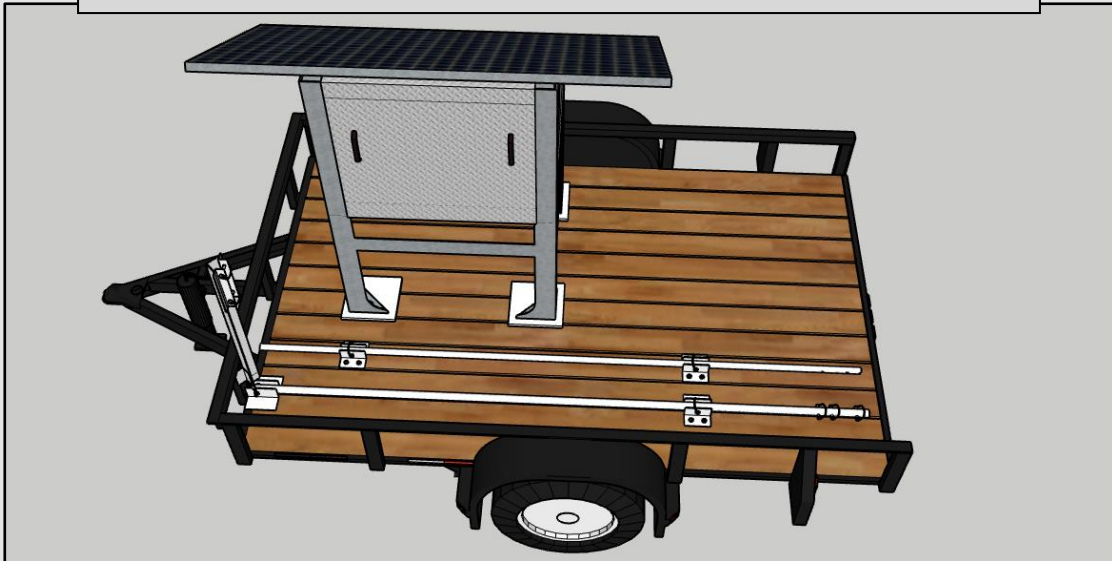


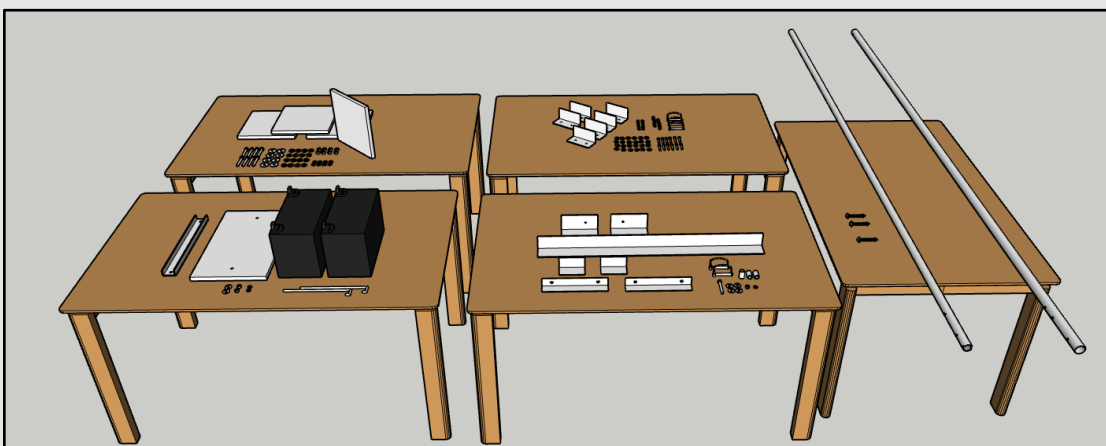
DIY Mobile Base Station Conversion Guide

Materials and Step by Step Instructions



How to convert a stationary base station provided by Vence Corp into a mobile base station. Your conversion may look different depending on the type of trailer you use with your conversion.

Disclaimer! *The content of this document accurately represents how we have successfully approached increasing the portability of virtual fence base stations, but users should undertake any modification of a base station at their own risk. Vence Corp base stations are not designed to be mounted on a trailer and sensitive equipment could be negatively affected by the consequences of transport. Thus, Vence Corp's product warranty will not cover any damages to the base station resulting from the effects of trailer-mounted transport. Check with your individual equipment supplier for recommendations and concerns.*



Written and 3D modeled by – Michael Stauder, Fabrication design by – Tony Runnels
 Edited by – Eastern Oregon Agricultural Research Center's Precision Agriculture Tech Group
 Questions contact – Rory O'Connor at <https://agsci.oregonstate.edu/eoarc>



Oregon State
University



Agricultural Research Service
U.S. DEPARTMENT OF AGRICULTURE

Table of Contents

Raw Materials/Shopping list & Tools	Pg.2
Step 1 – Vibration pads	Pg.3
Step 2 – Battery mount	Pg.5
Step 3 – Antenna cradles	Pg.9
Step 4 – Antenna mount	Pg.11
Step 5 – Antenna modifications	Pg.15
Step 6 – Mounting the battery	Pg.21
Step 7 – Mounting the base station	Pg.23
Step 8 – Antenna mount & cradles installation	Pg.27
Setup and take down	Pg.39

Raw Materials/Shopping List & Tools

x1 Rubber Stall Mat (8' x 4' x 3/4")

Steel MC channel (2" x 1" x 3/16") - need 20" minimum

Steel angle iron (1 1/2" x 1/8") – need 25" minimum

Steel angle iron (2" x 1/8") – need 10" minimum

Steel angle iron (2 1/2" x 3/16") – need 75" minimum

Steel angle iron (3" x 3/16") – need 20" minimum

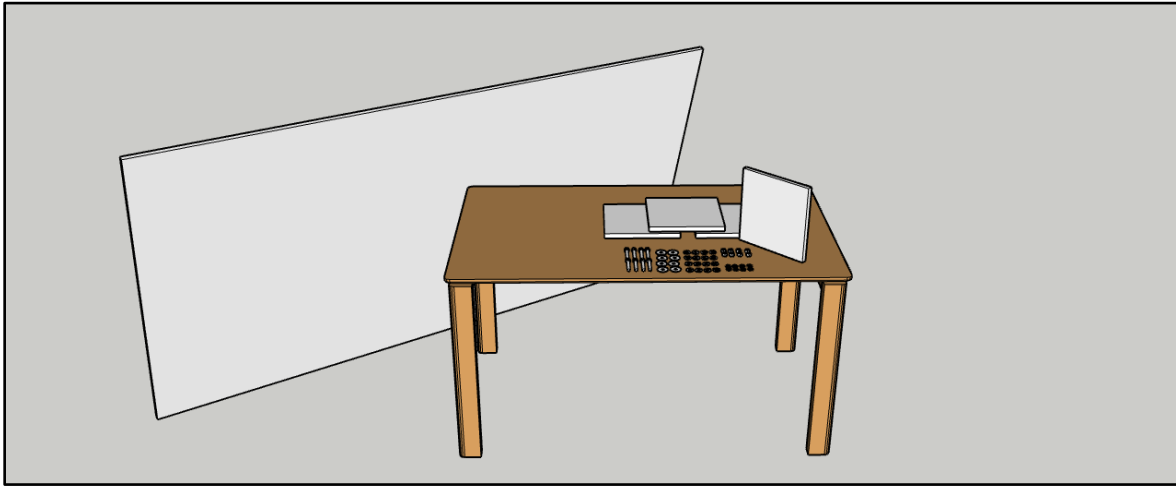
Trailer – minimum suggested specifications

- Single axle
- Rated to ~3000 lbs
- 6 1/2' x 10' bed
- Steel frame
- Wooden floor
- Standard 2" hitch
- 15" tires with 8-ply tread
- side mounted jack that rotates out of the way

Hardware			
Hex Bolts	Hex Nuts	Standard Washers	Lock Washers
x8 - 3/8" x 3 1/2"	x10 - 3/8"	x18 - 3/8"	x10 - 3/8"
x12 - 1/4" x 2 1/2"	x12 - 1/4"	x24 - 1/4"	x12 - 1/4"
x1 - 5/16" x 3"	x1 - 5/16"	x4 - 5/16"	x1 - 5/16"
Large Washers	PTO Pins	Other	
x8 - 3/8"	x3 - 1/4" x 3" x5 - 3/8" x 3"	x2 Battery mount rods (3/8") x2 Bushings Loctite	

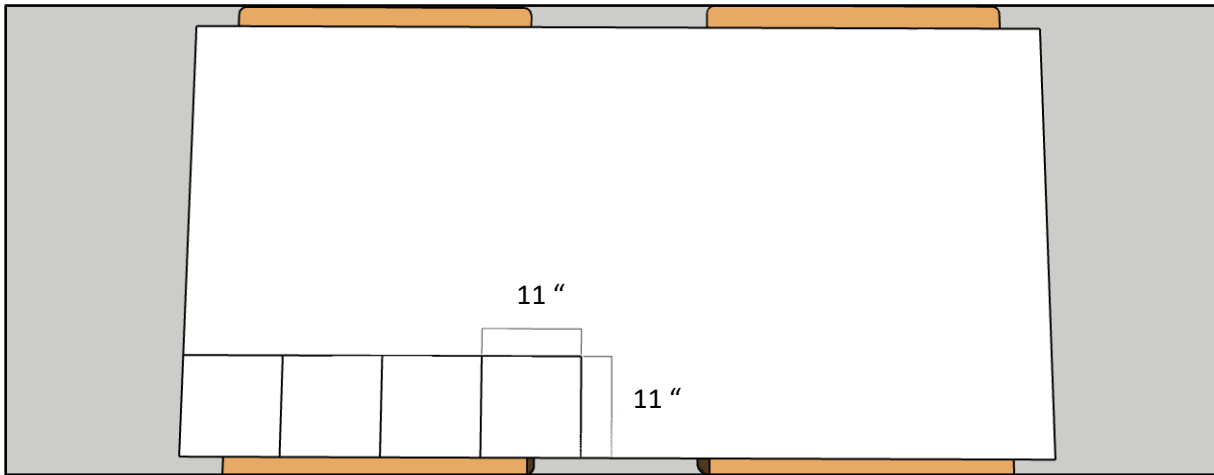
Tools	
-Personal protective equipment (PPE) for all associated tools -Reciprocating saw -Chop saw -Angle grinder w/flap disk -Flux-core wire feed welder -Power drill	-Drill press -Drill bit set for metal -Drill bit set for wood -Socket wrench set -Straight edge -Sharpie -Measuring tape

