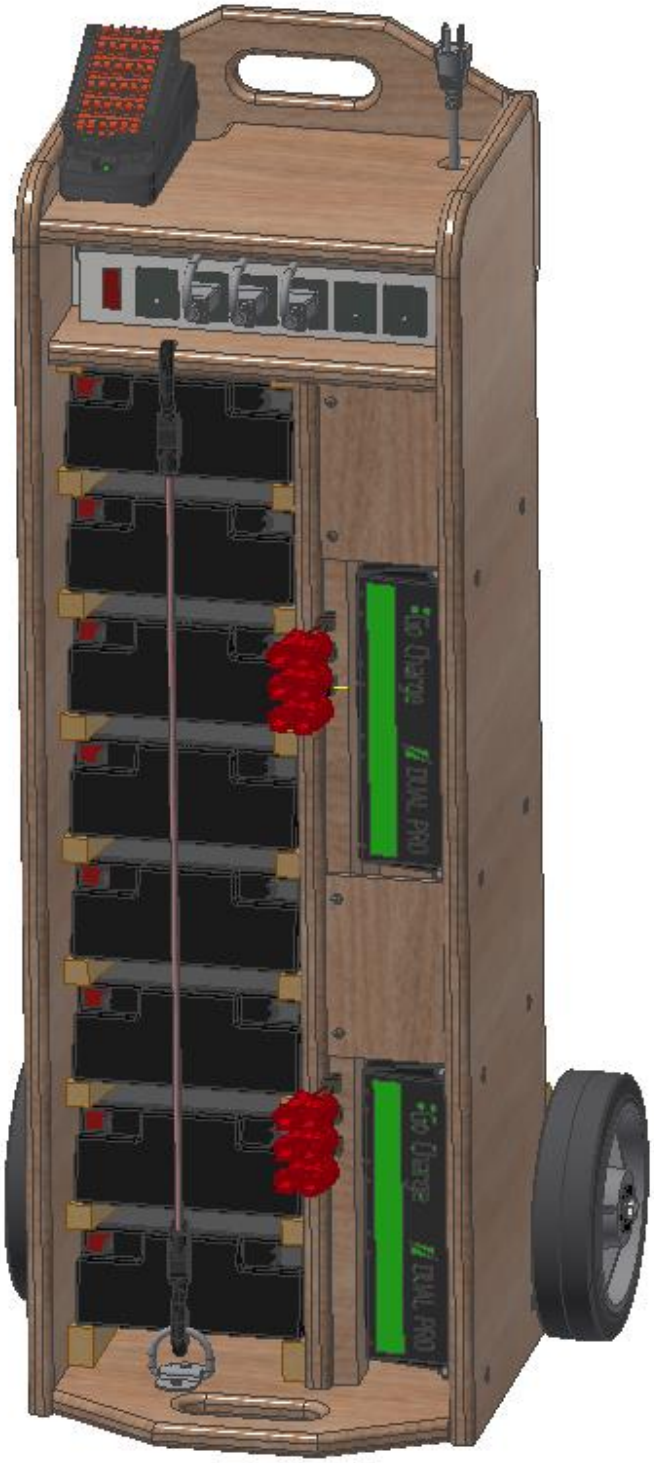


KB33 FRC Competition Battery Cart

Build Instructions

Every FIRST Robotics Team needs a good battery cart.

The Killer Bees have built several battery carts over our 25-year history. This design is highly optimized for form and function.

- Compact
- Robust
- Easy to Build
- Easy to Move
- 6 Charging Ports
- 8 Battery Capacity
- Built-in Power Strip

This guide provides step-by-step build instructions for making your very own FRC Competition Battery Cart for your robotics team.

The Killer Bees Robotics Team have built several competition battery carts over our 25 year history. Shown here is a 4th generation design which has been iterated over many years. We have privately shared this with many teams, but have not published this design until now.

This design is made of plywood. A properly constructed wooden cart is actually stiffer and stronger than an un-welded metal cart.

To double check these plans and instructions, we recently built a new cart. This new unit (left) is nearly identical to its predecessor (right), which has been in service for 6 years. Apart from some scuffed paint, the original is still in great shape. We take two of these units to all of our FRC events.

This cart can be built for approx. $100, plus the cost of the two charger units.

This design is very durable and will stand up to many years of FRC abuse.

A few comments on materials:

- We recommend using 7 ply ¾” Birch Plywood for this build. The flatness and strength of furniture grade plywood is superior to construction grade materials
- We recommend the Colson wheels we have listed below. These are virtually indestructible in this high load application. The original design had FRC 8” spoked wheels, which eventually failed.
- Use a steel axle, not aluminum.
- Proper gluing of all joints is critically important.

Required Materials List:

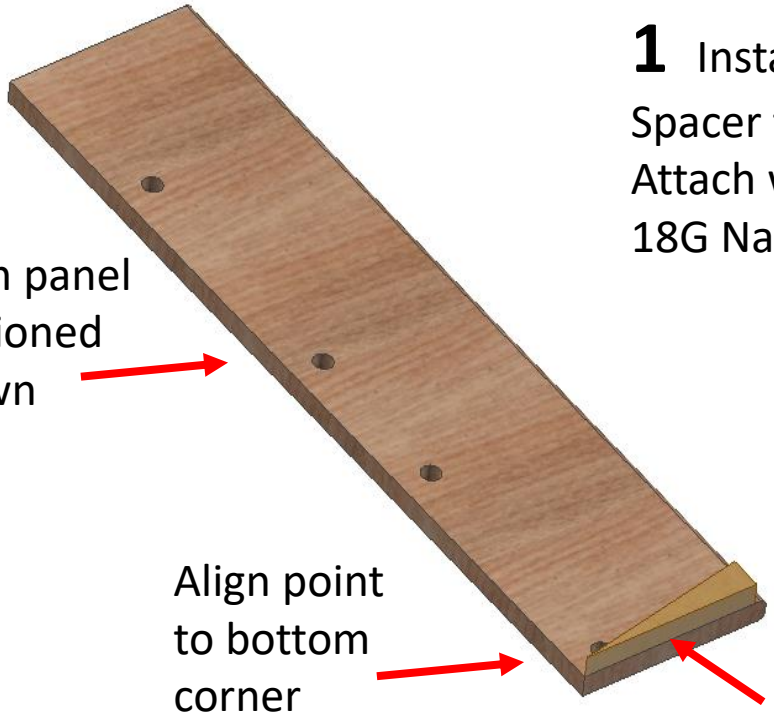
48” x 48” x 3/4" Birch Plywood
3 – ¾” x ¾” x 36” square stock pine. (you can also cut these pieces from the plywood sheet if you have a table saw)
1 – 2 x 4 x 24” Pine
1 - 1/2" x 24” Steel Rod https://www.mcmaster.com/3076T34/
2 - 8" x 1.5”Colson Wheels https://www.mcmaster.com/2829t423
2 - 1/2" Axle Cap Nuts https://www.mcmaster.com/94803A050/
1 - steel D-ring https://www.mcmaster.com/3076T34/
1 - Metal Power strip https://www.amazon.com/Prime-Wire-Cable-PB801120-6-Outlet/dp/B006G69UT4/ref=sxts_sxw
2 - Dual Pro RS3 Battery Charger
https://www.andymark.com/products/battery-charger-3-bank-6-amp-dual-pro-rs3-with-sb-50a-connectors
1-1/2" 15 Ga Nails
1-1/4” 18 Ga Nails
Titebond 2 wood glue
24” Bungee Cord
4 – 2” diameter slider discs
8 – 10-24 x 1.5" flathead screws,
8 – 10-24 nylock-nuts
1 Quart - Behr 2-in-1 Paint and Primer of your team color.

