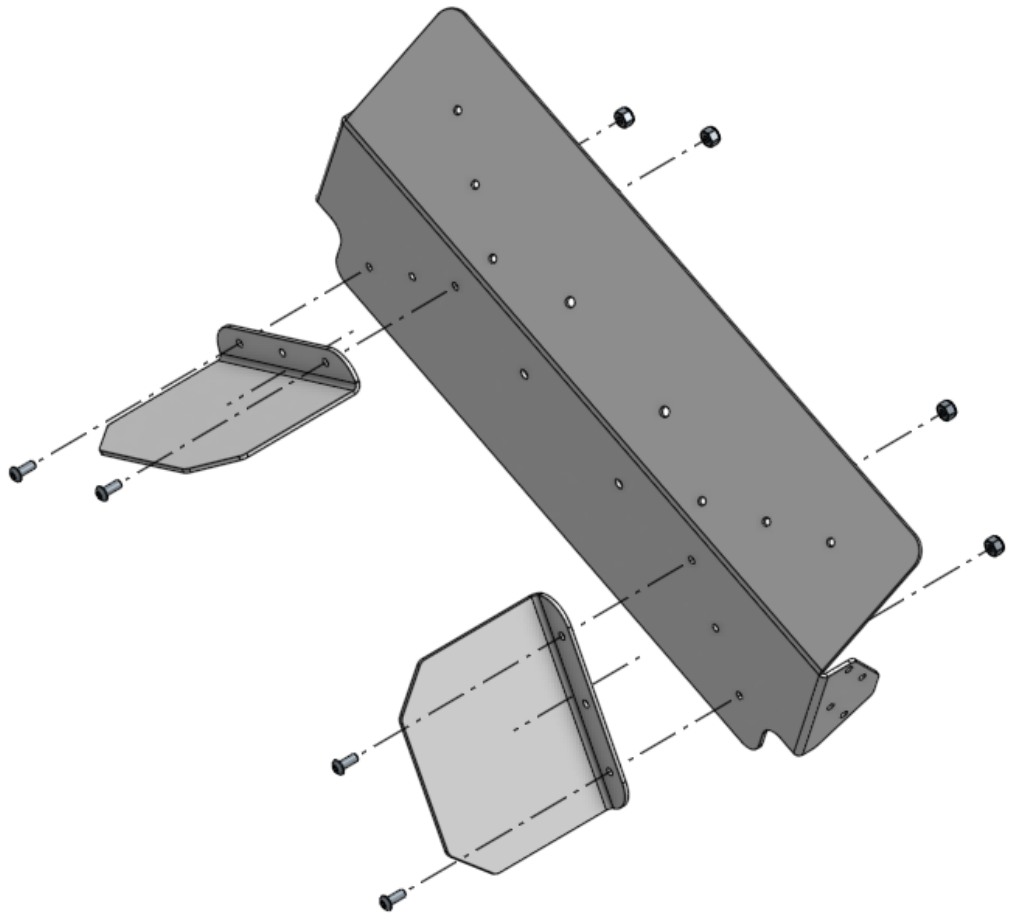
Parts needed:

- Intake Baseplate (KB-26003) – qty 1
- Hopper Bottom Panel (KB-26004) – qty 1
- Intake Guide (KB-26013) – qty 4
- Dead Zone Noodle (KB-26017) – qty 1
- 1/2in long #10-32 Button Head Cap Screw – qty 4
- 1in long #10-32 Button Head Cap Screw – qty 4
- #10-32 Locknut – qty 8

Step 1 **Front Intake Guides** - Start on the face of the Intake Baseplate (KB-26003) that has two small side flanges, with the flanges pointing away from you. Attach two of the Intake Guides (KB-26013) as shown in Figure 24Figure , so that they are a mirror image of each other. Attach using 4x ½in long #10-32 bolts and locknuts.

> Pay special attention to the orientation of the Intake Guides. They should be assembled so they form a peak in the center, with the flanges toward the outside.

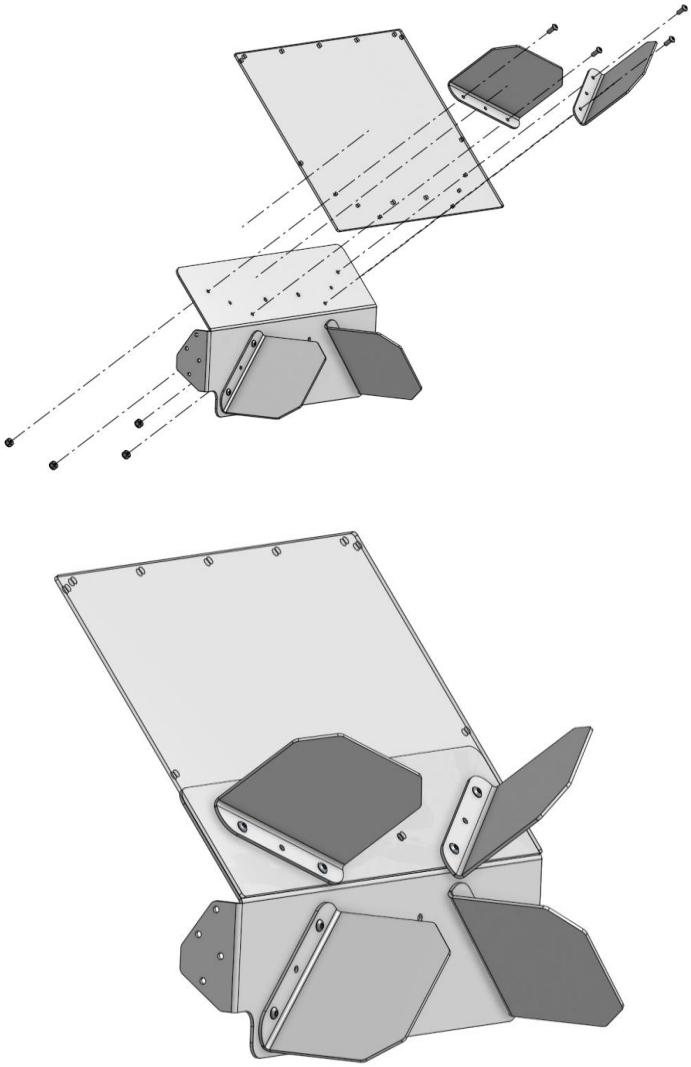
Figure 24: Assembling the Front Intake Guides



Step 2 **Back Intake Guides** – On the other face of the same side of the Intake Baseplate (KB-26003), line up the Hopper Bottom Panel (KB-26004) and the remaining Intake Guides (KB-26013). You can use the holes in the Intake Baseplate to match drill the Hopper Bottom Panel if that isn't already done. The edge of the Hopper Bottom Panel should line up with the start of the bend in the Intake Baseplate. Attach these components together using 4x 1in long #10-32 bolts and locknuts with the bolt head on the same side as the Intake Guides. The Hopper Bottom Panel is sandwiched between the Intake Baseplate and the Intake Guides.

> **VERY IMPORTANT STEP** – These two intake guides need to be mounted differently from each other, so that one is facing one side of the assembly and one is facing the opposite side, as shown in Figure 25 Figure and Figure . Failure to do this will result in the Fuel jamming in the hopper rather than feeding into the launcher correctly.

Figure 25: Attaching the Back Intake Guides



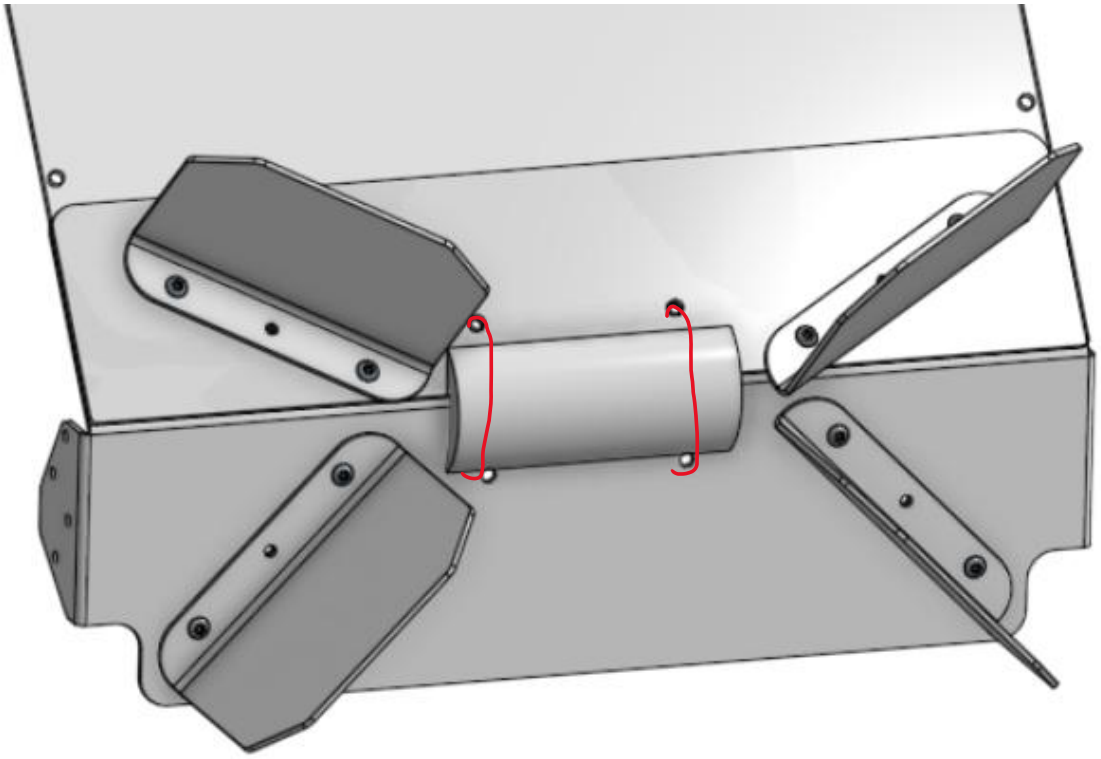
Step 3 **Cut the Dead Zone Noodle** - Cut a foam noodle to be 5in long and cut it into thirds down the length.

> The exact thickness of this foam is something that may need to be experimented with depending on differences in foam material and robot assembly

Step 4 **Attach the Dead Zone Noodle** –Take this cut noodle and attach it to the assembly using 2x 50lb cable ties (shown in red in Figure 26). Make sure the heads of the cable ties are on the back of the assembly (the side opposite the noodle) so that they do not interfere with the Fuel. These cable ties can be tightened as much as possible.