Step 1 – Vibration Pads

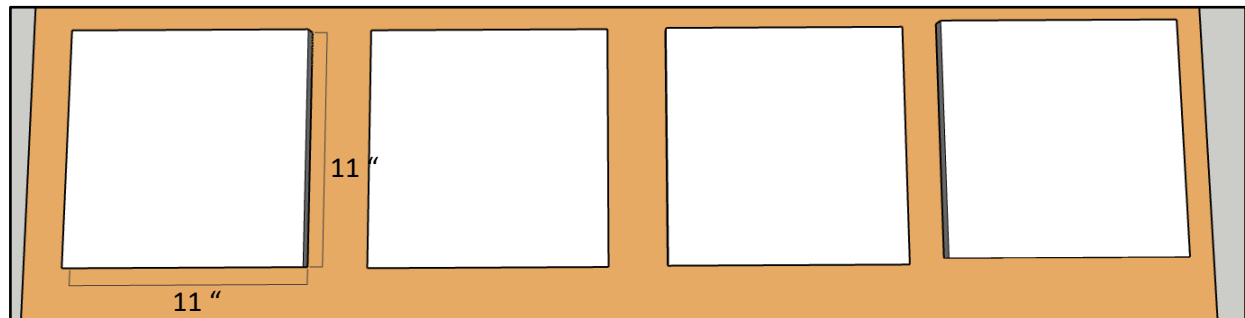


Materials	Tools
x1 Rubber stall mat (8' x 4' x 3/4")	Reciprocating saw
	Measuring tape
	Straight edge
	Sharpie

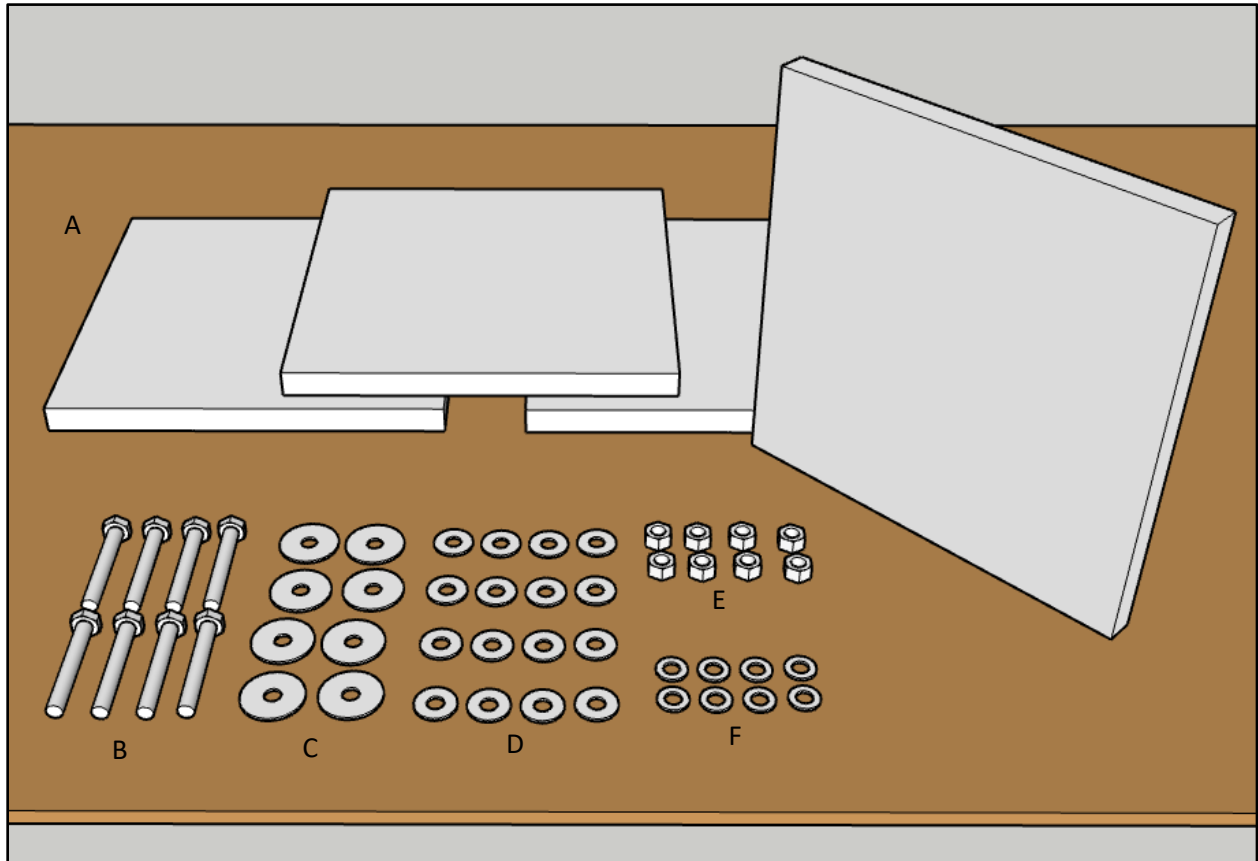
Step 1.1 – Lay the 3/4" thick rubber stall mat out on a stable flat surface. Measure out and mark four 11" x 11" square sections.



Step 1.2 - Cut sections out with a reciprocating saw.



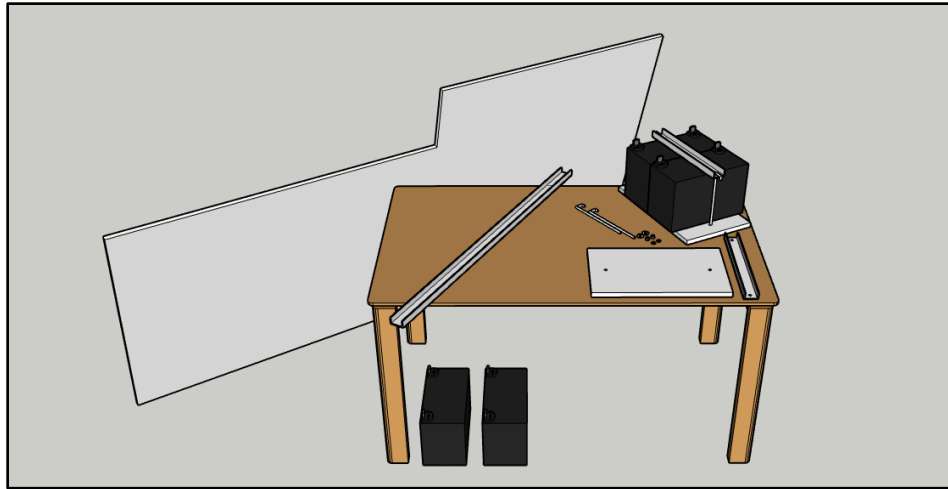
Step 1.3 – Put the completed vibration pads and the following hardware aside for step 7 ([pg. 23](#)).



- A. x4 Vibration pads (11"x11"x 3/4")
- B. x8 Hex bolts (3/8" x 3 1/2")
- C. x8 Large washers (3/8")

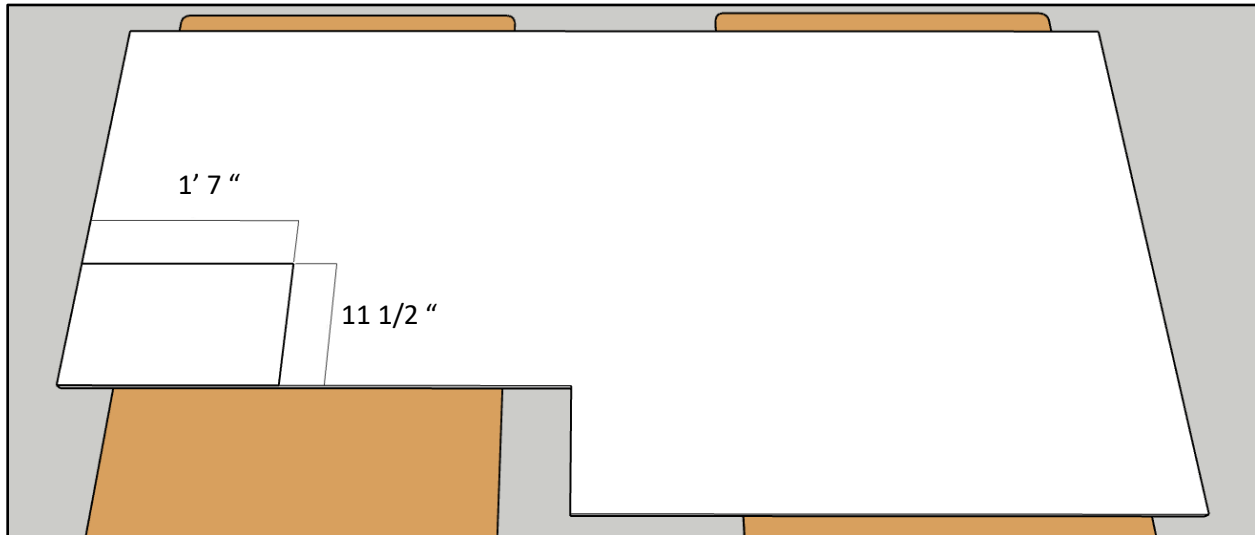
- D. x16 Standard washers (3/8")
- E. x8 Hex nuts (3/8")
- F. x8 lock washers (3/8")