List of tools needed.

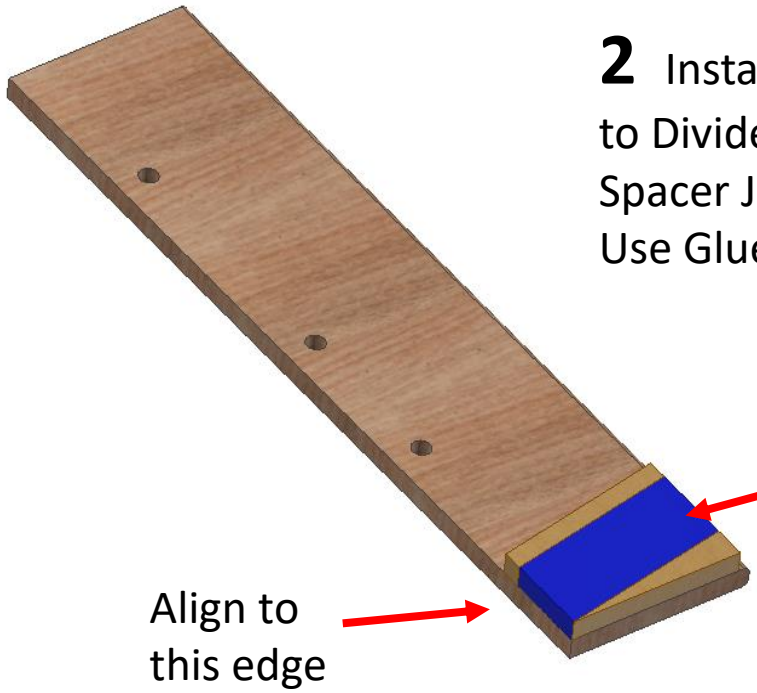
- Circular Saw or Table Saw
- Hand Drill or Drill Press
- Drill / Driver with #2 Bit
- Router or Router table with ¼” Round-over bit
- Jigsaw
- Hacksaw or Cutoff Wheel
- Air Nailers (15 and 18 gauge)
- Sanding block
- Forstner bits ¾”, 1-1/4”, 2”
- Countersink bit
- Clamps
- Hammer
- 3/8" Nutdriver
- Wood Glue Spreader
- 1.5” Paint Brush

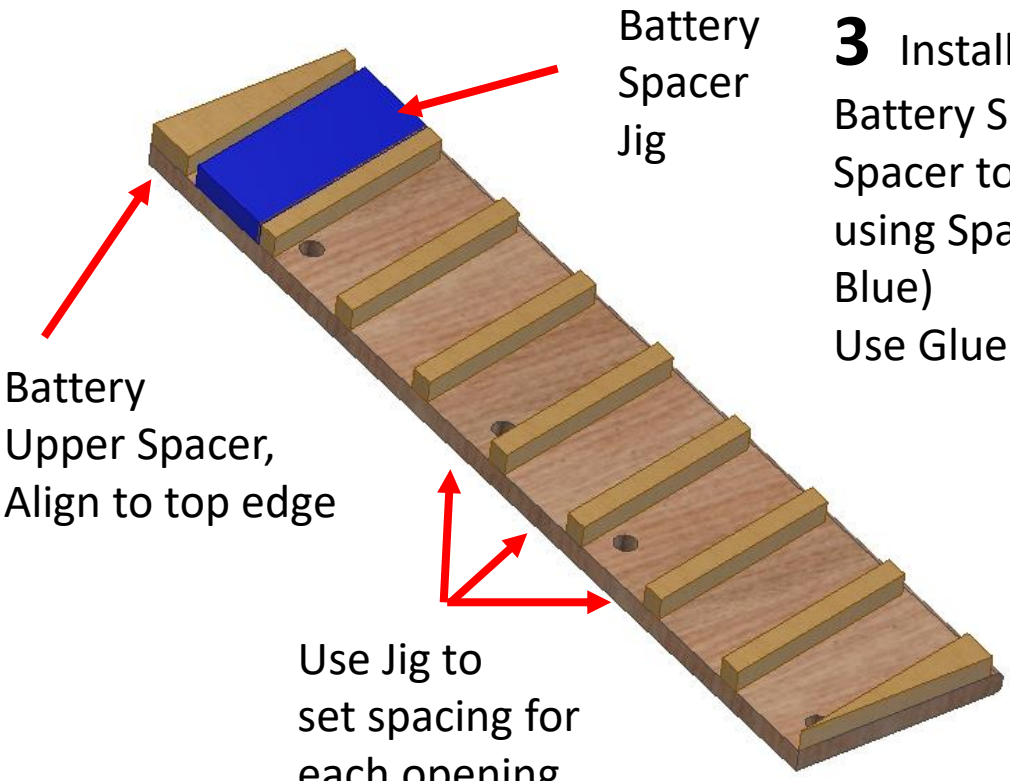
Also check out the One-Day-Build YouTube video https://youtu.be/XOAfVUXOnXo
and the Engineering Drawings and CAD model can be found at http://www.killerbees33.com/resources/