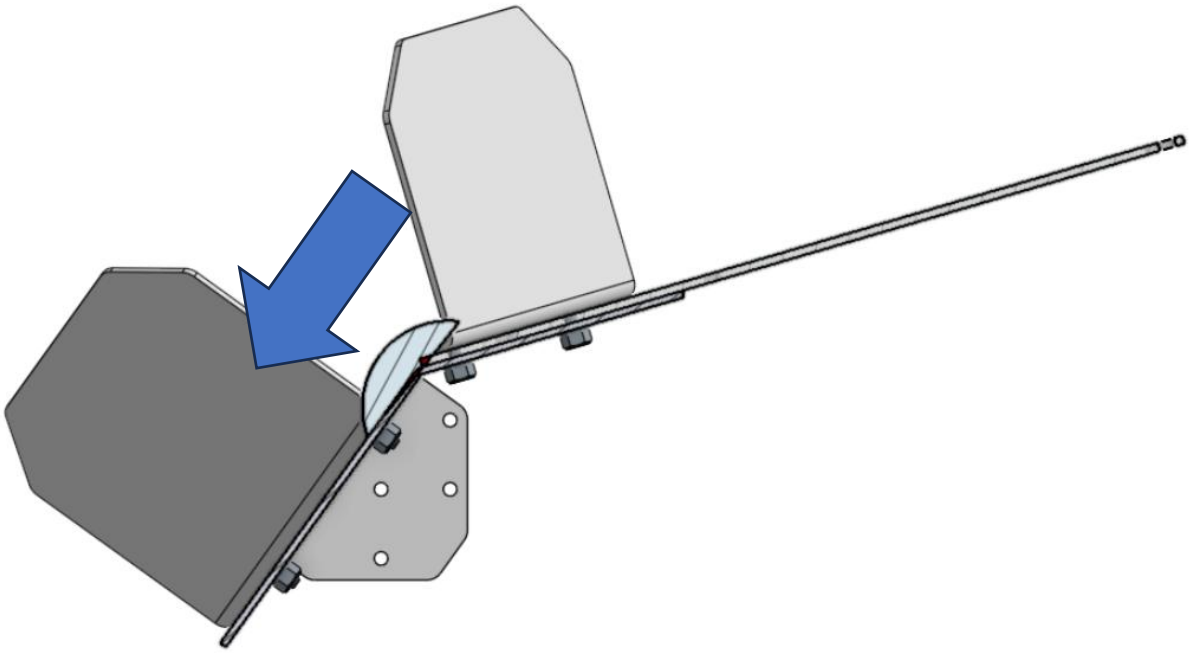
> The purpose of this noodle is to remove a “dead zone” between the intake rollers and the launcher wheel while launching Fuel.
>
> This Dead Zone Noodle may need to be replaced throughout the season so watch for wear.

Figure 26: Attaching the Dead Zone Noodle



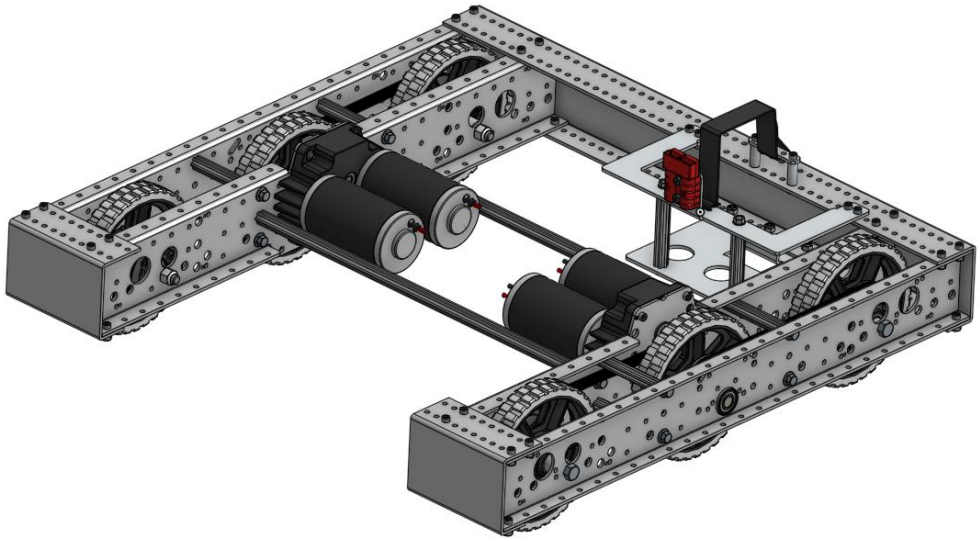
It is very important to align the noodle as far down (towards the floor on the intake side) as possible. The noodle is meant to add compression between the intake rollers and the baseplate, but not the feeder roller. If Fuel is consistently going into the launcher while intaking, it is likely because this noodle is too large or shifted too close to the feeder roller. See Figure 27 for more details showing how to locate the noodle.

Figure 27: Noodle Mounting Location



6.2.3 Adjust the Robot Chassis

Figure 28: Front Frame

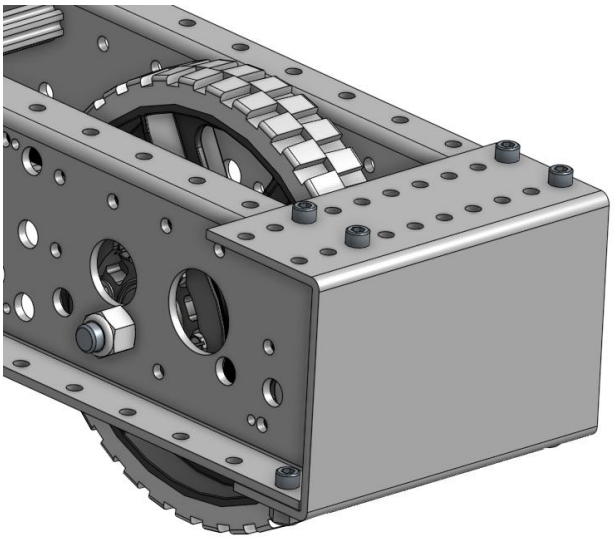


Parts needed:

- Am14u6 Chassis

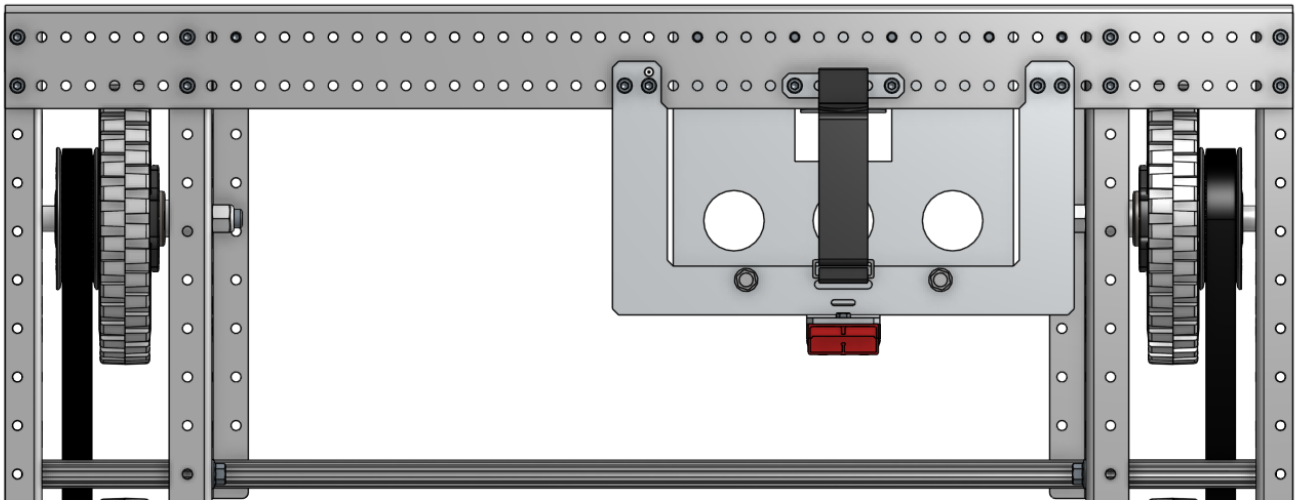
Step 1 **Cut the Front Rail** – After building the chassis in the "Square Configuration" dimensions, the front rail of the chassis will need to be cut in order to provide an opening for Fuel to pass through. You can either cut the rail in place, such that the front rail is flush with the bottom flange of the inside of each drive rail, or unbolt the front rail, cut two 5in long segments and reattach them at the front of each side of the chassis.

Figure 29: Cutting the Front Rail



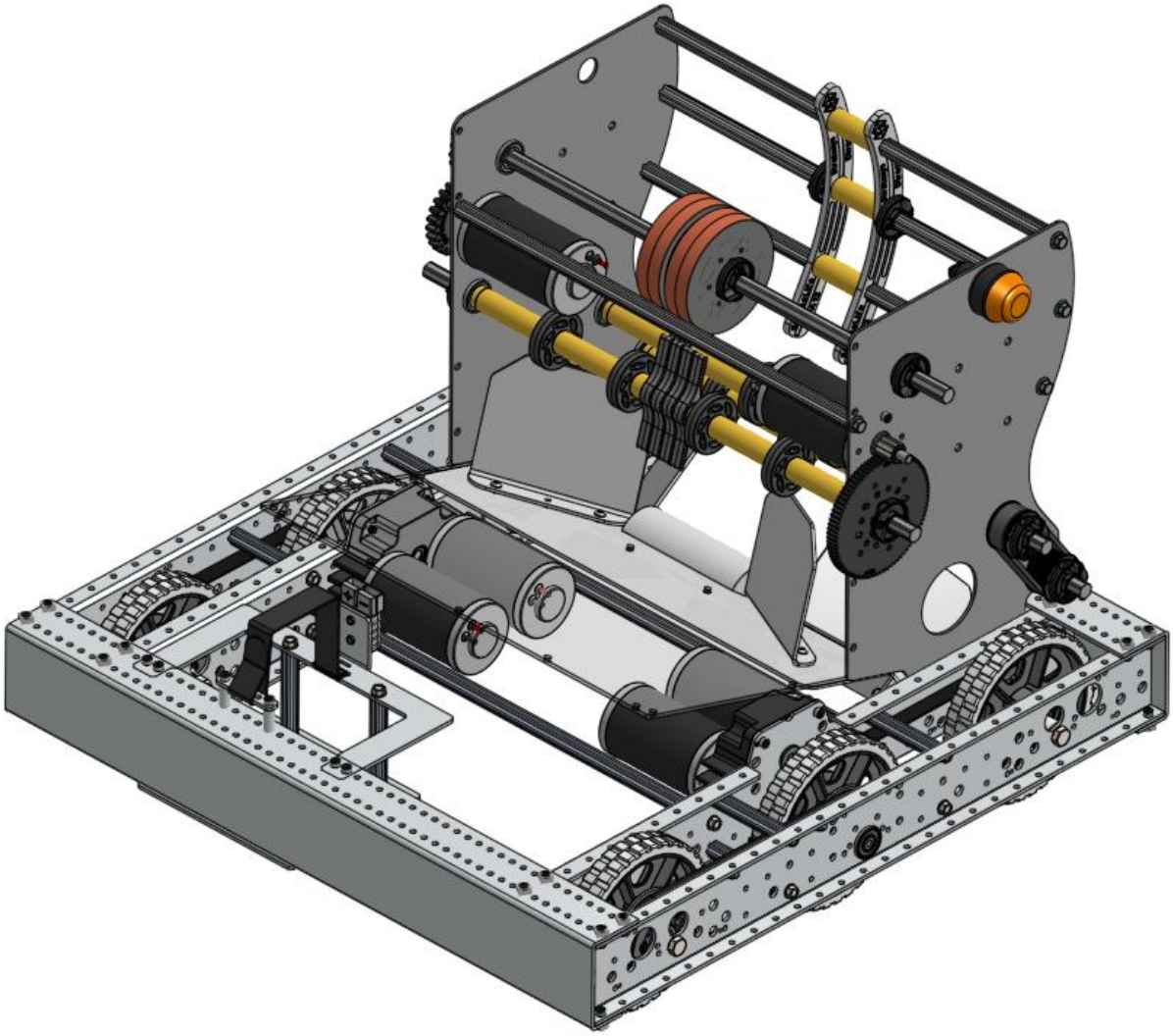
Step 2 **Attach or Move the Battery Mount** – If you have not already built and attached the battery mount assembly, build it now using the AndyMark Battery Mount instructions, and attach in the corner of the chassis as shown below. If you have already attached the battery mount assembly, it needs to be shifted all the way to the corner in the back of the robot chassis, as shown below in Figure .

Figure 30: Location of Battery Mount



6.2.4 Attaching the Mechanisms

Figure 31: Attaching the Mechanisms



Parts needed:

- Fuel Mechanism (from 6.2.1)
- Intake Assembly (from 6.2.2)
- Modified AM14U6 Drive Base (from 0)
- 1/2in long #10-32 Button Head Cap Screw – qty 12
- #10-32 Locknut – qty 12

> **Before Starting this section**: It is recommended to remove the front wheels in order to create more access for tools. These wheels are easy to take on and off by removing the large bolt that functions as the wheel axle.