Step 2 – Battery Mount

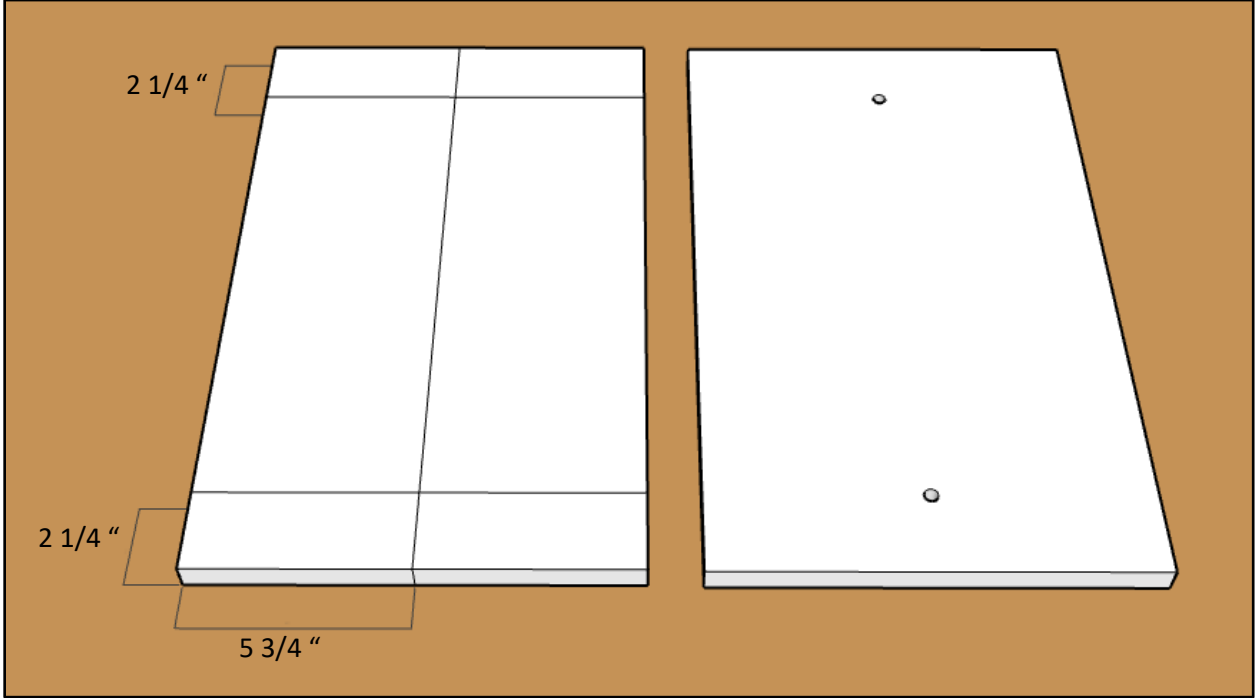


Materials	Tools
MC channel (2" x 1" x 3/16")	Chop saw
x1 Left-over rubber stall mat (8' x 4' x 3/4")	Reciprocating saw
x2 Deep cycle batteries (provided by vendor)	Measuring tape
	Straight edge
	Sharpie
	Drill press
	3/8" drill bit

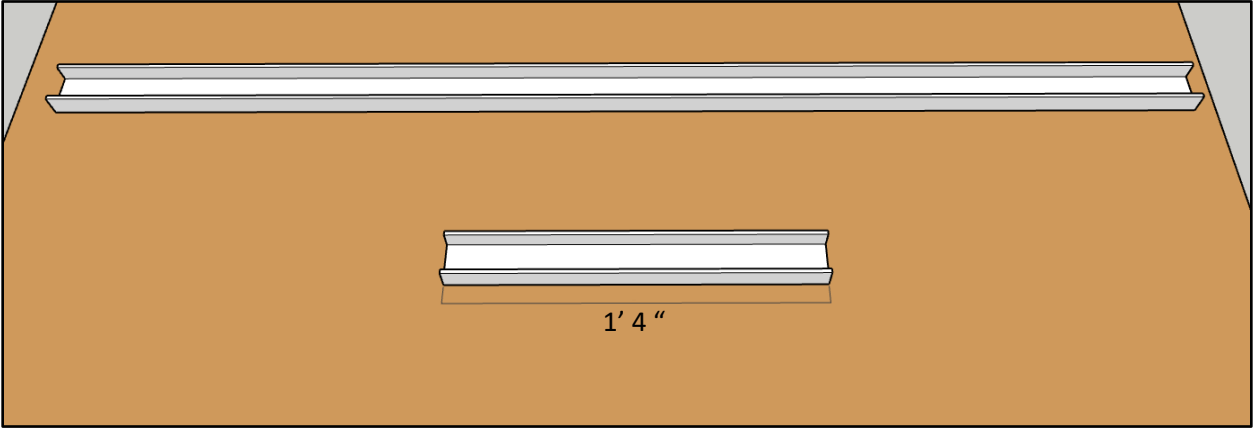
Step 2.1 – Lay the left-over rubber stall mat out on a flat stable surface. Measure out a 1'7" x 11 1/2" section and cut with a Reciprocating saw.



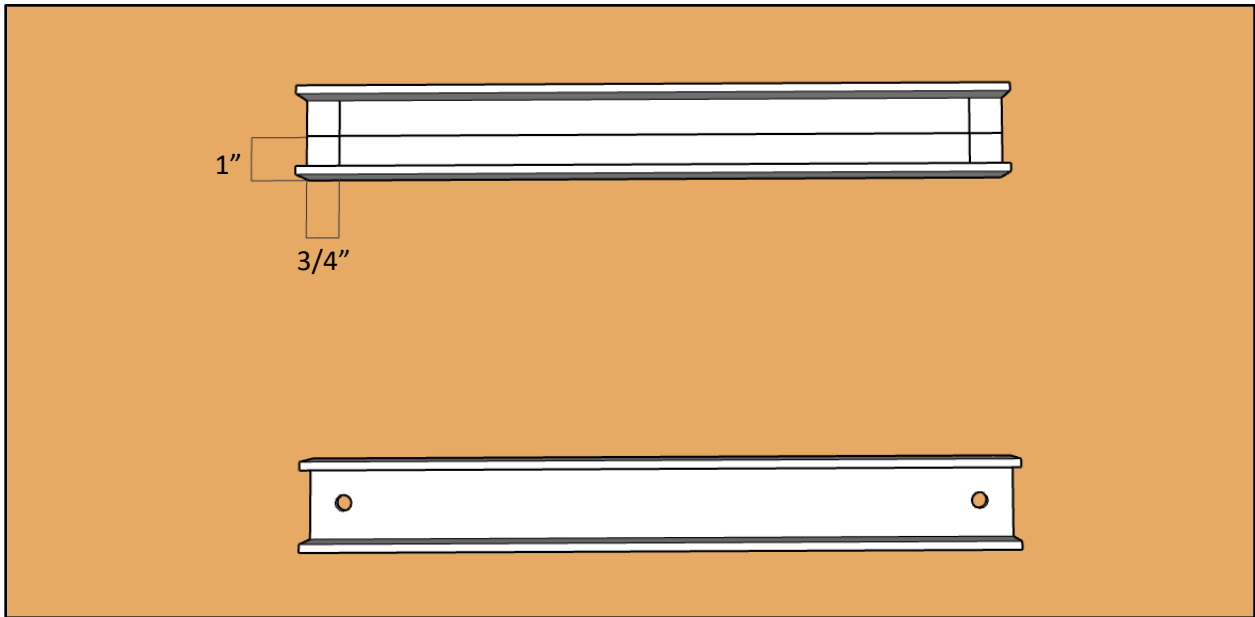
Step 2.2 - Measure out (see illustration below) and drill two 3/8" holes into the 1'7" x 1 1/2" section.



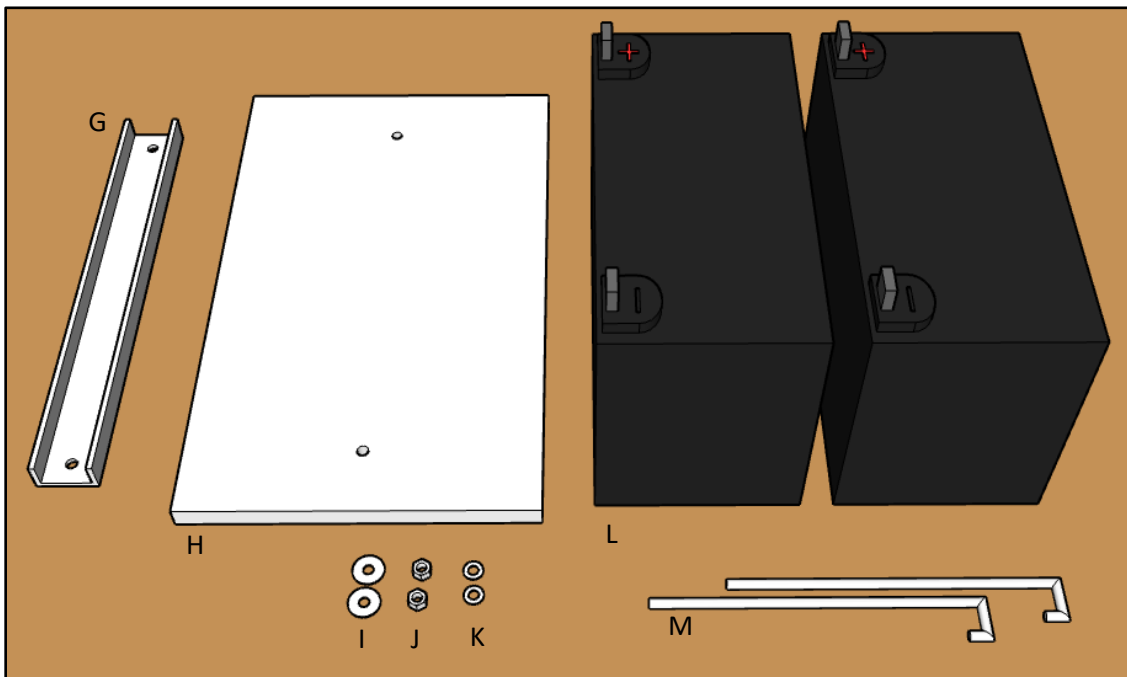
Step 2.3 – Cut down the MC channel to 1' 4" length with a chop saw.



Step 2.4 – Measure out (see illustration below) and drill two 3/8” holes on either side of the MC channel.



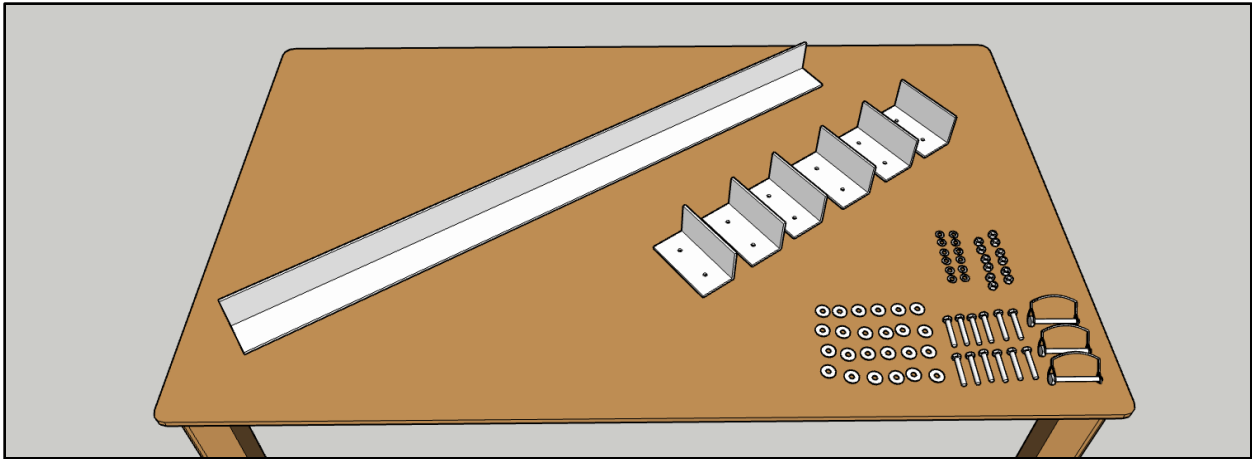
Step 2.5 – Put the modified MC Channel, rubber battery pad, two deep cycle batteries (provided by vendor) and the following hardware aside for Step 6 ([pg. 21](#)).