1 Install Lower Battery Spacer to Divider Panel. Attach with Glue and 18G Nails

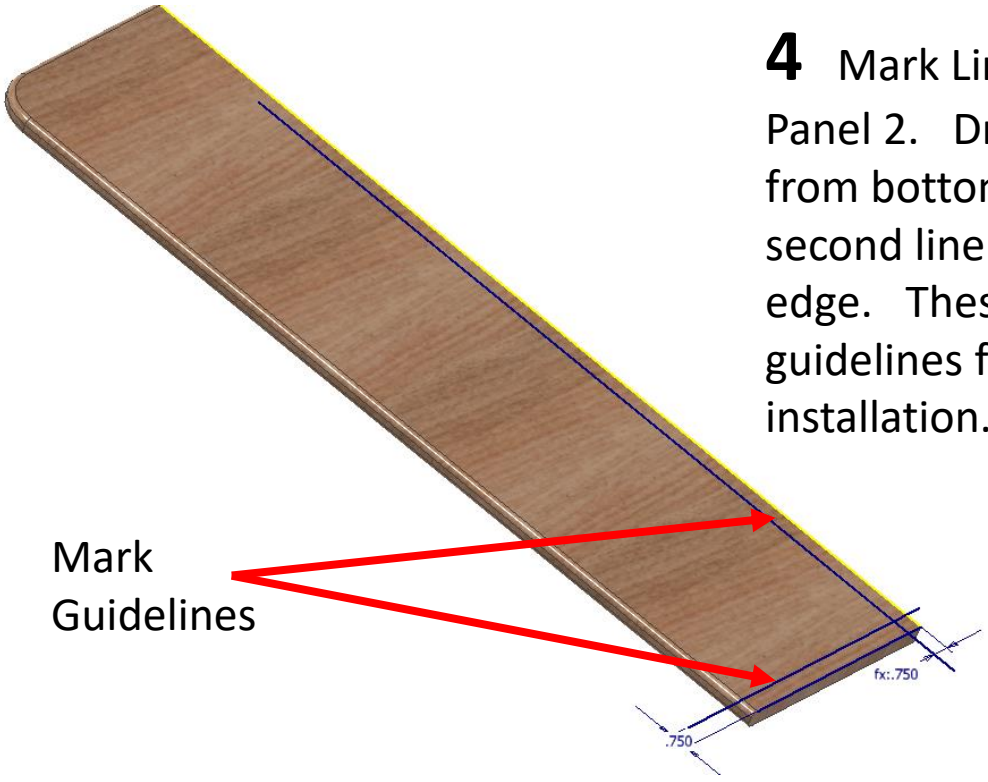


2 Install Battery Spacer to Divider Panel using Spacer Jig (Shown in Blue) Use Glue and 18G Nails



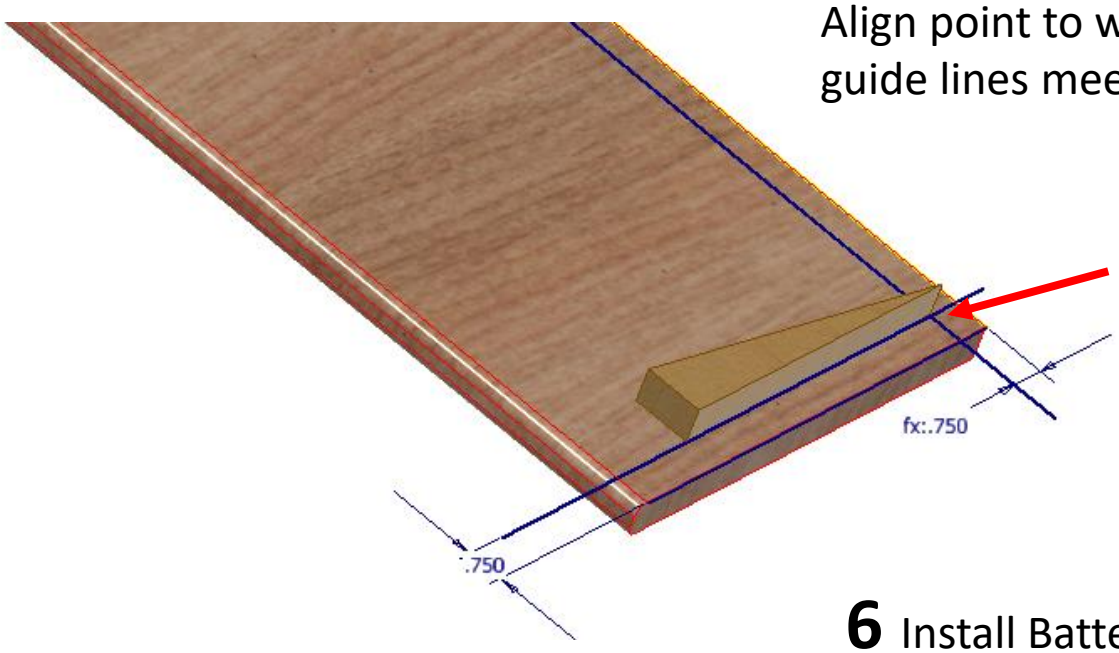


3 Install Remaining 6 Battery Spacers and Upper Spacer to Divider Panel using Spacer Jig (Shown in Blue)
Use Glue and 18G Nails