Step 1 **Attach the Intake** - Drop the Intake Assembly into the chassis from above on the open side of the frame, with the Hopper Bottom Panel pointing towards the back of the chassis. Use the 4x holes on each side of the drive base (as highlighted gold in Figure 33Figure) to connect the Intake Baseplate to the chassis. Attach with 1/2in long #10-32 button head cap screws and #10-32 locknuts.

> Do not fully tighten the bolts until after putting bolts in all the holes so that it is easier to line up.

Figure 32: Dropping the Intake into the Chassis

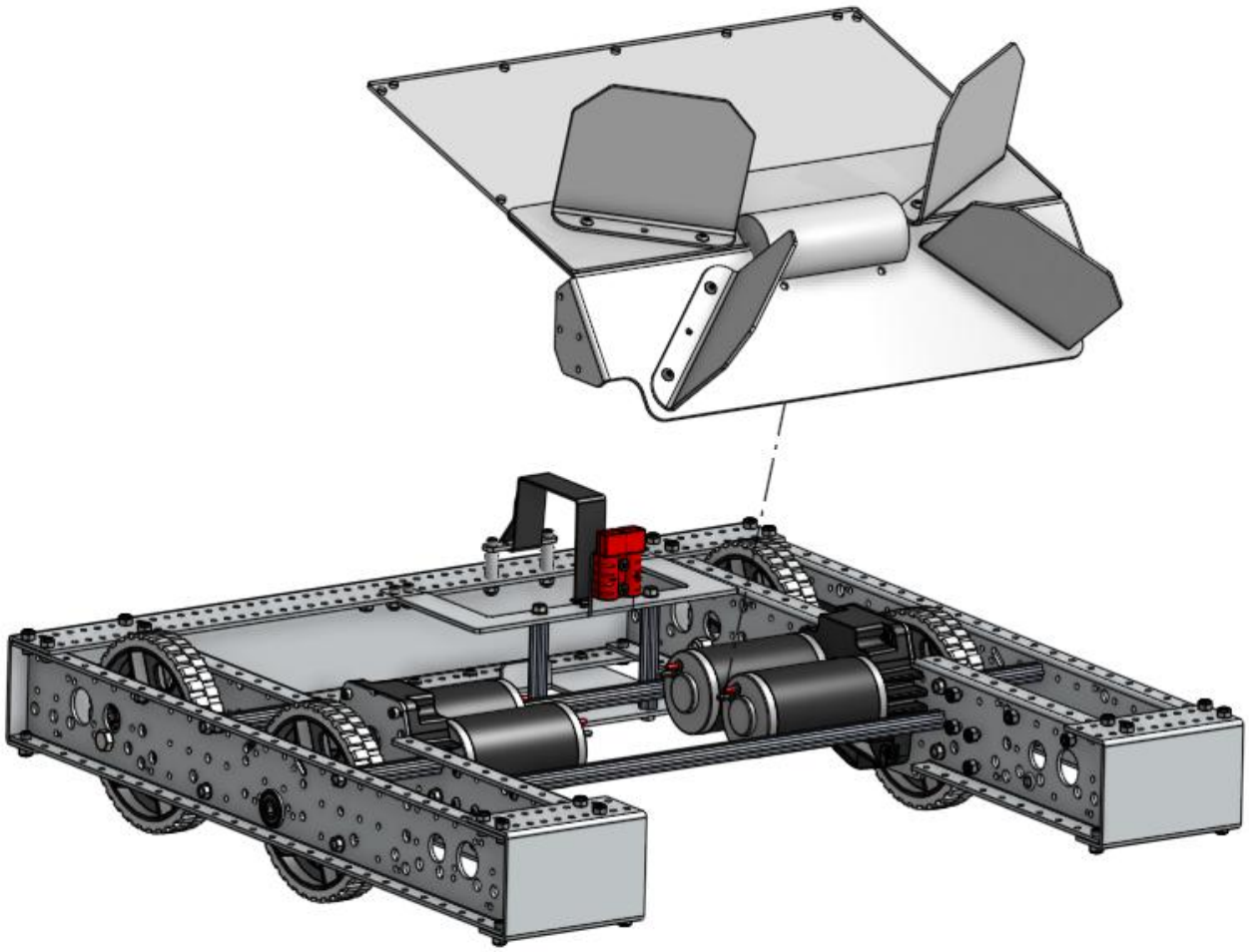


Figure 33: Bolt Hole Locations for Intake Baseplate

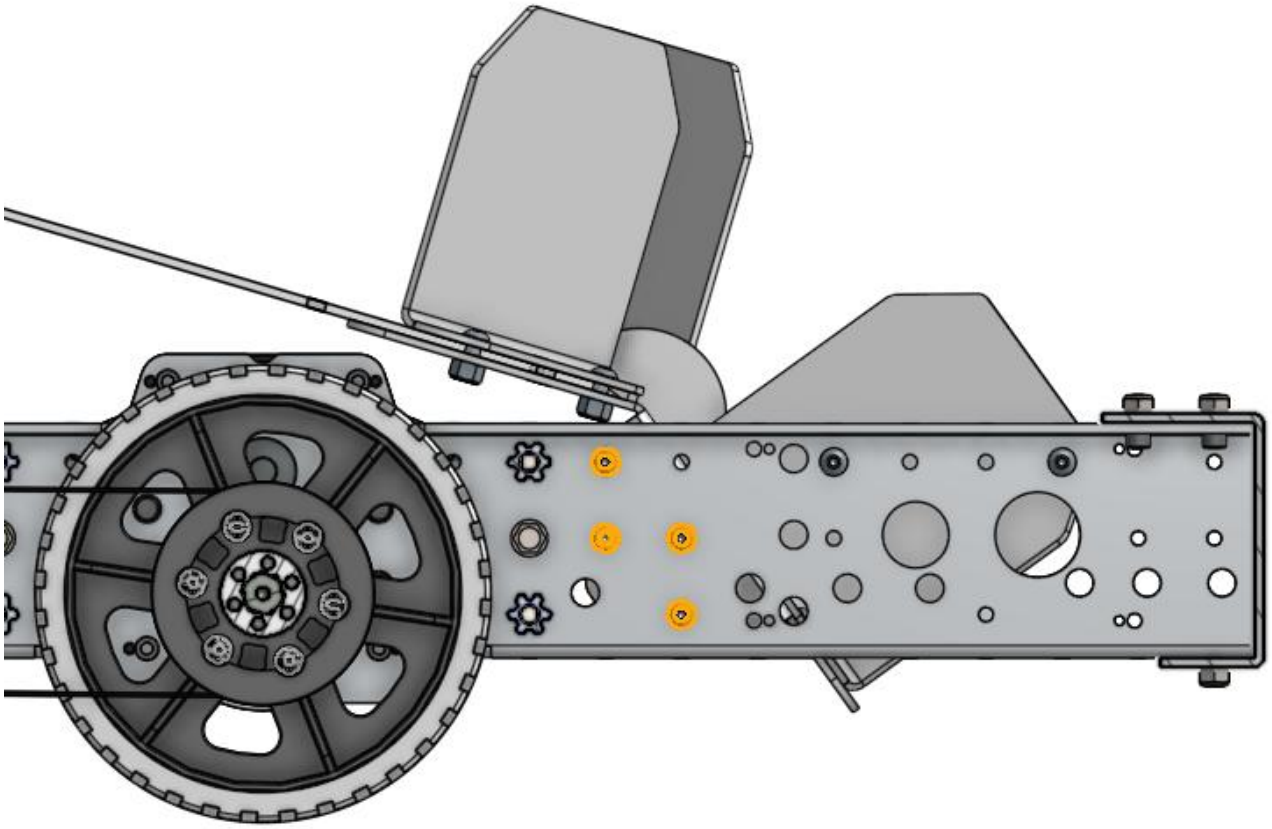
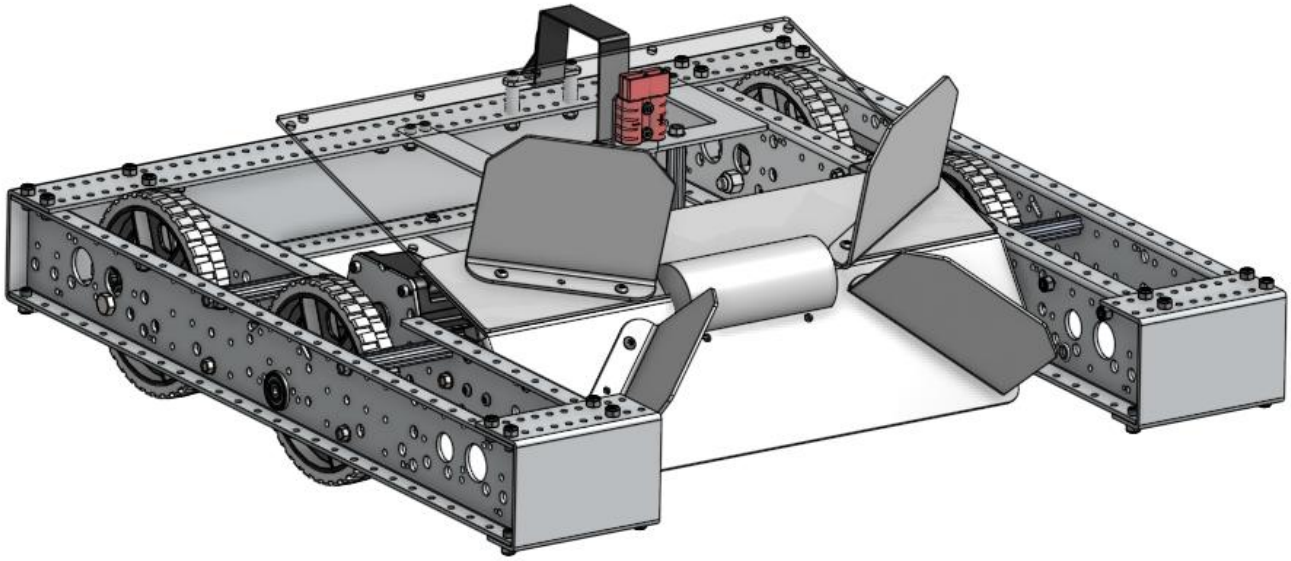


Figure 34: Assembled Intake Baseplate



Step 2 **Attach the Fuel Mechanism** – Drop the Fuel Mechanism into the chassis from above on the open side of the frame, with the bottom intake roller pointing towards the front of the chassis. Use the 4x holes on each side of the drive base, as highlighted gold in Figure 36, to connect the Fuel Mechanism to the chassis. Attach with 1/2in long #10-32 button head cap screws and #10-32 locknuts. After these bolts are tightened, the front drivetrain wheels and belts can be re-attached.

> Do not fully tighten the bolts until after putting bolts in all the holes so that it is easier to line up.
>
> Only 2x of these holes are necessary per side, but all can be used.