- G. x1 MC channel (2" x 1" x 3/16" x 1' 4")
- H. x1 Battery pad (1'7" x 11 1/2" x 3/4")
- I. x2 Standard washers (3/8")
- J. x2 Hex nuts (3/8")

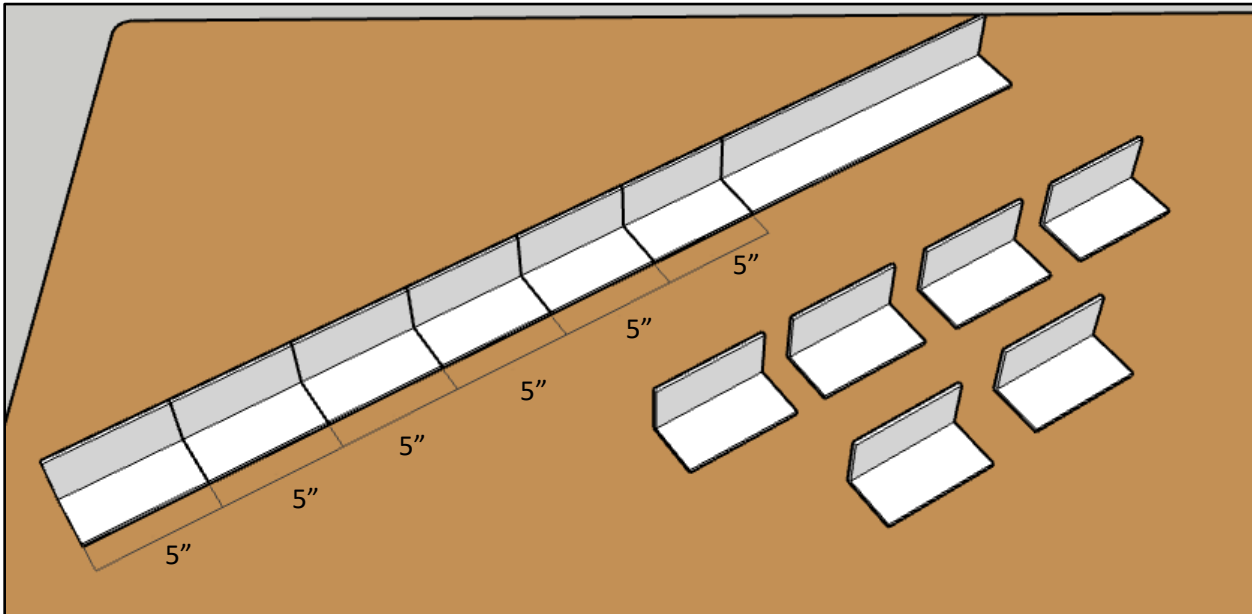
- K. x2 Lock washers (3/8")
- L. x2 Deep Cycle batteries
- M. x2 Battery mount rods (3/8")

Step 3 – Antenna Cradles

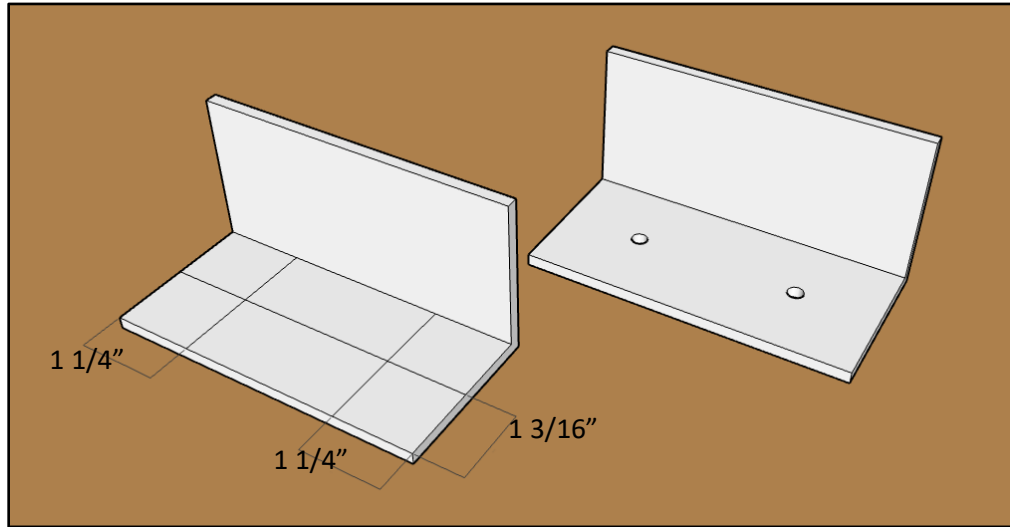


Materials	Tools
Angle iron (2 1/2" x 3/16")	Chop saw
	Measuring tape
	Straight edge
	Sharpie
	Drill press
	1/4" drill bit

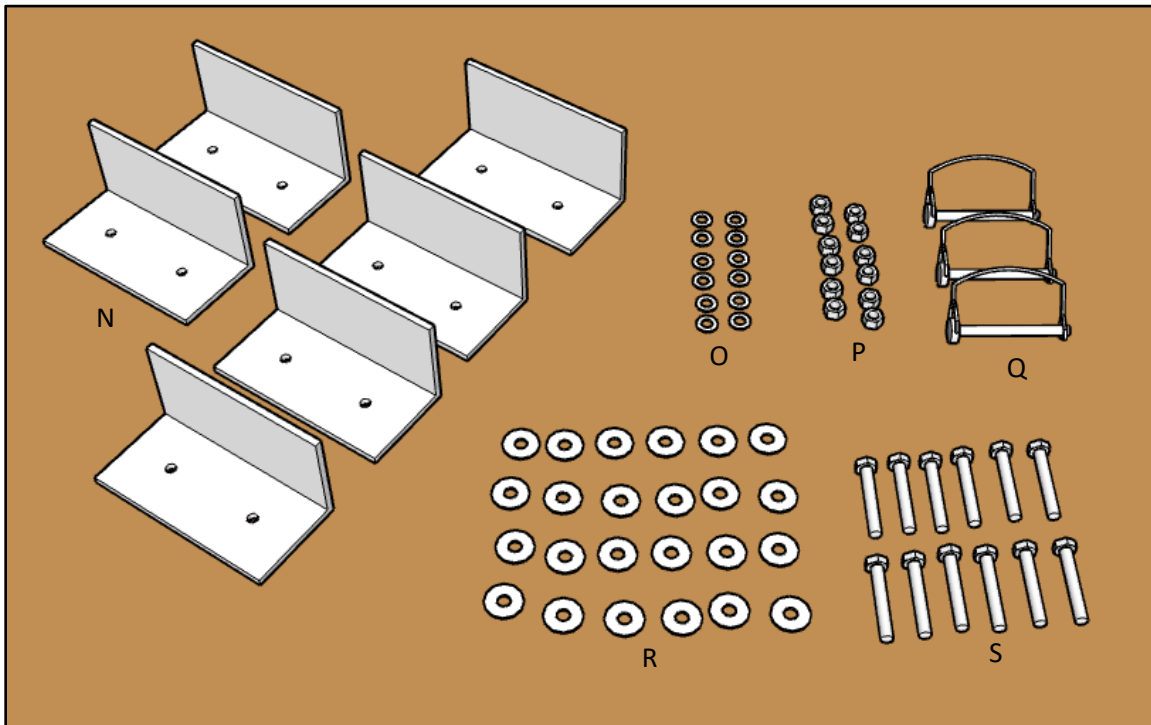
Step 3.1 – Measure out and cut six 5" sections from the 2 1/2" x 3/16" angle iron with a chop saw. Make sure marking lines are same width as saw blade to ensure length isn't lost in cut.



Step 3.2 – Measure out (see below) and drill two ¼” holes at the intersection of the lines of measurement on one side of each of the six angle irons.



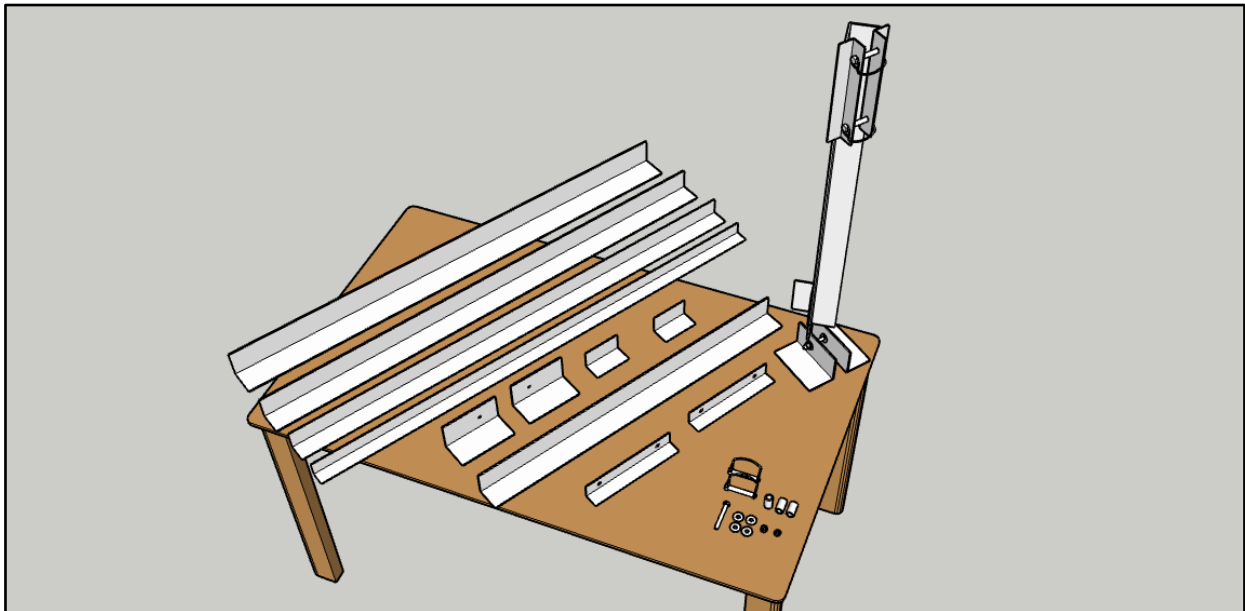
Step 3.3 – Put the modified angle irons and the following hardware aside for step 8 ([pg. 27](#)).