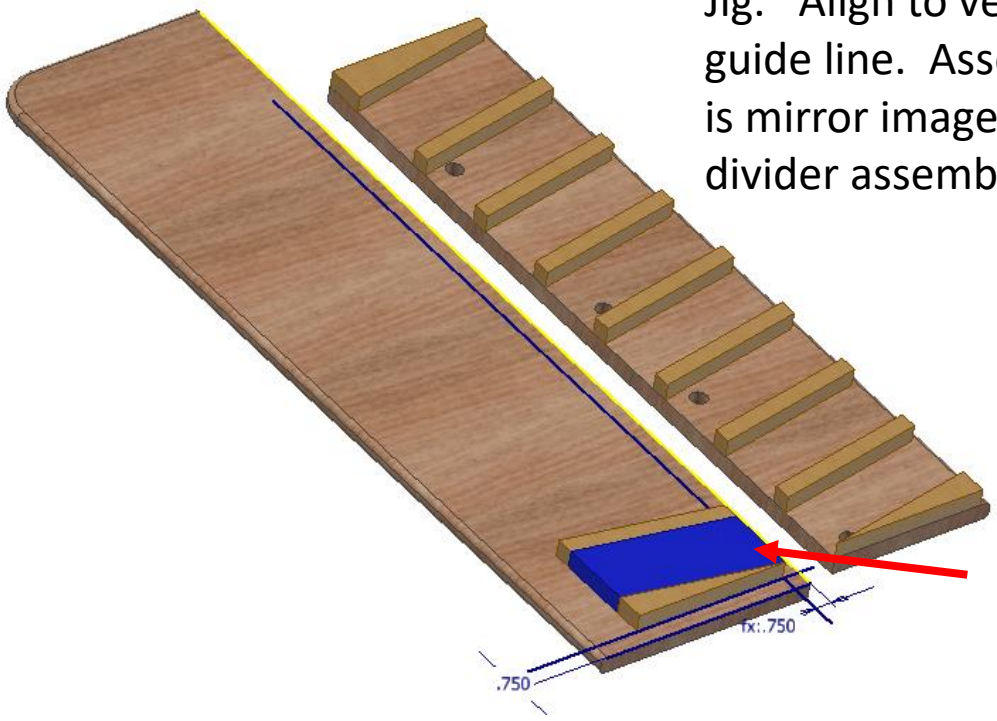


4 Mark Lines on Side Panel 2. Draw one line ¾" from botton edge, draw second line ¾ from back edge. These are guidelines for the spacer installation.

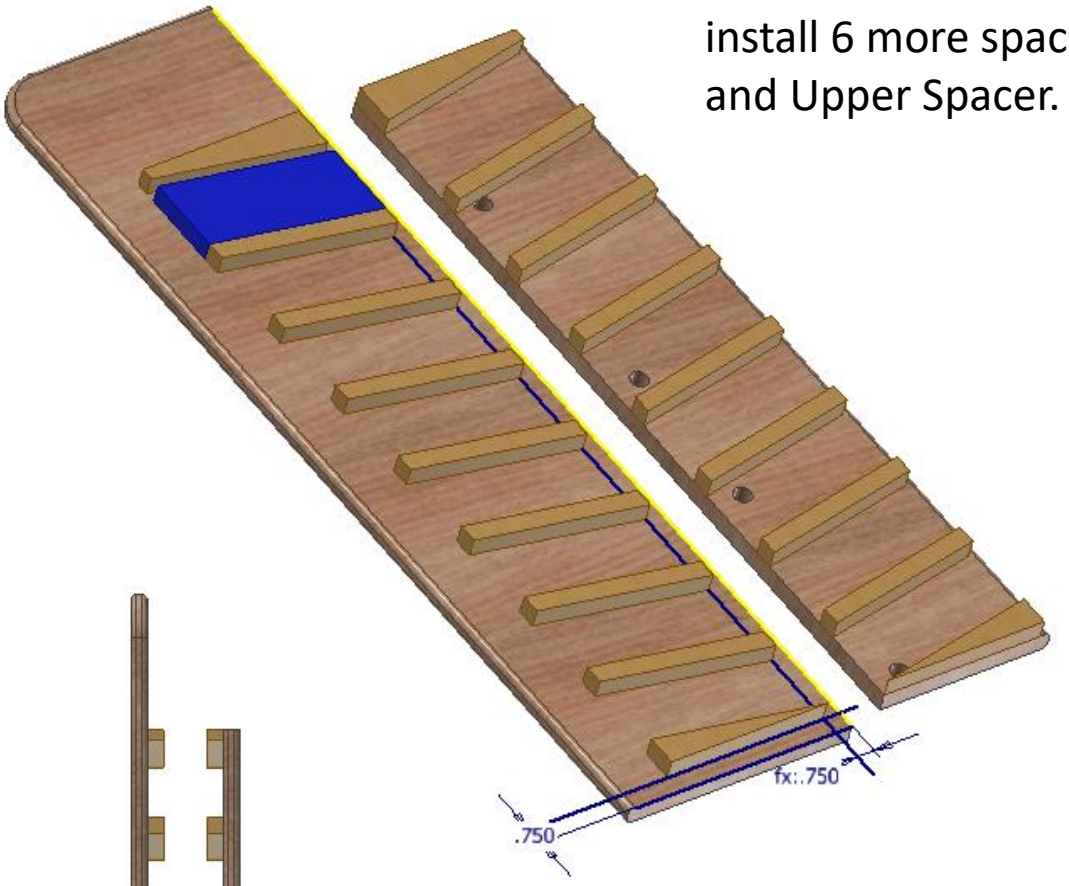
5 Install Lower Spacer, Align point to where guide lines meet