Figure 35: Attaching the Fuel Mechanism

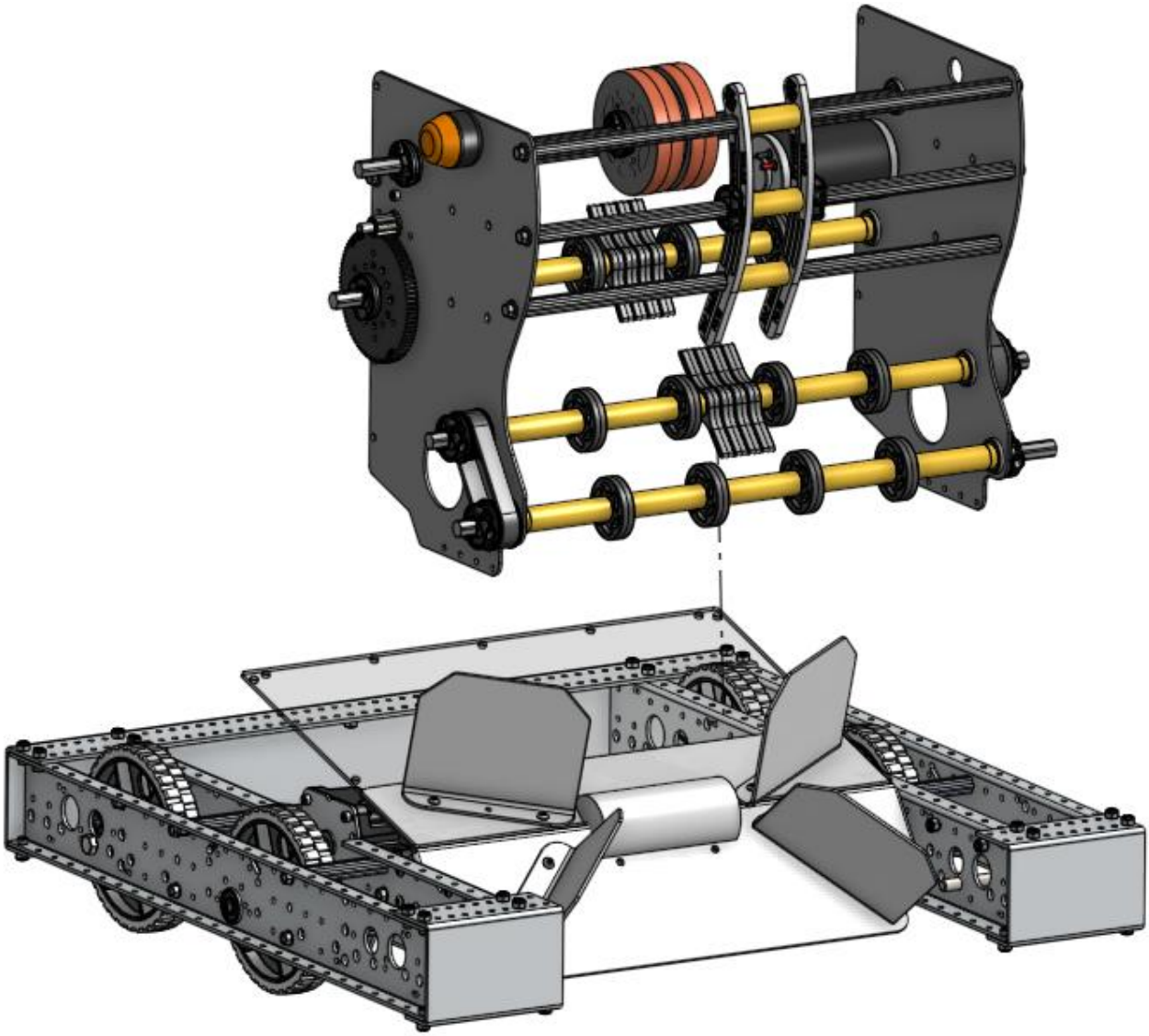
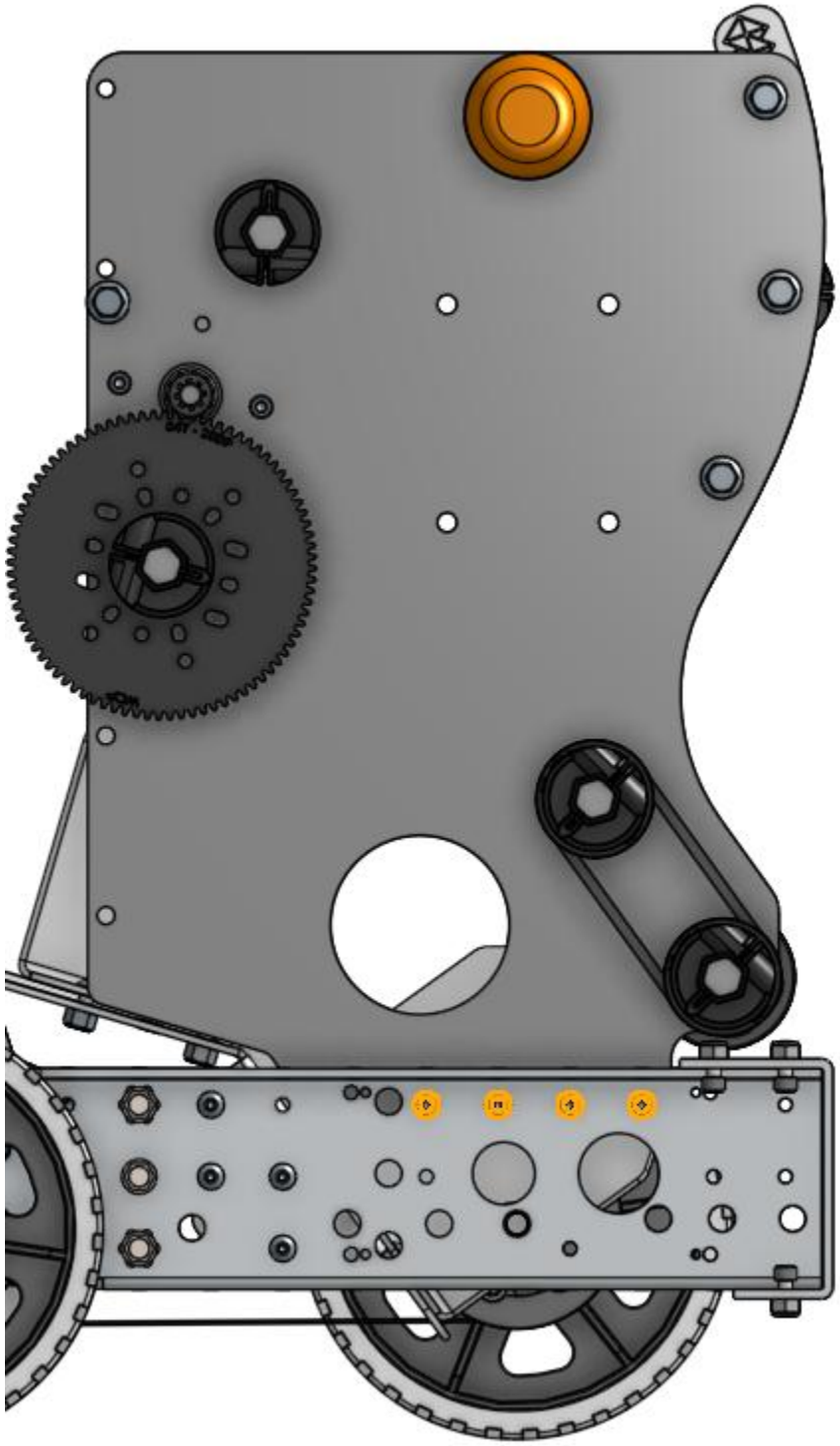
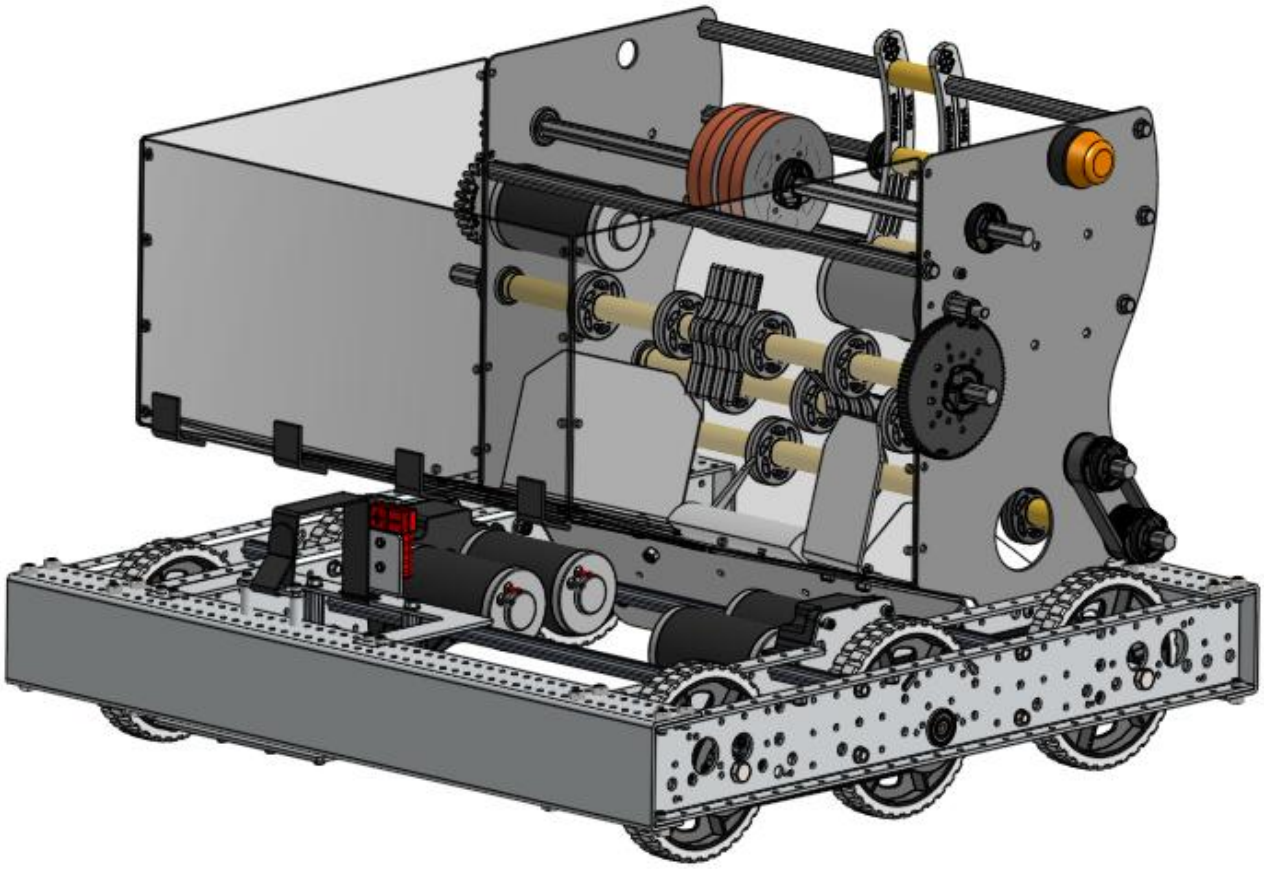