N. x6 Angle irons (5" x 2 ½" x 3/16")
 O. x12 Lock washers (1/4")
 P. x12 Hex nuts (1/4")

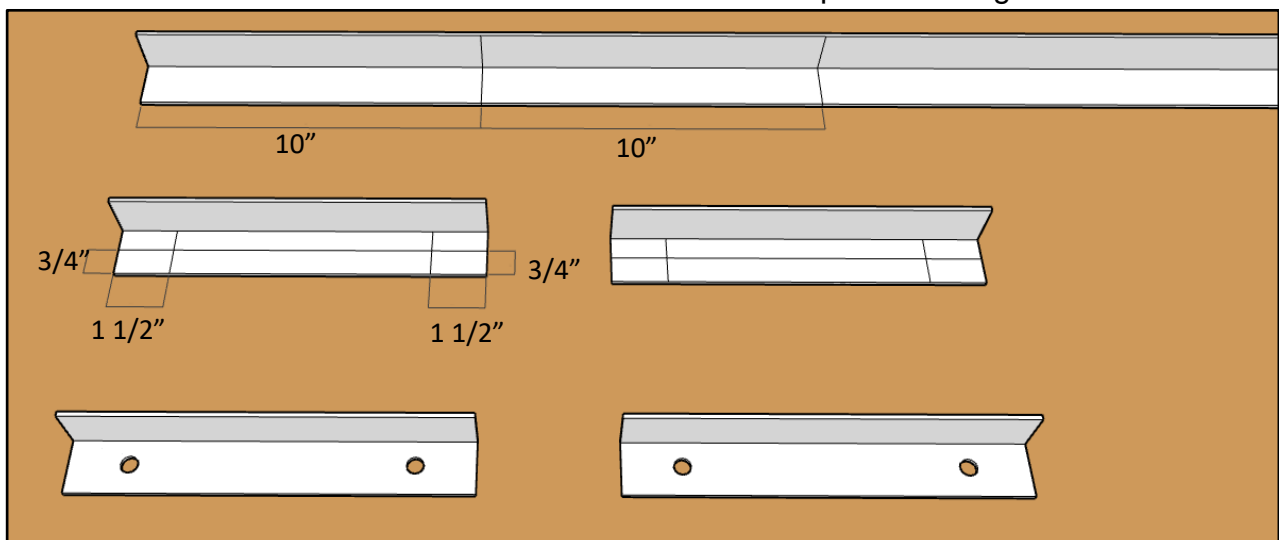
Q. x3 PTO pins (1/4" x3")
 R. x24 Standard washers (1/4")
 S. x12 Hex bolts (1/4" x 2 ½")

Step 4 – Antenna Mount

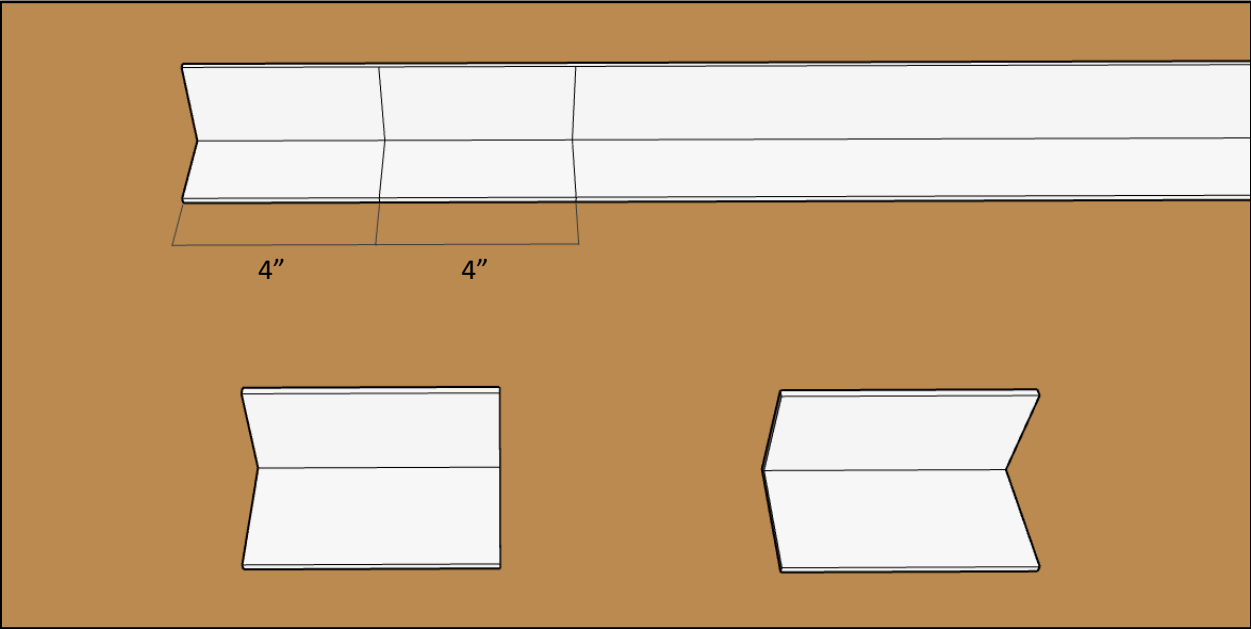


Materials	Tools
Angle iron (1 ½" x 1/8")	Chop saw
Angle iron (2" x 1/8")	Measuring tape
Angle iron (2 ½" x 3/16")	Straight edge
Angle iron (3" x 3/16")	Sharpie
	Drill press
	5/16" drill bit
	7/16" drill bit

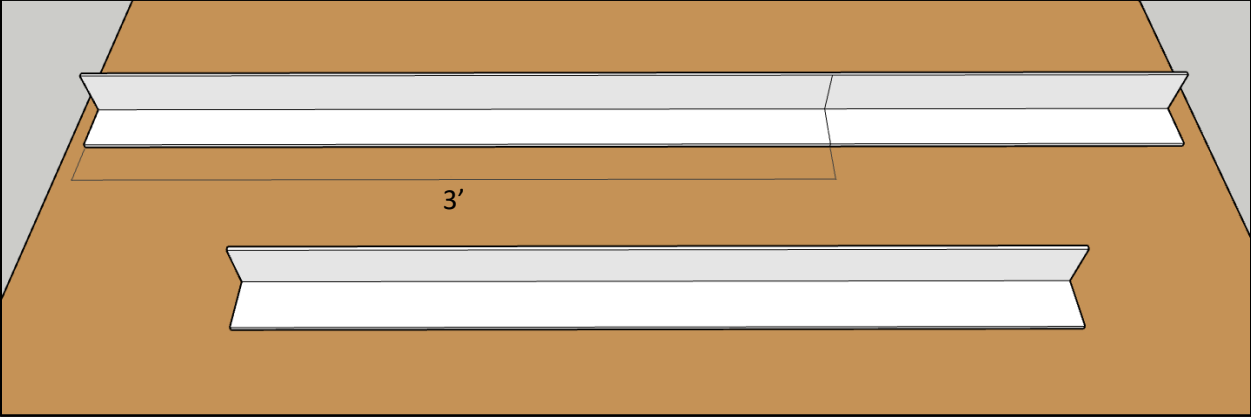
Step 4.1 - Measure out and cut two 10" sections from the 1 ½" x 1/8" angle iron with a chop saw. Make sure marking lines are same width as saw blade to ensure length isn't lost in cut. Then measure out (see below) and drill two 7/16" holes at the intersections of the lines of measurement on one side of each of the two pieces of angle irons.



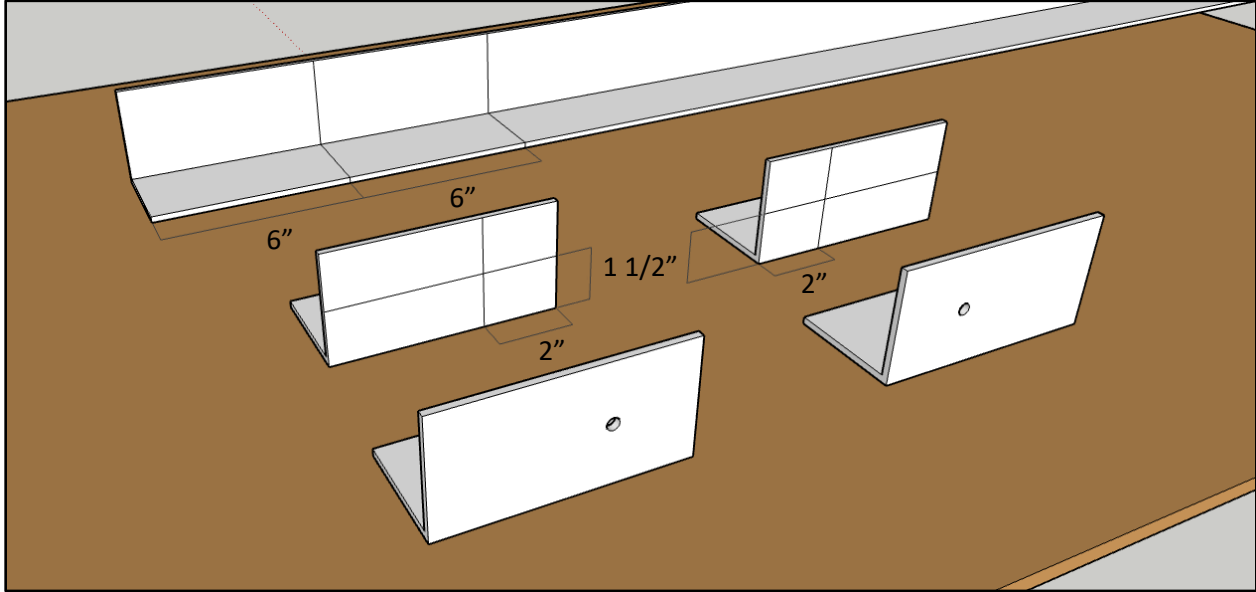
Step 4.2 - Measure out and cut two 4" sections from the 2" x 1/8" angle iron with a chop saw. Make sure marking lines are same width as saw blade to ensure length isn't lost in cut.