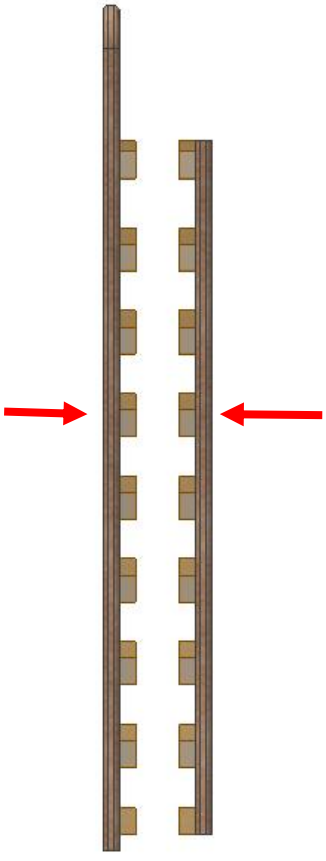


6 Install Battery Spacer using Spacer Jig. Align to vertical guide line. Assembly is mirror image of divider assembly



7 Repeat Process to install 6 more spacers and Upper Spacer.

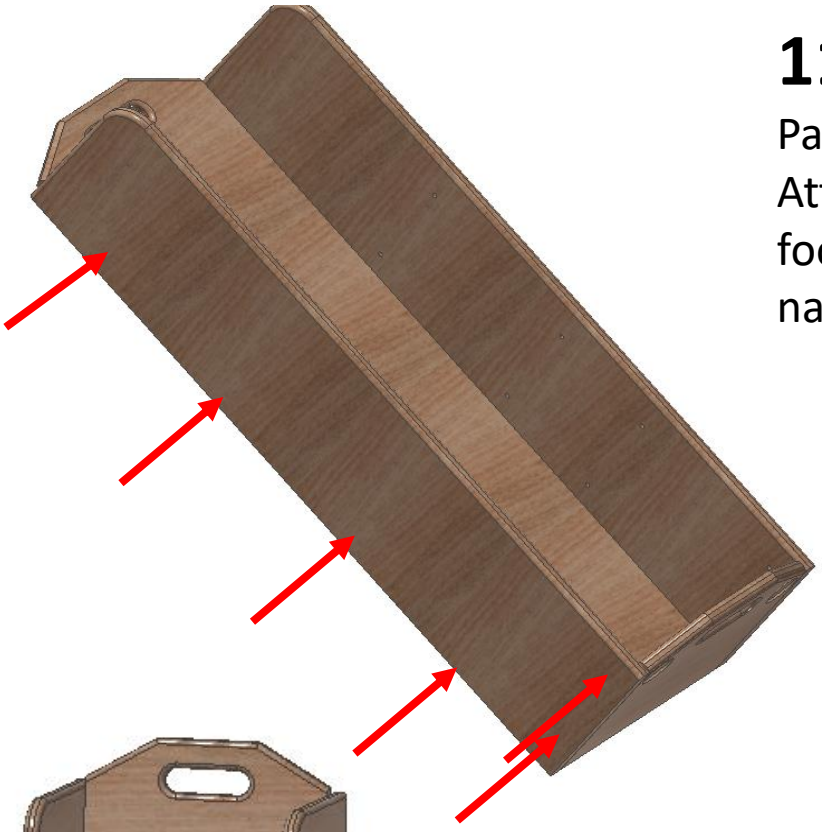




8 Place assemblies face to face to ensure that all spacers are aligned properly before proceeding

9 Carcass Assembly: Assemble Foot Plate to Back Plate. Foot mounts to bottom of back. Glue and Nail from bottom.

10 Assemble Side Panel 1 to carcass. Attach to back and foot



11 Assemble Side Panel 2 to carcass. Attach to back and foot using glue and nails.

12 Assemble divider panel to carcass. Attach through back and foot using glue and nails.

Use Spacer Jig #2 to set the gap to 7.25”

13 Assemble Lower Shelf panel to carcass, Attach through sides and back

14 Assemble Power Strip Panel and Spacer Block. Attach through sides and lower shelf.

Align to bottom edge of carcass

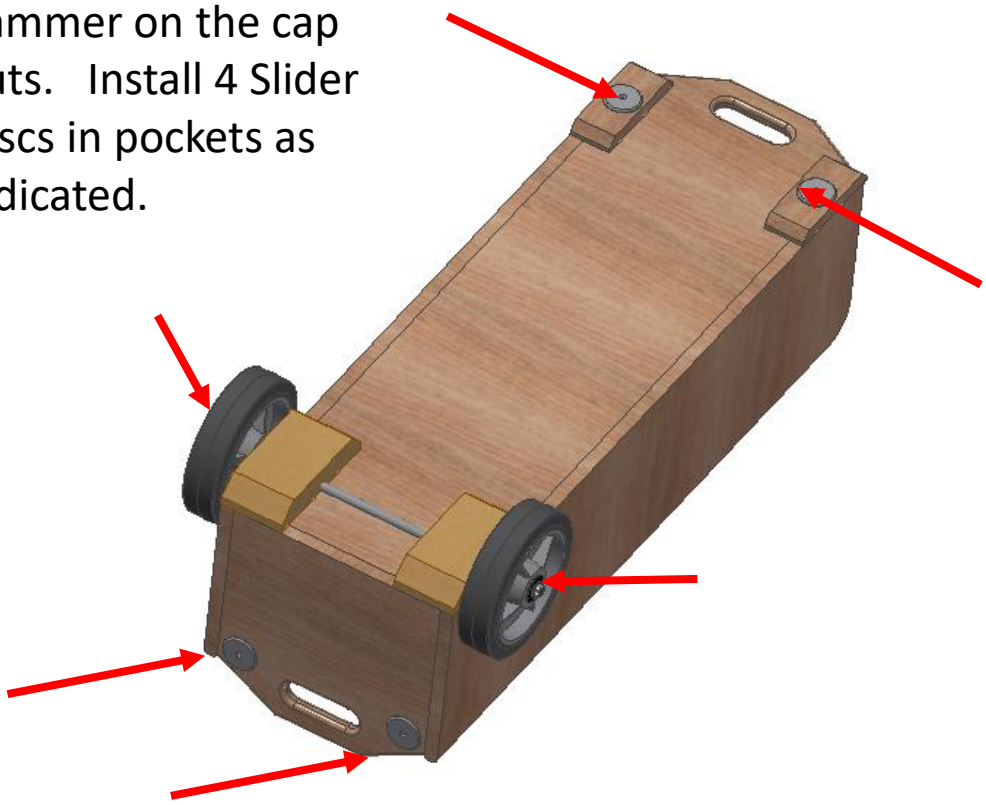
15 Assemble Axle Blocks to Carcass. Install Axle before attaching blocks. Glue well, these are the most important joint in the design. Add screws from inside to attach the blocks.

16 Attach Upper Skid Blocks, Align to upper edge of side panels.

At this point it is recommended to add 1-5/8” deck screws to all perimeter joints at appox, 8” spacing Pilot drill all holes to avoid splitting

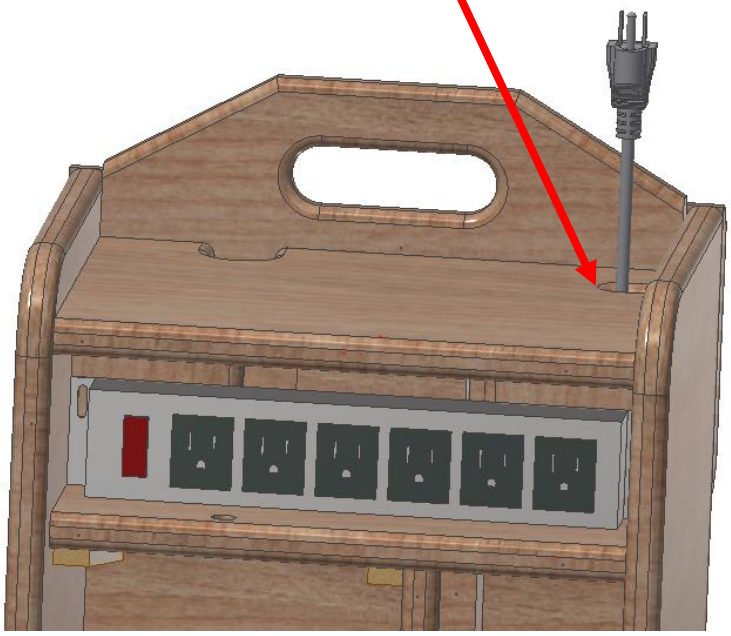
17 At this point, it is recommended that you paint your cart. It is much easier to do before the rest of the parts are installed.
We recommend a 2-in-1 Exterior Semi-Gloss Paint Primer Combo for durability and cleanability.