Figure 36: Bolt Hole Locations for Attaching Fuel Mechanism



6.2.5 Building the Hopper

Figure 37: Building the Hopper

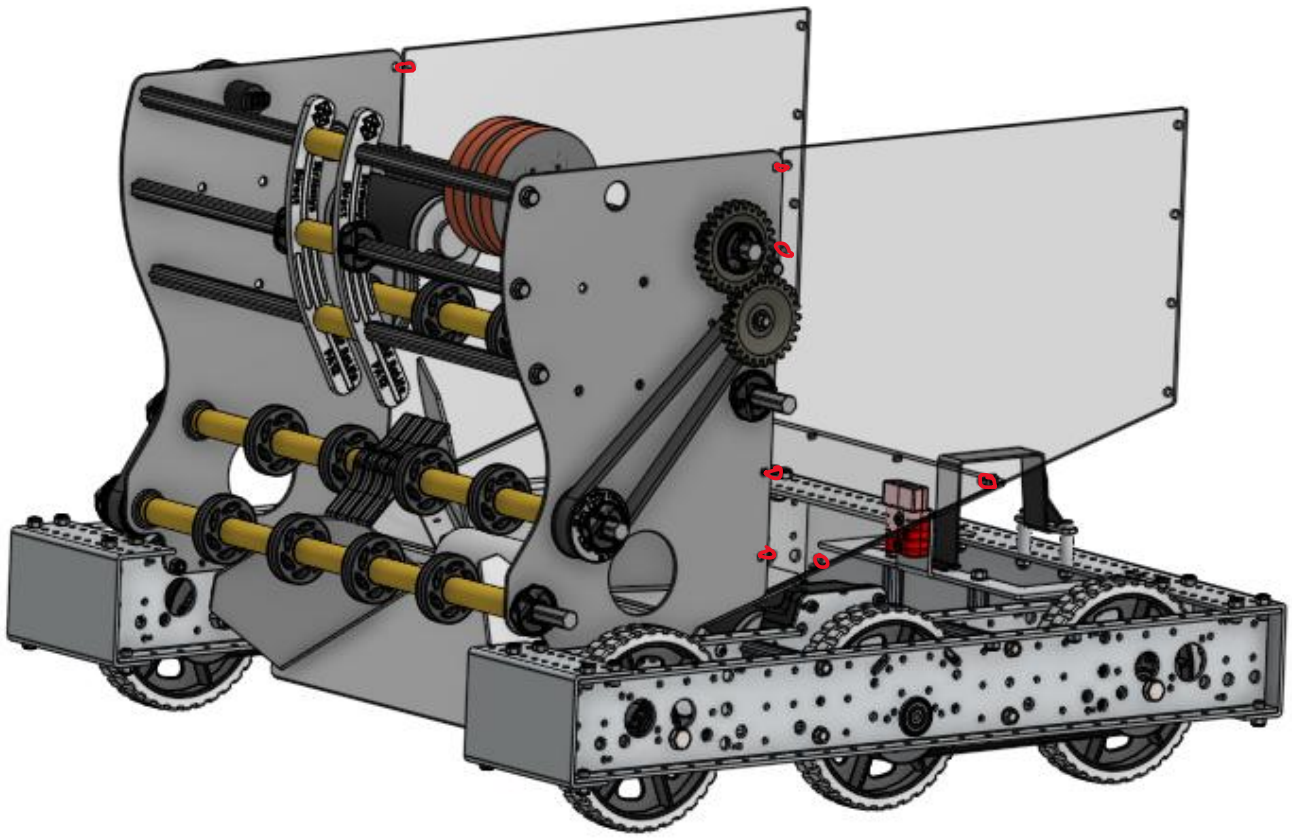


Parts needed:

- Robot through Section 6.2.4
- Side Hopper Panel (KB-26005) - qty 2
- Back Hopper Panel (KB-26006) - qty 1
- Battery Access Panel (KB-26014) - qty 1
- Panel Locks (KB-26009) – qty 4
- 50lb Cable Ties – qty 25

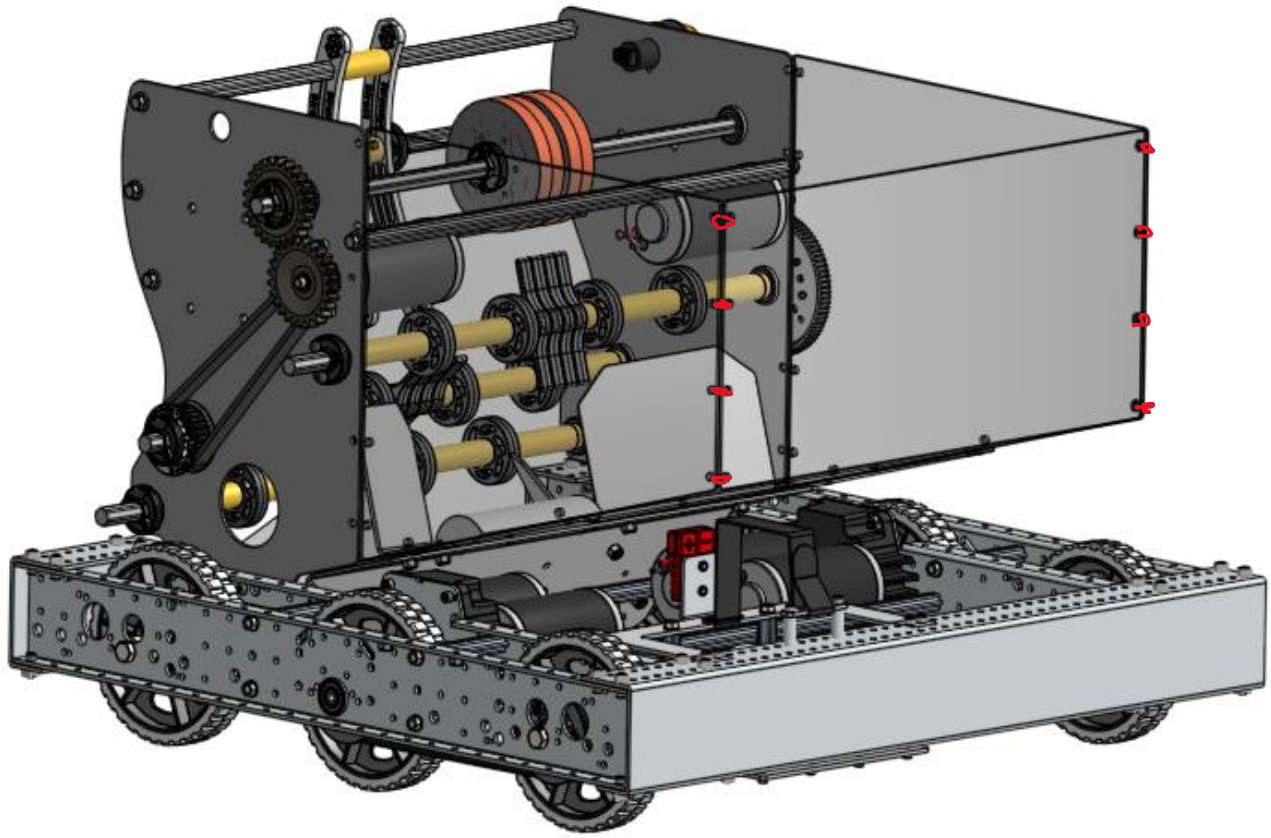
Step 1 Attach the Side Hopper Panels to each Side Plate and to the Bottom Hopper Panel with twelve 50lb cable ties (6 per side) as shown in red. Keep the heads of the cable ties on the outside of the structure, then use flush cutters to trim the excess cable tie once they are all tight.

Figure 38: Attaching the Side Hopper Panels



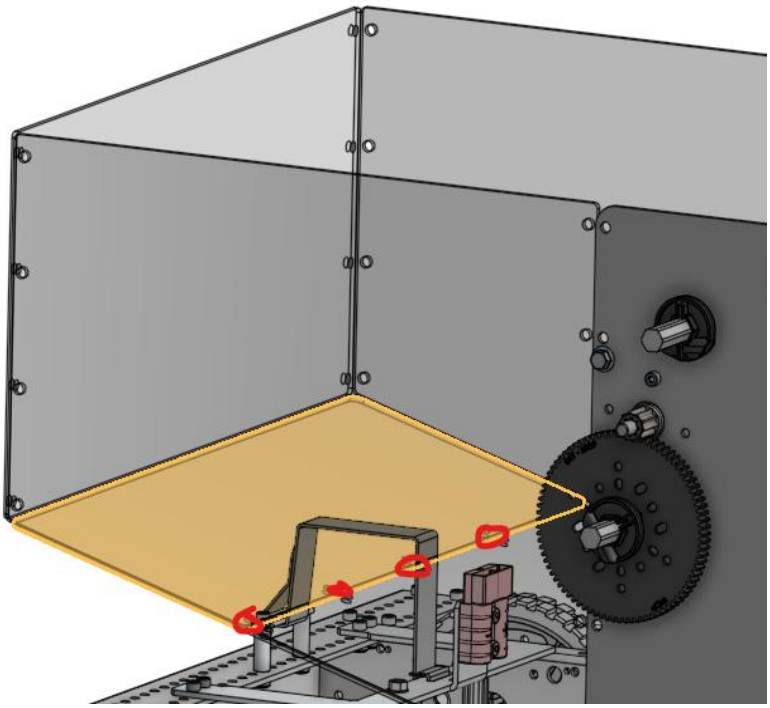
Step 2 **Attach the Back Hopper Panel** – Attach the Back Hopper Panels to the ends of the Side Hopper Panels with eight 50lb cable ties (4 per side) as shown. Keep the heads of the cable ties on the outside of the structure, then use flush cutters to trim the excess cable tie once they are all tight.

Figure 39: Attaching the Back Hopper Panel



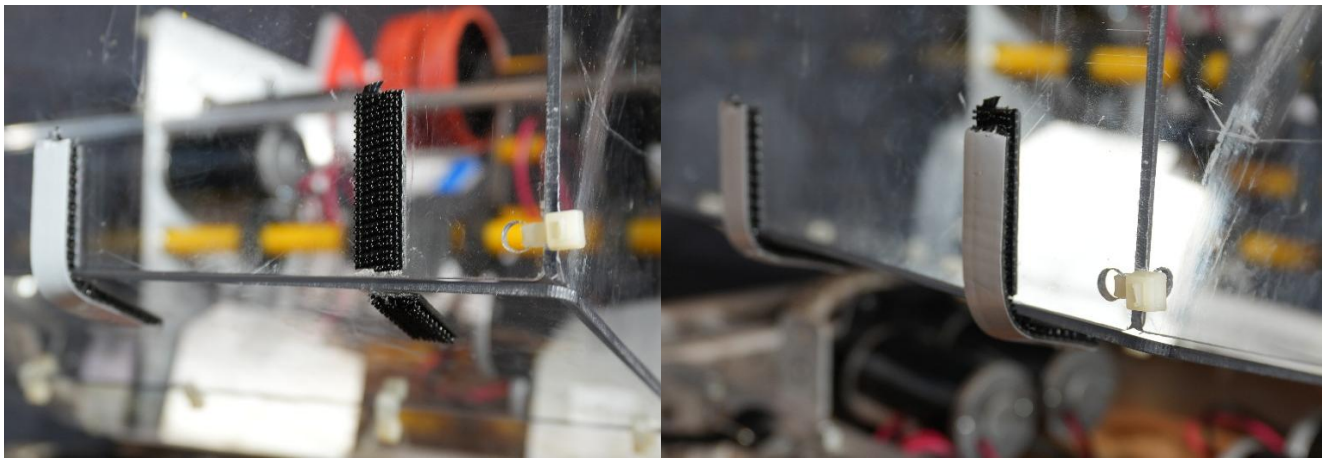
Step 3 **Attach the Battery Access Panel** - Attach the Battery Access Panel to the Bottom Hopper Panel with five 50lb cable ties. These cable ties should be snug, but not tight, this will create a hinged flap door. Keep the heads of the cable ties on the bottom of the structure, then use flush cutters to trim the excess cable tie once they are all tight.

Figure 40: Attaching the Battery Access Panel



Step 4 **Panel Locks** - Cut and the Panel Locks (four 3in long strips of paired Dual Lock). Adhere one side of each pair spanning across the bottom edge of the hopper and the Battery Access Panel. Cut along the seam between the two panels to allow Battery Access Panel to move again. Use the other half of each pair, with the backing still in place, to create locks for the Battery Access Panel.

Figure 41: Battery Access Panel Locks



7 Bumper Assembly

The following section suggests one way to build 2 sets of bumpers (red and blue), but teams may choose to use other materials and processes if desired. Be sure to reference the 2026 Game Manual for specifics on what is and is not allowed.

Teams sourcing materials themselves may choose to do a different process if preferred and can reference the Bumper Guide for an overview of other materials and methods for making bumpers.

Rookie teams will still need to source additional foam to make 2 sets of Bumpers or figure out how to do swappable bumper covers (some recommendations are in the Bumper Guide). These directions assume that teams have sourced additional foam.