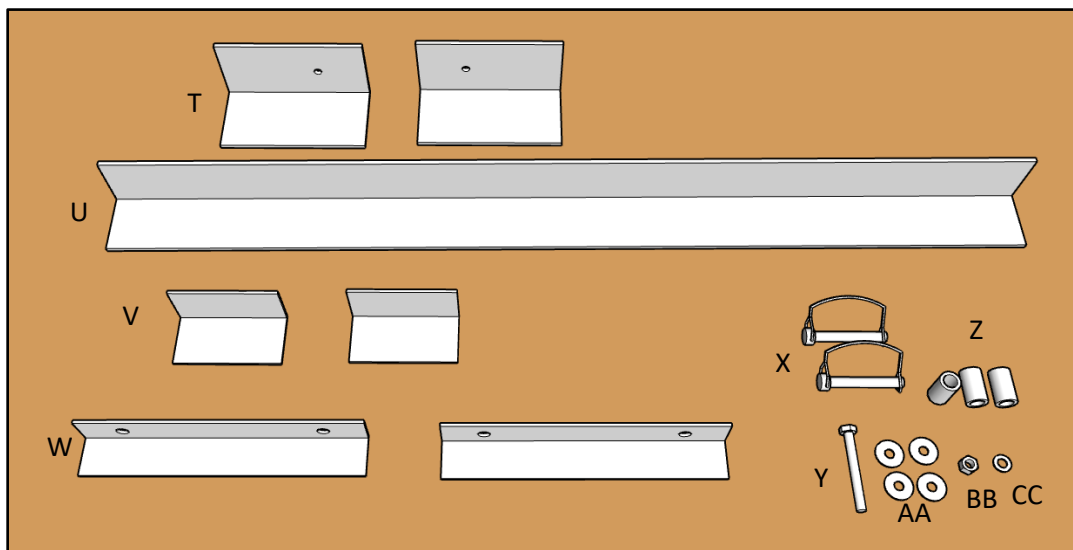
Step 4.3 - Measure out and cut one 3' section from the 2 1/2" x 3/16" angle iron with a chop saw. Make sure marking lines are same width as saw blade to ensure length isn't lost in cut.



Step 4.4 - Measure out and cut two 6" sections from the 3" x 3/16" angle iron with a chop saw. Make sure marking lines are same width as saw blade to ensure length isn't lost in cut. Then measure out (see below) and drill a 5/16" hole at the intersection of the lines of measurement on one side of each of the two pieces of angle iron. **Make sure to measure from the inside of each section so the holes will mirror each other.**



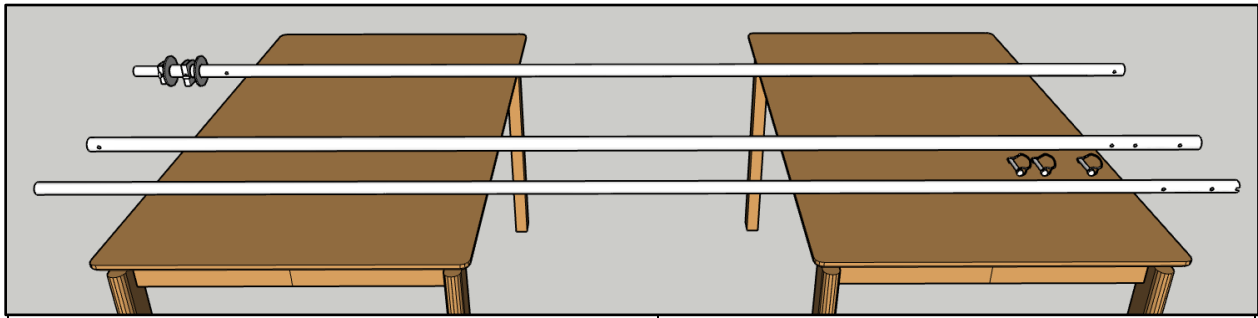
Step 4.5 – Put the modified angle irons and the following hardware aside step 8 ([pg. 27](#)).



T. x2 Angle irons (6" x 3" x 3/16")
 U. x1 Angle iron (3' x 2 1/2" x 3/16)
 V. x2 Angle irons (4" x 2" X1/8")
 W. x2 Angle irons (10" x 1 1/2" x 1/8")
 X. x2 PTO pins (3" x 3/8")

Y. x1 Hex bolt (5/16" x 3")
 Z. x3 Bushings (1 1/4" x 3/4")
 AA. x4 Standard washers (5/16")
 BB. x1 Hex nut (5/16")
 CC. x1 Lock washer (5/16")

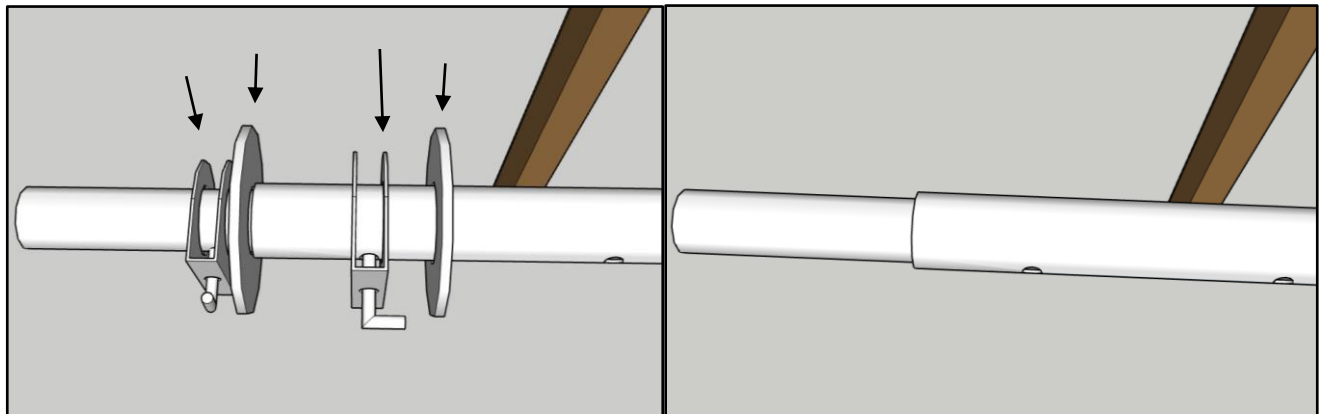
Step 5 - Antenna Modifications



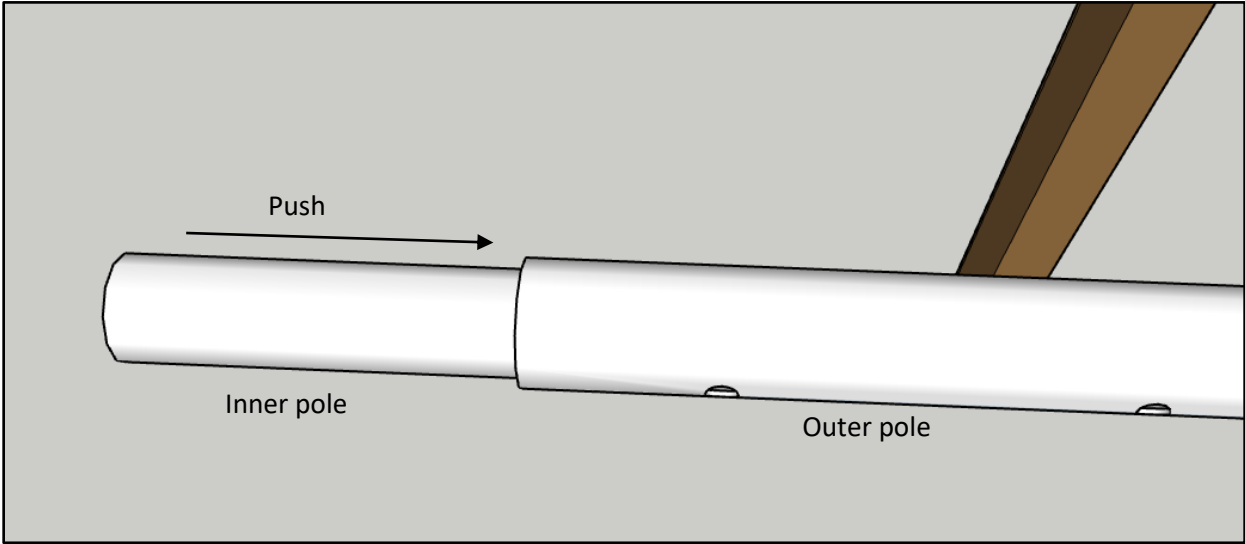
Materials	Tools
Factory provided extendable antenna pole	Measuring tape
X3 PTO pins (3" x 3/8")	Straight edge
	Sharpie
	Drill press
	Angle grinder w/ flap disk
	1/4" drill bit
	3/8" drill bit

The factory antenna consists of cabling, two transceivers and an extendable metal pole. The factory extendable pole is not designed to be pulled apart into two separate pieces. It is designed to be extended, then wired for long-term installation. An important part of making the antenna easy to quickly disassemble is not having to rerun cable every time you set it up and pulling the extendable pole into two separate pieces allows for this. This section will cover how to modify the factory-provided extendable pole while **some important cabling considerations will be covered in step 8 (pg. 24)**.