18 Install Wheels, hammer on the cap nuts. Install 4 Slider Discs in pockets as indicated.

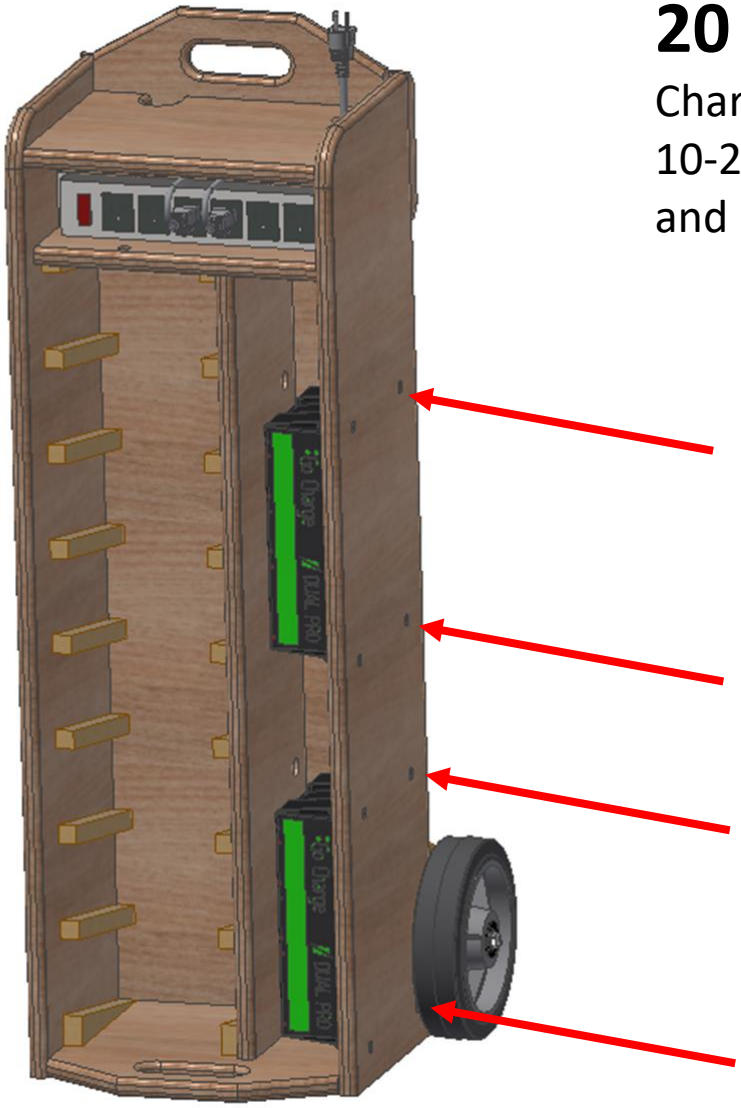


19 Install Power Strip to mounting panel as shown. Install Upper Shelf Panel using screws. (this shelf is intended to be removable so do not glue)