7.1 Plywood

Step 1 Cut ¾in Plywood according to the following dimensions:

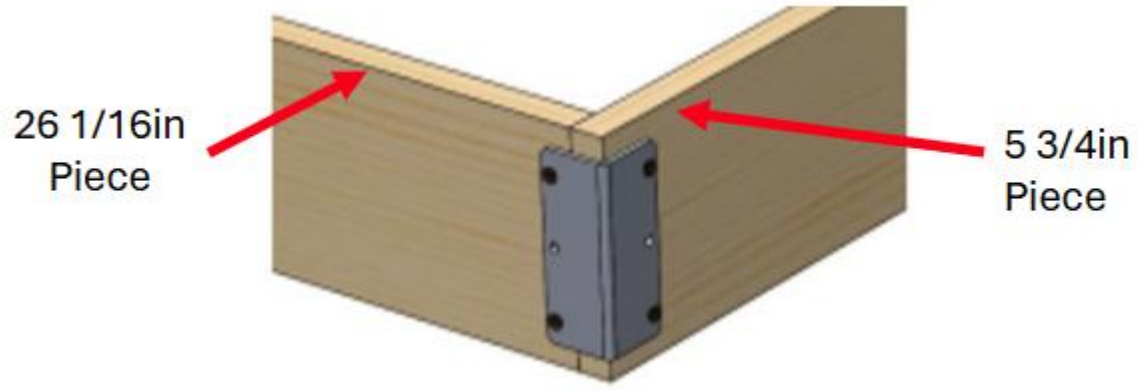
Table 10: Bumper Backing Dimensions

Dimensions	Quantity
5 3/4in x 5in (14.61cm x 12.7cm)	4
26 1/16in x 5in (66.2cm x 12.7cm)	4
28in x 5in (71.12 x 12.7cm)	2

Note that the side bumpers, 26-1/16in (66.2cm) are intentionally 1/4in (0.635cm) shorter than the length of the chassis. This is to allow room for the multiple layers of fabric between the side bumper and back bumper.

Step 2 Attach one of the 26 1/16in long pieces to the 5 3/4in long pieces with a corner bracket. Ensure that the end of the 26 1/16in should meet the face of the 5 3/4in piece

Figure 42: Alignment of Plywood for L Attachment



Step 3 Repeat Step 2 so you end up with 4 L-shaped pieces of wood.

7.2 Foam Noodles

Step 1 Cut foam noodles to the following dimensions:

Table 11: Foam Noodle Lengths

Length	Quantity
8-1/4in* (21cm)	8
33in* (83.82cm)	4
27-13/16in* (70.64cm)	8

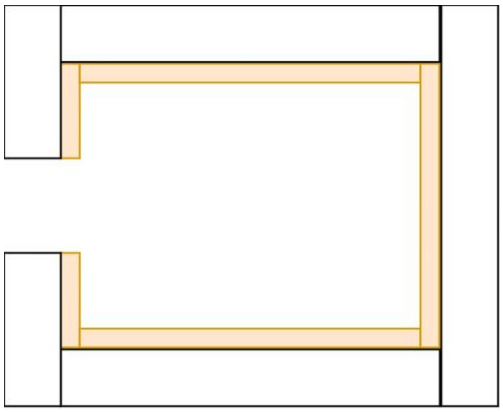
*Solid foam noodles will generally provide adequate performance and durability for most robots. If you would like additional protection, we recommend that teams purchase ½in (1.27cm) foam tiles and cut the sheets to be 5in(12.7cm) by the above lengths, splitting longer lengths across 2 tiles as needed, and place either in front of or behind the foam noodles. If teams do this, add 1in(2.54cm) to the 27-13/16in (70.65cm) measurement for the back noodles to end up at 28-13/16in (73.18cm) in length, and add 0.5in (1.27cm) to the 8-1/4in (20.96cm) measurement for the front noodles to end up at 8-3/4in(22.23cm).

Alternatively, for reduced likelihood of measurement error and to ensure a snug fit, you can use the bumper backing itself to measure. To do this, lay out all 3 bumper sections as they will sit on the robot, with the end of the long side of each L bumper abutting the face of the single back bumper.

Figure 43: Bumper Backing Layout

Start with the sides of the robot (the top and bottom of Figure 43), cut a pair of stacked foam noodles such that they perfectly cover all exposed plywood. You may want to secure these noodles to the wood with tape (as described in the next step) so they don't move around as you work on the remaining pieces. For the back side, cut a stacked pair of noodles such that each end is flush with the far edge of the side noodles, overhanging the wood by ~2.5in (6.35cm) on each side. For each front piece, cut a pair of noodles such that one end is flush with the end of the plywood at the edge of the bumper opening, and the other end is flush with the outside edge of the side noodles as noted in Figure 44.

Figure 44: Foam Noodle Layout



It's easiest to cut foam noodles with a serrated blade.

Smaller pieces of foam noodle may be combined to meet the total length needed but additional tape may be needed to secure in place.

Step 2 Attach foam noodles to wood with a piece of tape taking care to not compress the foam noodles.

The foam noodles on the back piece of wood will overhang on both sides so pieces should be placed approximately center.

7.3 Fabric covering

Step 1 Cut Fabric to the following dimensions:

Dimensions	Quantity
48in x 15in (122cm x 38cm)	3 red, 3 blue

Step 2 Wrap the fabric around the foam noodles and attach fabric to the back of the wood with staples.

If you plan to use another method besides paint to attach team numbers, attach numbers before attaching the fabric

For recommended fabric attachment processes, please refer to the Bumper Guide for options.

Step 3 Trim excess fabric to make attaching bumpers to the robot easier.

Be careful not to trim too close to the staples.

Step 4 Paint your team numbers on each side of the bumpers, as described in the Game Manual. (assuming you have not already attached numbers using another method)

7.4 Bumper Brackets

Step 1 Attach a 10-32 3.75in long bolt from the Bumper Hardware Kit, with the end sticking through the top of the chassis, in the 4 locations indicated in the image below by securing a locknut from the Bumper Hardware Kit as shown. Note that this requires the removal of existing hardware installed in the locations highlighted in red in Figure 45.

Figure 45: Bumper Bolt Locations

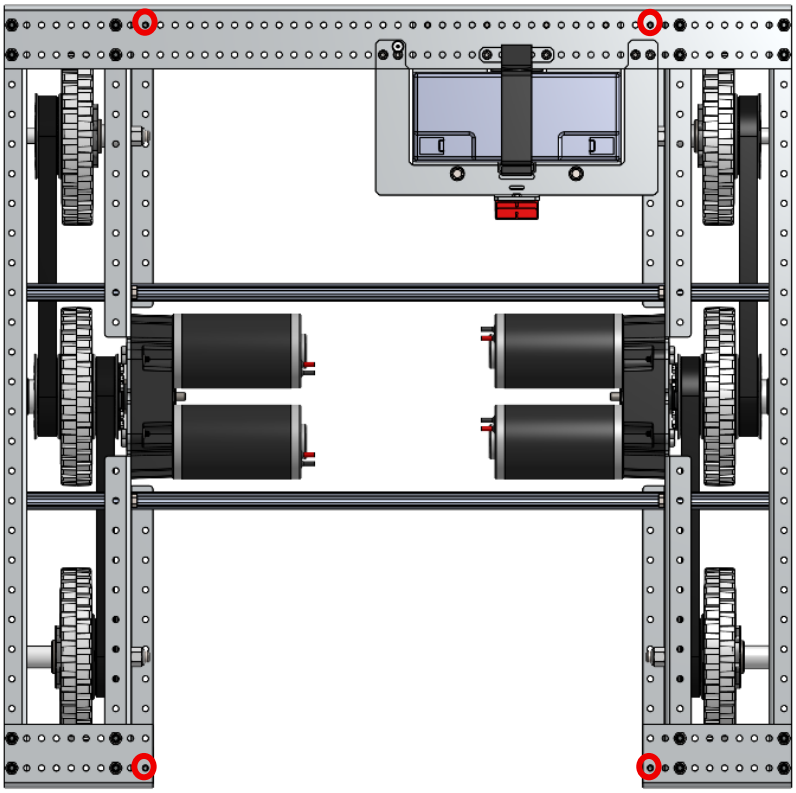
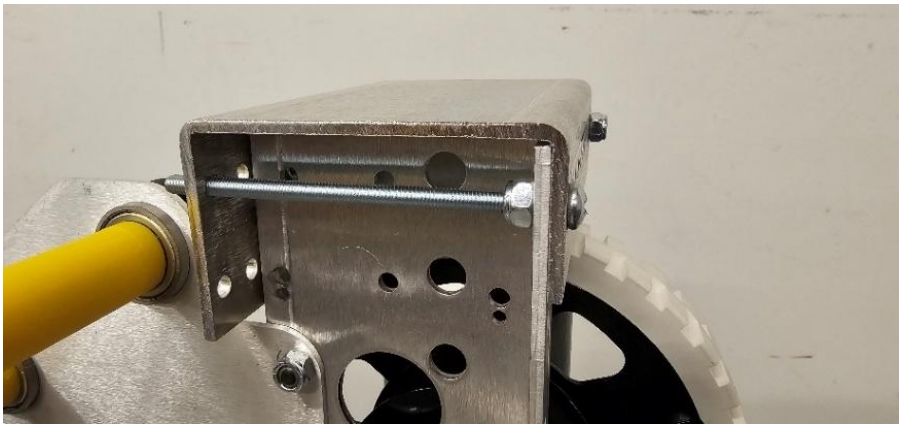
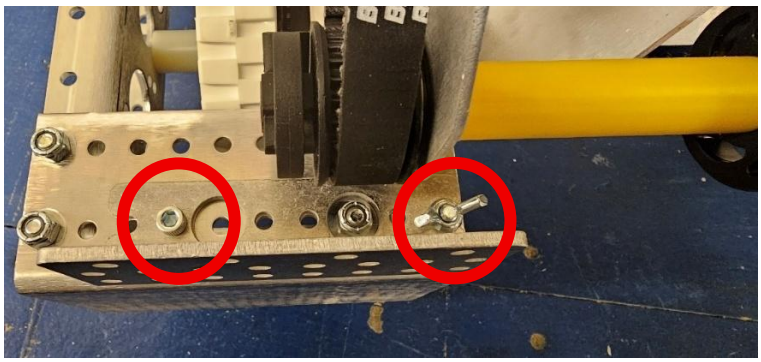


Figure 46: Bumper Bolt Side View



Step 2 Secure an angled bumper bracket from the Bumper Hardware Kit to the extended thread of one of the front bolts from the previous step using a wingnut. Temporarily place another 10-32 bolt, with no nut, into another hole on the bracket to secure it from rotating (the hardware removed from the chassis in Step 1 works well for this).

Figure 47: Front Bracket Temporary Attachment



Step 3 To secure the bumper to the bracket, you can either:

1. Use double-stick tape or a rolled loop of tape to secure the bracket to the bumper temporarily, remove the wingnut and temporary bolt, then remove the bumper and bracket from the robot while pinching the bracket to the bumper to assure it stays in place as shown below in Figure 48. You can then secure the bracket with 4 screws.