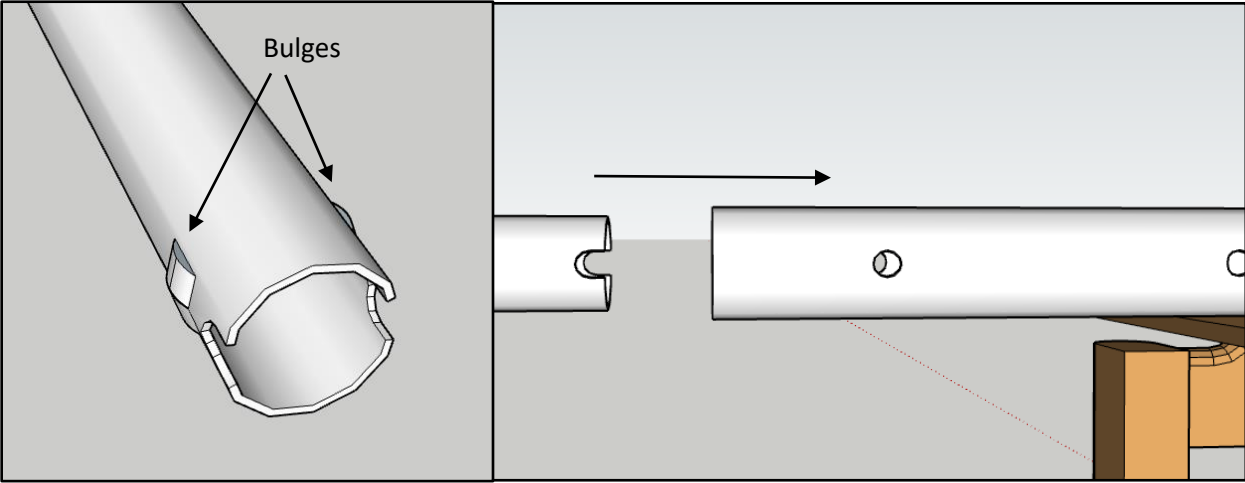
Step 5.1 – Remove the hardware provided for permanent installation.



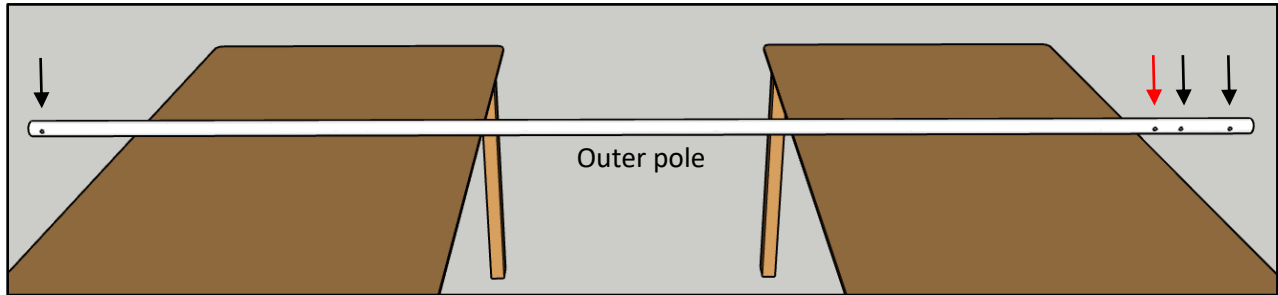
Step 5.2 – Separate the extendable pole into two separate poles. You will have to push the inner pole in the direction shown below to do this easily. There are metal bulges on one end of the inner pole that prevent separation in the other direction.



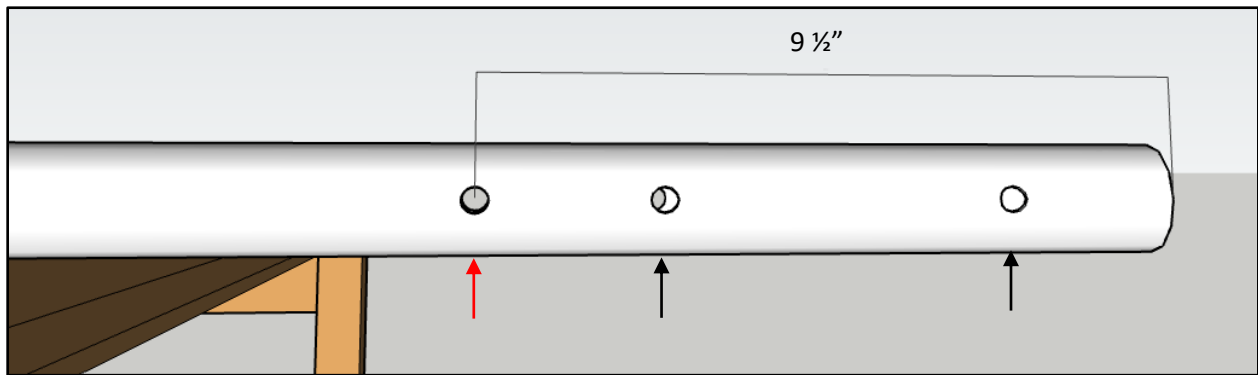
Step 5.3 – Grind down the metal bulges on either side of the inner pole with an angle grinder so the inner section can smoothly slide into the outer from either direction.



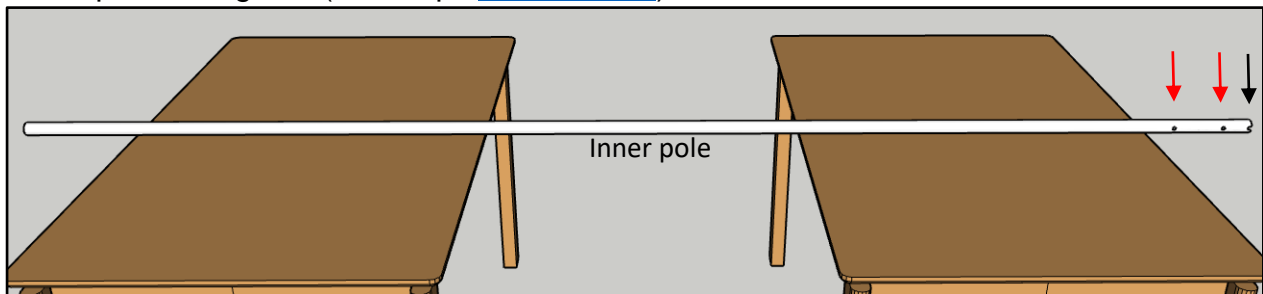
Step 5.4 – The **outer pole** comes with three sets of holes (black arrows). An additional set of holes needs to be drilled (red arrow) to help secure the outer and inner poles together while in the upright position. This set of holes should be drilled with a 3/8" drill bit.



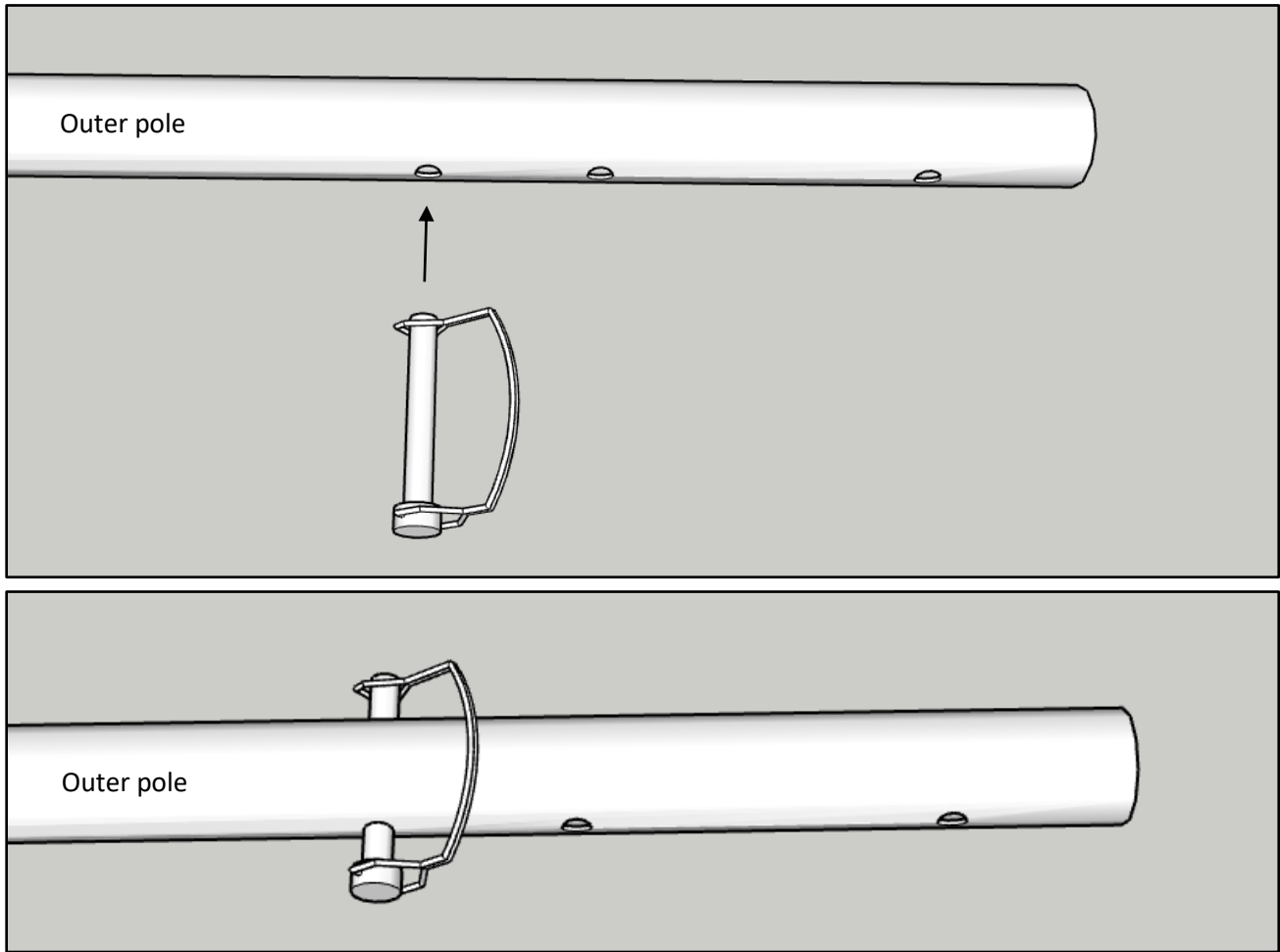
The measurement in the image below is from the edge of the pole to the center of the hole. **IMPORTANT – Make sure this set of holes is drilled straight through the center of the pole (suggest using a drill press for precision).**



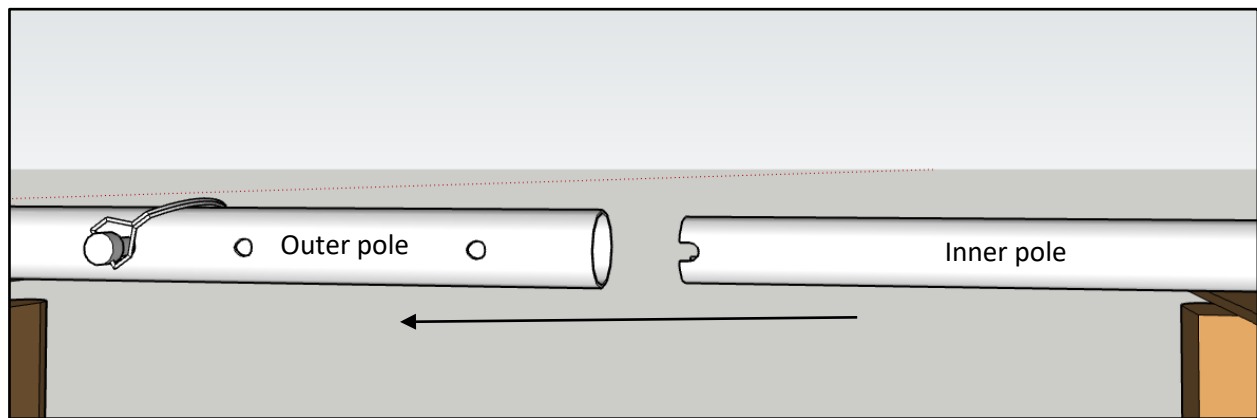
Step 5.5.1 – The **inner pole** comes with one set of holes on the very edge of one side (black arrow). Two additional sets of holes need to be drilled to help secure the outer and inner poles together while in the upright position (red arrows) and they are most easily drilled by inserting the inner pole into the outer pole and using the holes in the outer pole as a guide (see steps [5.5.2](#) – [5.5.4](#)).