Route Power Cable through narrow slot in shelf

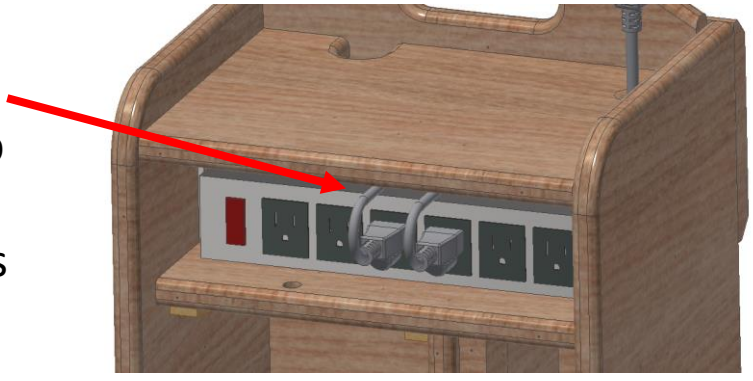


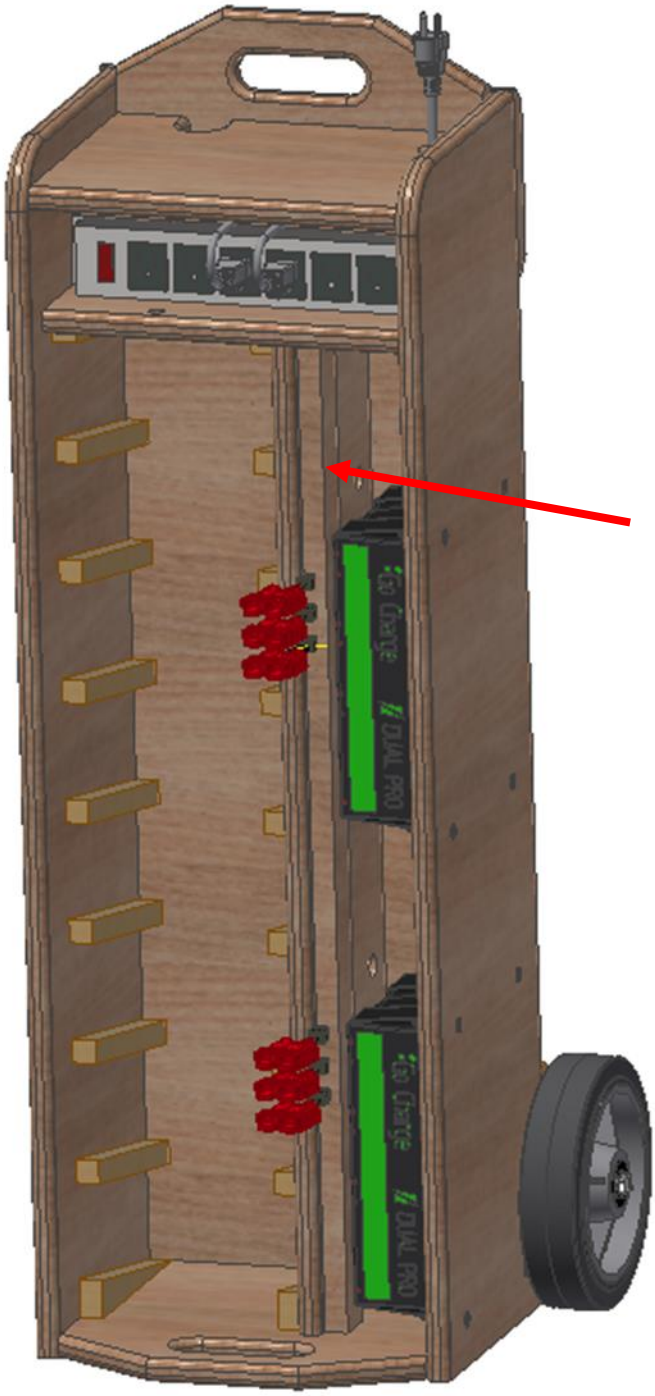
20 Install Battery Chargers using eight 10-24 flat head screws and nylock nuts.



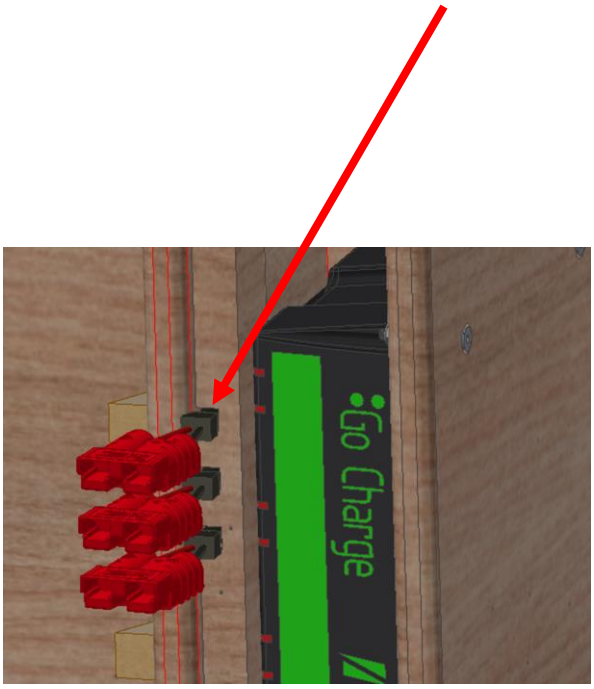
Use Access holes in Divider to tighten nuts as needed

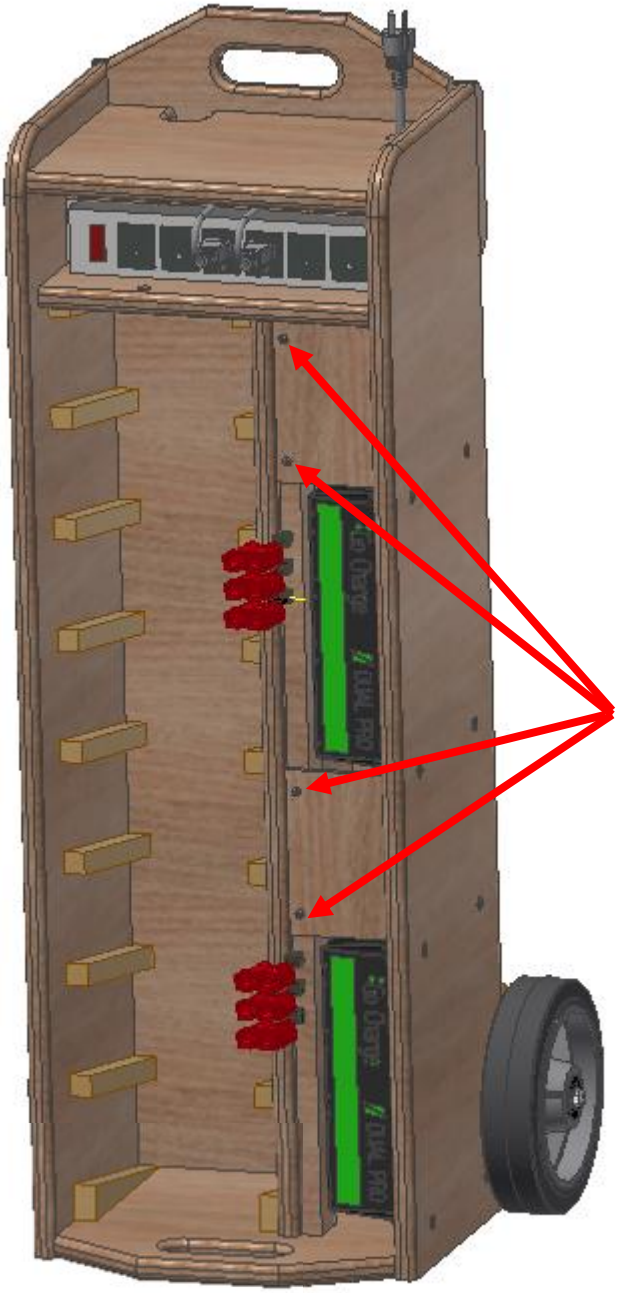
Route Charger Power Cables up through gap between shelves and plug into power strip