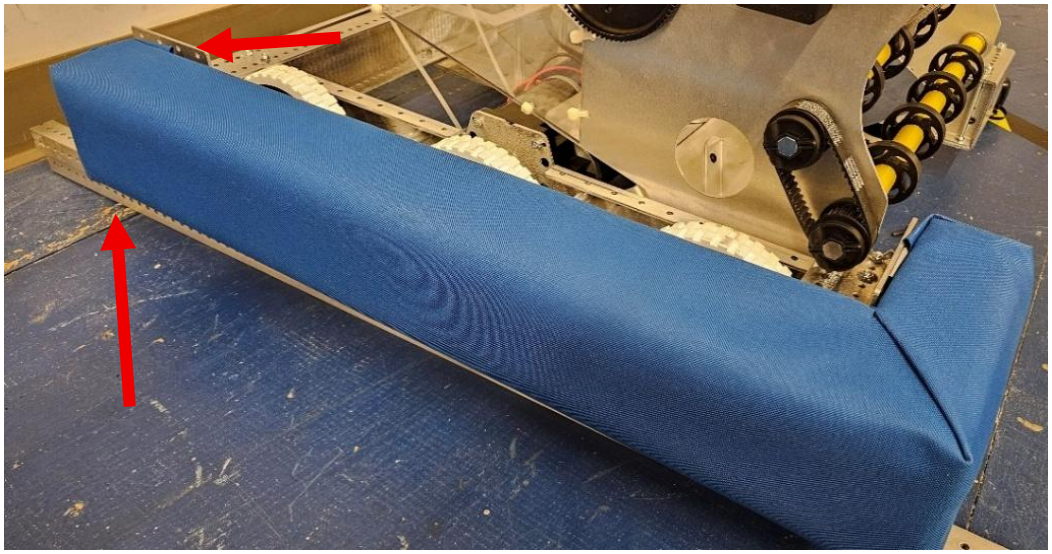
Figure 48: Removing the Front Bracket

2. Secure 2 screws into the bracket while it is in place on the robot. Remove the wingnut and temporary bolt then remove the bumper and bracket from the robot to secure the remaining two screws.

For either method, to align the bumper to the robot:

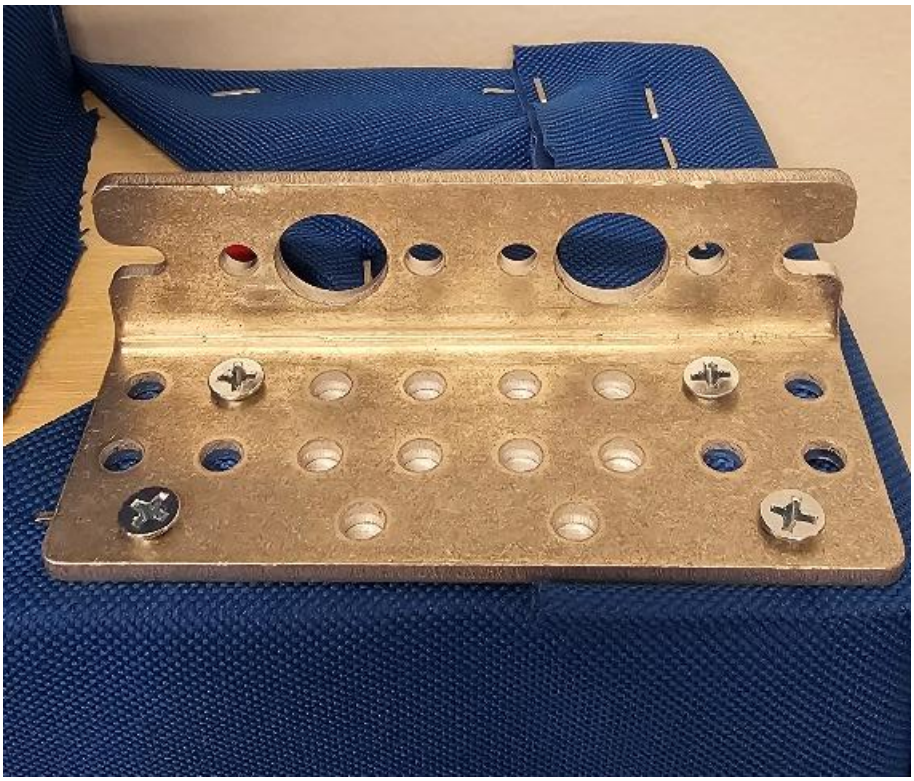
- The long side bumper should be pressed against the side of the chassis.
- The bottom of the bumper should be approximately flush with the bottom of the AM14U chassis. You can use 2in material underneath the bumper, a level on top of the bumper, or temporarily set a bracket on the back chassis rail to help ensure the bumper is level.

Figure 49: Bumper Leveling Examples



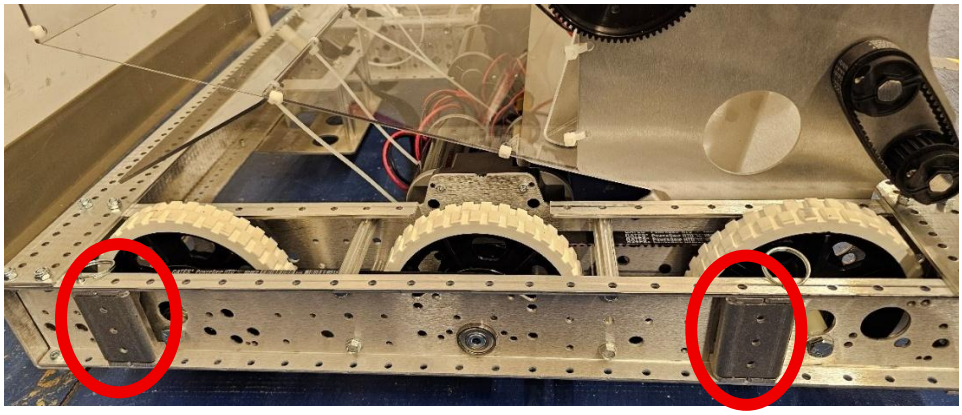
Step 4 Secure all 4 screws as shown in Figure 50 to hold the bumper bracket to the bumper

Figure 50: Front Bracket Screw Locations



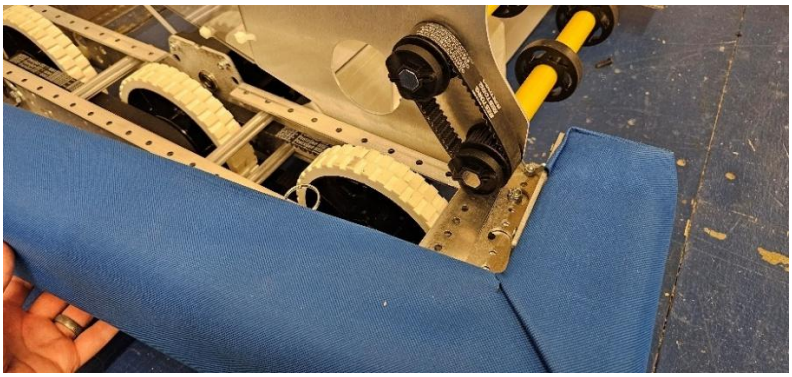
Step 5 Secure 2 side brackets in the indicated locations in Figure 51 using a single ring pin. Place double-stick tape or a rolled loop of tape (sometimes the thickness from additional rolls or multiple layers help the bracket stick better) onto each bracket.

Figure 51: Side Bracket Chassis Locations



Step 6 Carefully secure the front bracket to the robot using the wingnut with the side bumper pivoted away from the robot. Then rotate the side bumper towards the robot and press it into the tape on the side brackets.

Figure 52: Side Bracket Rotation Installation



Step 7 Pull the ring pins, remove the wingnut, and carefully remove the bumper from the robot. Approximately reversing the procedure used to install it. Secure each side bracket to the bumper using a wood screw through each of the three provided holes.

Step 8 Repeat Step 2 to Step 7 to attach brackets to the other L bumper.

Step 9 With both L bumpers installed on Step 3 the robot, secure the angled bumper brackets to the back of the robot. Use either technique to secure the brackets to the rear bumper, then fully secure each bracket as shown in Step 4.

8 Electronics & Wiring

The electronics panel for the KitBot is also designed to enable parallel work. Components can be attached to the panel, and some of the wiring can be done before installing the panel on the robot. You can attach this panel before or after the KitBot superstructure.

The KitBot electronics panel is custom shaped panel panels 19.75in x 6.5in (500mm x 165mm) made from a ½in (13mm) sheet of plywood at least 11.66in x 26.5in (29.62cm x 67.31cm). Refer to the drawing to manufacture this panel. This drawing has rounded corners on both inside and outside corners for ease of manufacture if using a jigsaw, the radius of these is not particularly important and they can be omitted entirely if desired. The panel is positioned across the chassis behind the center gearboxes/motors. To make the holes for mounting the panels to the chassis, you can use a chassis rail (if your chassis is not assembled) or flip the chassis (if already opened) over to mark the hole locations from the bottom up. It is recommended to secure the panel with at least 4 bolts, 1 near each corner.

The wiring document indicates where you should pause if you have not yet installed the panels on the KitBot.

9 Next Steps

Congratulations, you have successfully completed the KitBot. After your robot is constructed, check out the Java code and software guide to get it up and running. The KitBot Enhancement/Iteration Guide has some tips on how to purposefully test your robot and decide on improvements.

The Guide to Selecting Drive Team Members can provide some ideas about how to narrow down who will drive/operate your robot in competition and the Improving Driver Performance document can help provide ideas for how they can practice effectively. We also highly recommend that teams review the Drive Coach Best Practices resource which is intended to focus on how to be an exemplary Drive Coach, and the content is applicable to both student and adult Drive Coaches. This guide can also be used by other Drive Team members, or even other members of the team, to know what to expect from their Drive Coach.

It is highly recommended to do a self-inspection prior to attending an event to help identify any issues before attending the event. Teams can do this by utilizing the Inspection Checklist (keep an eye out for this to be released in a Team Update) and verifying their robot complies with each item on the list.

Teams are also encouraged to start the inspection process as soon as possible. First, go to the inspection station to figure out how the inspection process works at your event. Even if you are not 100% ready, partial inspections, such as height and weight compliance, can be started early to minimize surprises and ensure you get inspected before qualification matches begin.

10 Troubleshooting

The KitBot performs best when using fully charged batteries. With this, we highly recommend teams check the batteries they are using and have multiple batteries to ensure time to recharge between matches.

10.1 Problem: Launched Fuel are hitting the funnel or traveling too far over the goal

Even with the Fuel Mechanism consisting of primarily provided components, small variations in assembly can result in slight changes in compression or angle which may affect the trajectory of launched fuel. Rather than try to adjust any of these mechanical variations, it is instead recommended to adjust the voltage of the launcher and/or feeder shafts in code to achieve the desired trajectory. If the issue persists, adjustments to the 3D printed hood pieces may be needed.

10.2 Problem: Fuel Getting Stuck Between Flap Wheels and not moving into hopper or Launcher

Potential Solutions:

- Increase thickness of, location of, or replace, dead zone noodle. Make sure that the noodle is pushed as far to the intake side of the robot as possible when attaching, as it can easily cause jams if it is too far under the feeder roller in the hopper. The dead zone noodle can be removed to improve intaking, but will cause Fuel going to the launcher to be less consistent and occasionally jam.