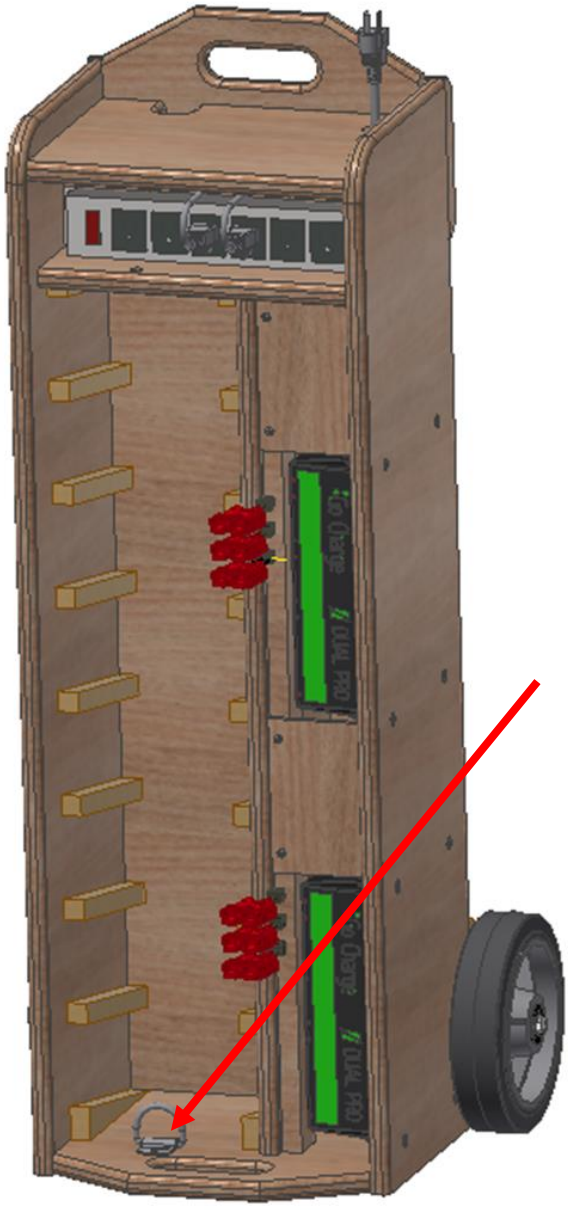


21 Install Battery Cable Retainer Bar. Route all 6 Charging cords through the slots in the Retainer bar as shown (do not glue)



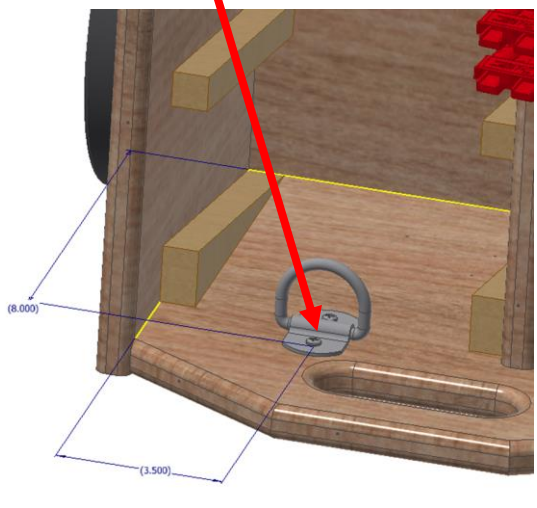


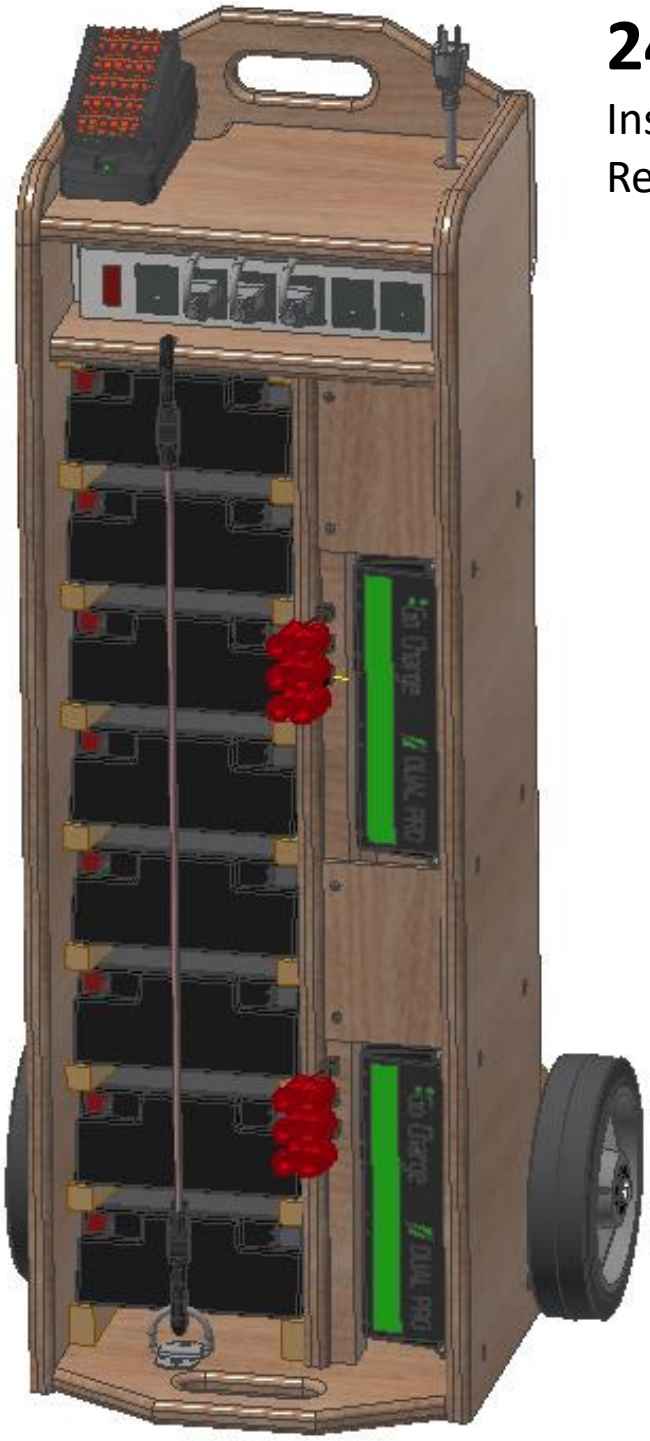
22 Install Battery Cable Cover Panels. Using four ¾” screws. (Do not Glue, these are service doors)



23 Install Tie Down Ring to foot using ¾” screws

Front screw is 8” x 3.5” from rear corner





24 Project Completed!
Install Batteries, and Retaining Bungee Cord.

Good Luck to all teams in the coming seasons!