10.3 Problem: Fuel Frequently Pass Through Launcher While Intaking

Note: occasional balls passing through the launcher while intaking, especially as the hopper fills, is normal and likely unavoidable without additional robot modifications

Potential Solutions:

- Decrease thickness of, or relocate the dead zone noodle. If the dead zone noodle is pushed underneath the feeder roller, it will push balls into the launcher instead of letting them pass into the hopper. The dead zone noodle can be removed altogether to solve this problem, but it will potentially cause inconsistencies or jams while launching.
- Reduce voltage to intake/shooter roller during intaking

10.4 Problem: Fuel Get Jammed in the Launcher while intaking

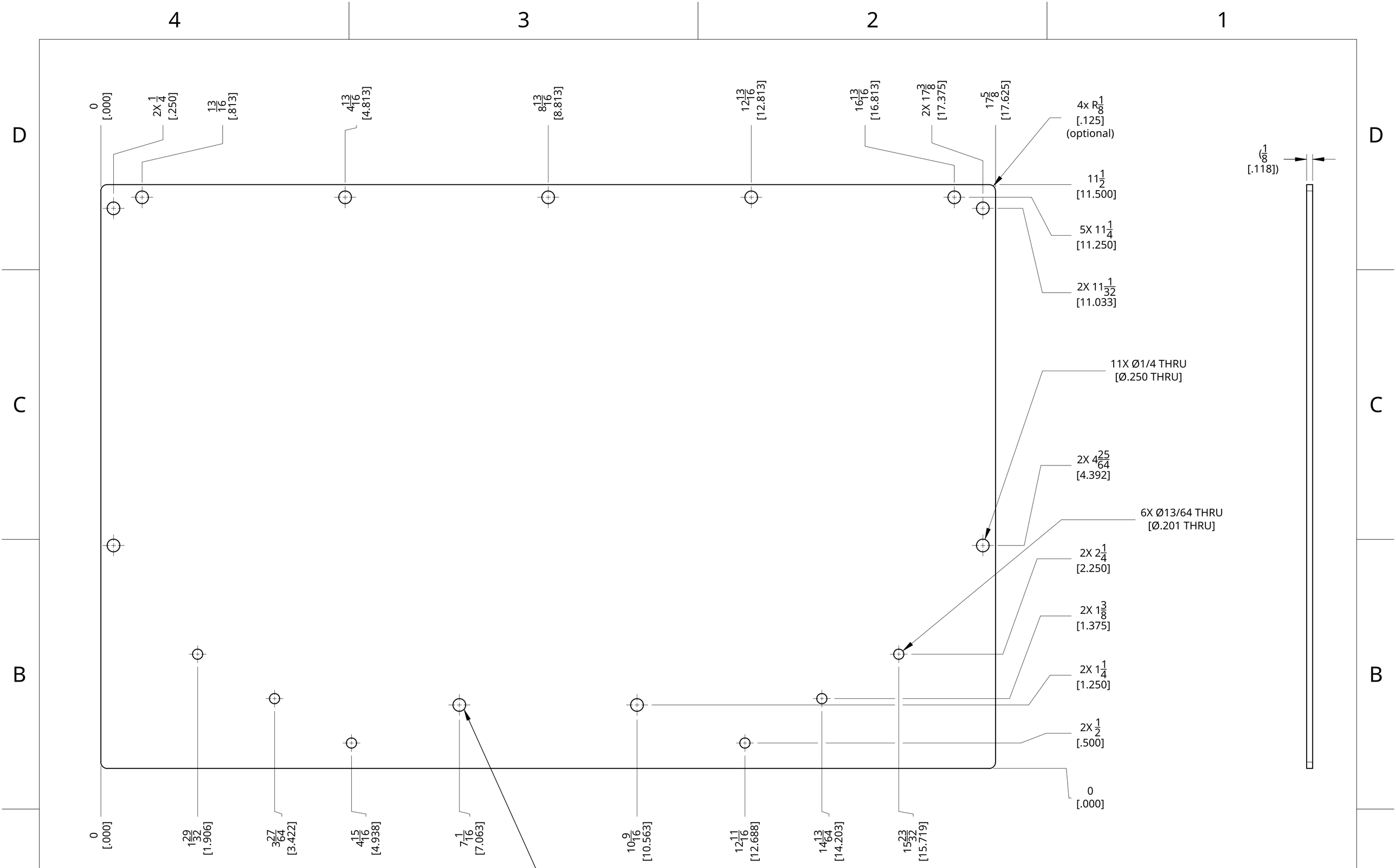
Potential Solutions:

- Reduce frequency of balls passing through launcher (see 10.3)
- Make sure to keep running intake until sure no balls are in launcher
- Increase launcher power by adding a motor or changing to a more powerful motor
- Increase Gear Ratio between launcher motor and launcher shaft with new 3D printed parts to increase torque on launcher shaft

10.5 Problem: Bearings popping out of plates after KitBot is completely assembled

Potential Solutions:

- Ensure bolts on bracing shafts and securing the Fuel Mechanism to the chassis are tight
- Ensure all shaft collars are tight and are compressing the shaft as tight as possible
- If neither resolve the issue, you may need to reduce the total length of spacers on the affected shaft, likely by filing or sanding the long spacers closest to the outside edge of each shaft (they will be easier to modify than the short spacers).



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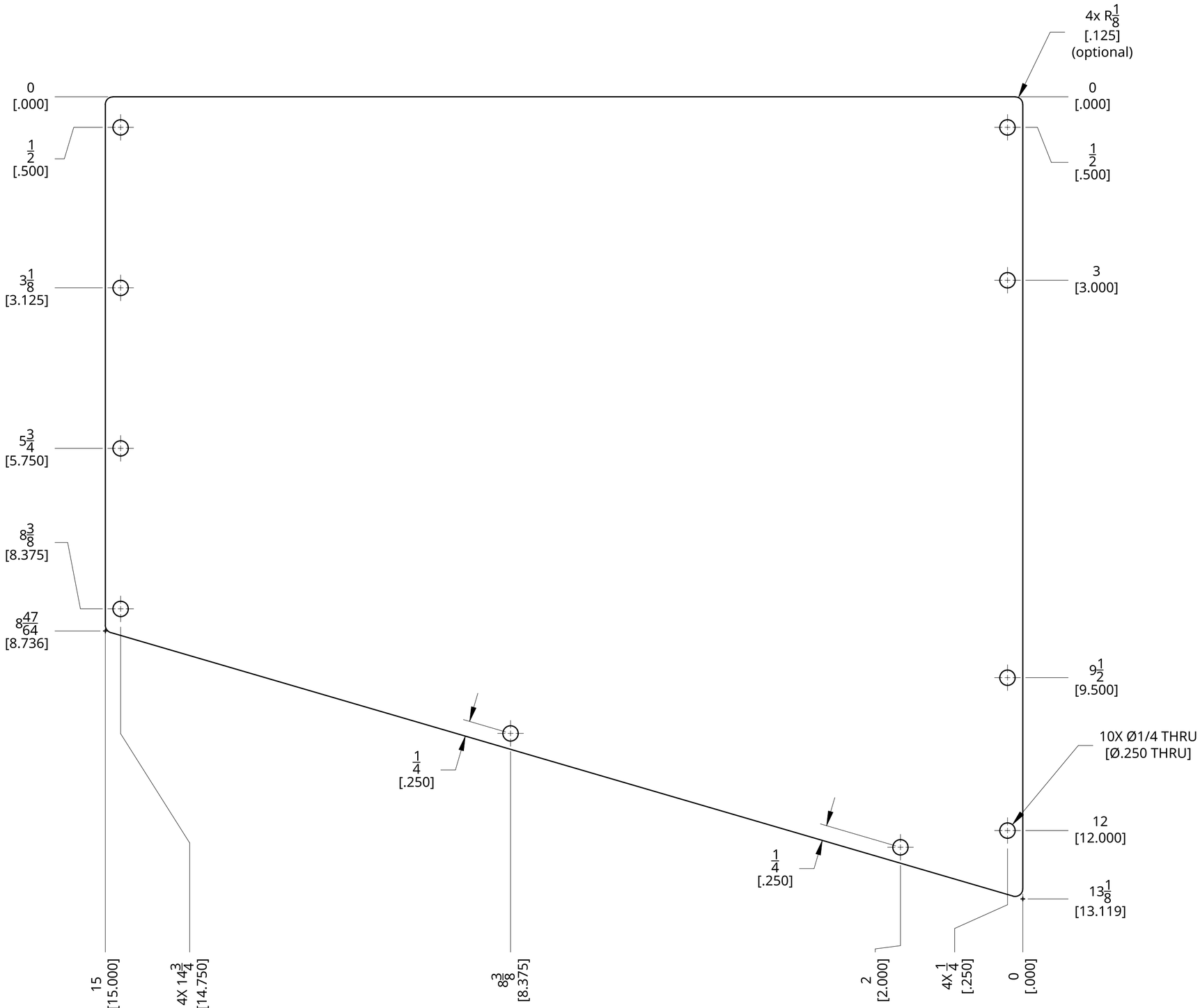
FIRST ROBOTICS COMPETITION

TITLE: BOTTOM HOPPER PANEL

SIZE	DWG NO.	REV.
C	KB-26004	
SCALE 4:5	SHEET 1 of 1	



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C	KB-26005	
SCALE: 3:4	SHEET: 1 of 1	

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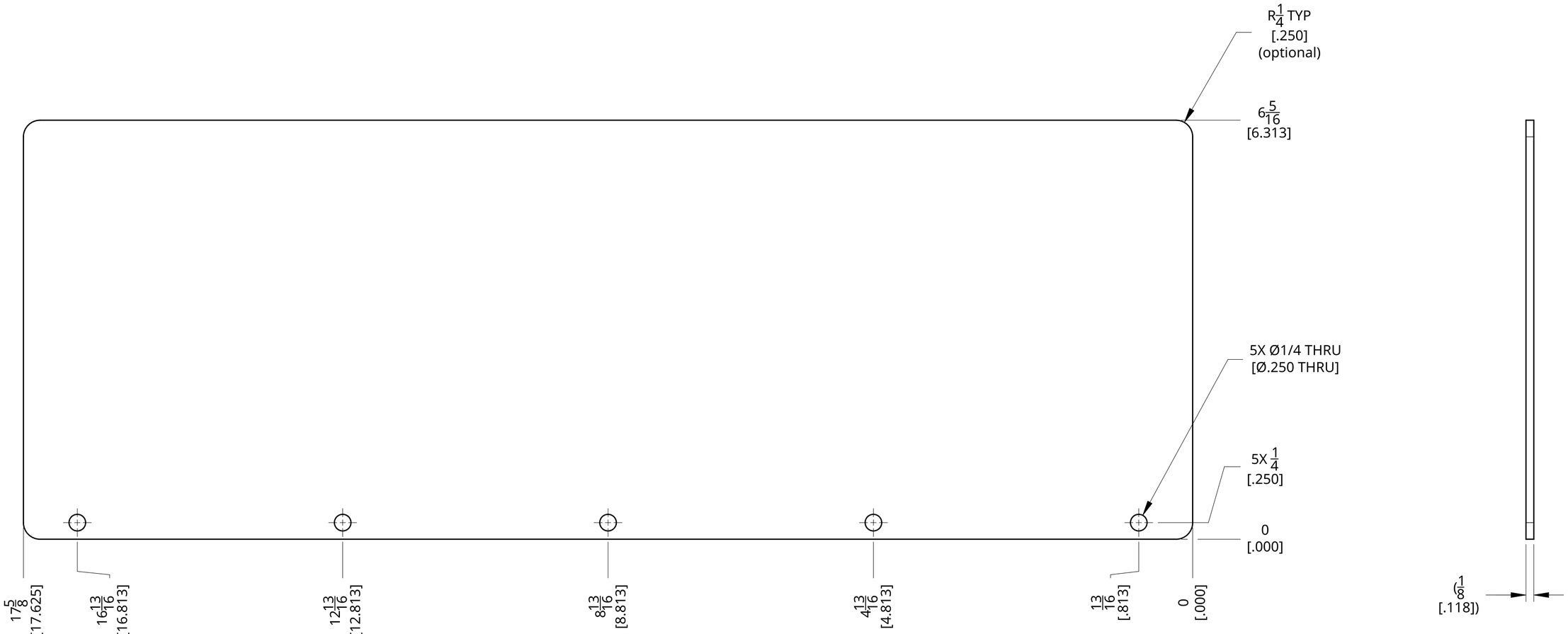
FIRST ROBOTICS COMPETITION

TITLE: BACK HOPPER PANEL

SIZE	DWG NO.	REV.
C	KB-26006	
SCALE: 4:5	SHEET: 1 of 1	



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FIRST ROBOTICS COMPETITION

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SIZE	DWG NO.	REV.
C	KB-26014	
SCALE 4:5		SHEET 1 of 1