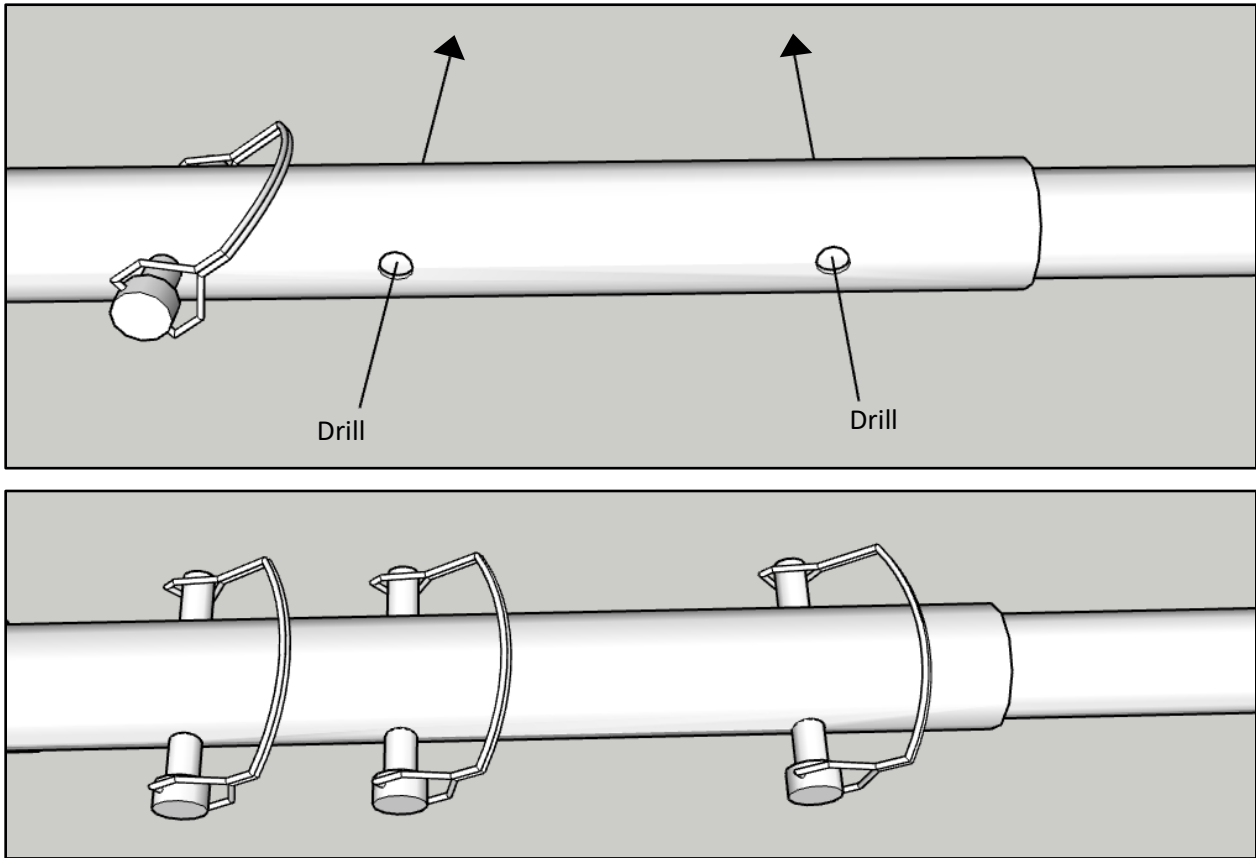
Step 5.5.2 – Insert one of the PTO pins (3" x 3/8") into the newly drilled set of holes in the outer pole. This will act as a stopper for the inner pole.



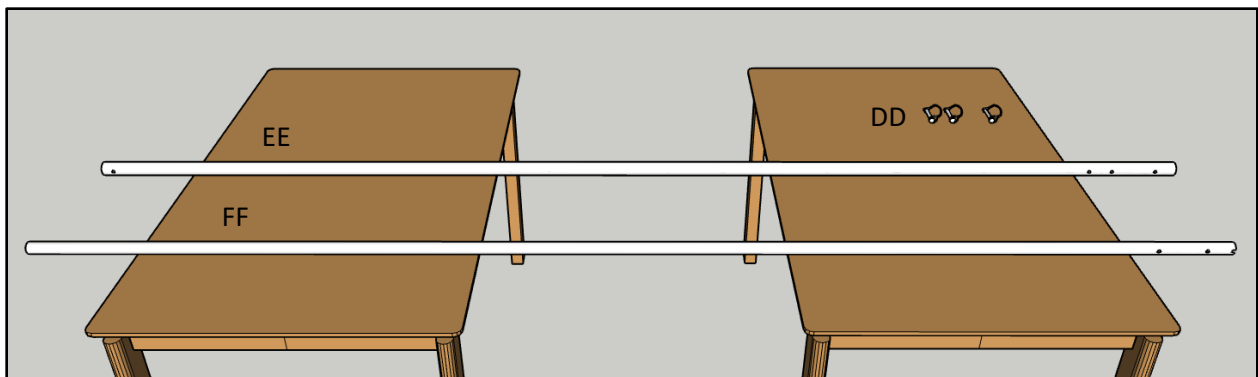
Step 5.5.3 – Insert the inner pole into the outer pole so the set of factory holes on the inner pole lock into the PTO pin inserted through the outer pole.



Step 5.5.4 – Use the two holes in the outer pole as guides to drill through inner pole. Use a 3/8” drill bit. Once these holes are drilled you should be able to fit all three PTO Pins (3” x 3/8”) through.

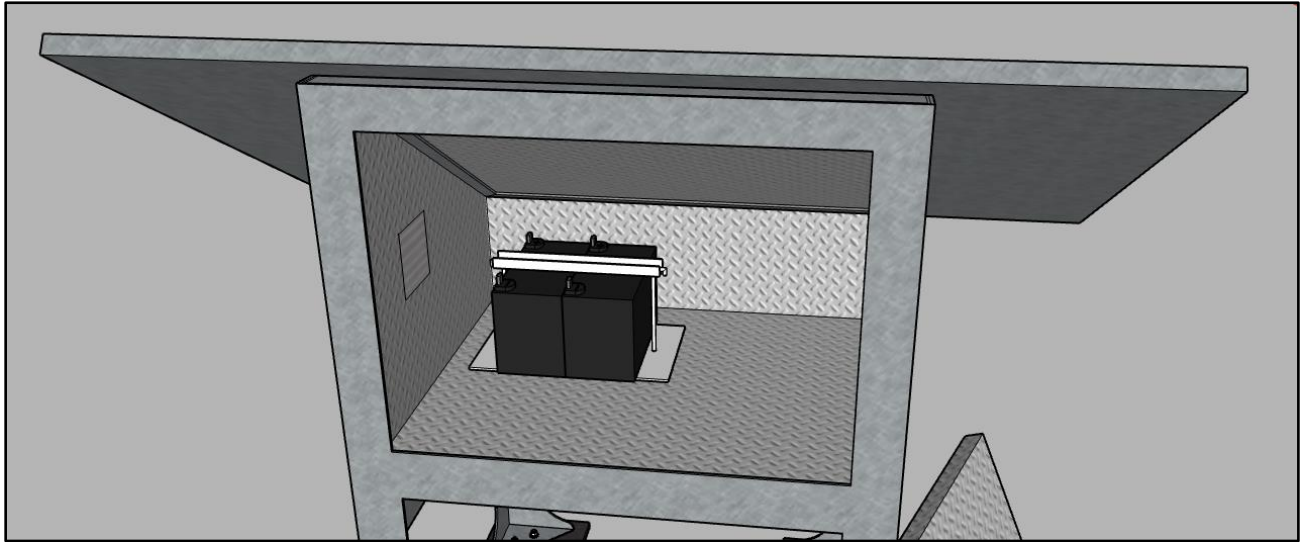


Step 5.6 – Remove PTO pins, pull apart inner and outer poles and set aside for step 8 ([pg. 27](#)).



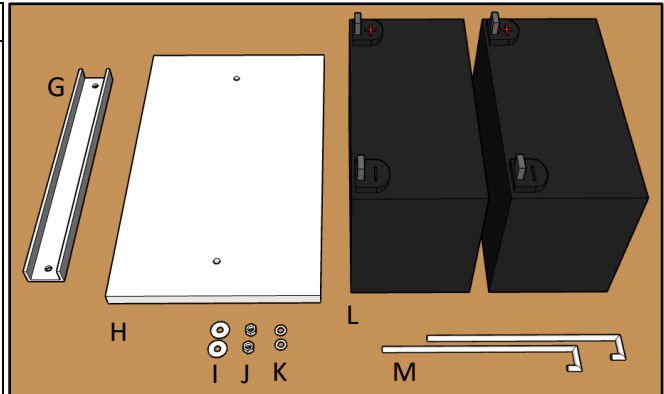
- DD. x3 PTO pins (3” x 3/8”)
- EE. Modified outer pole
- FF. Modified inner pole

Step 6 – Mounting the battery

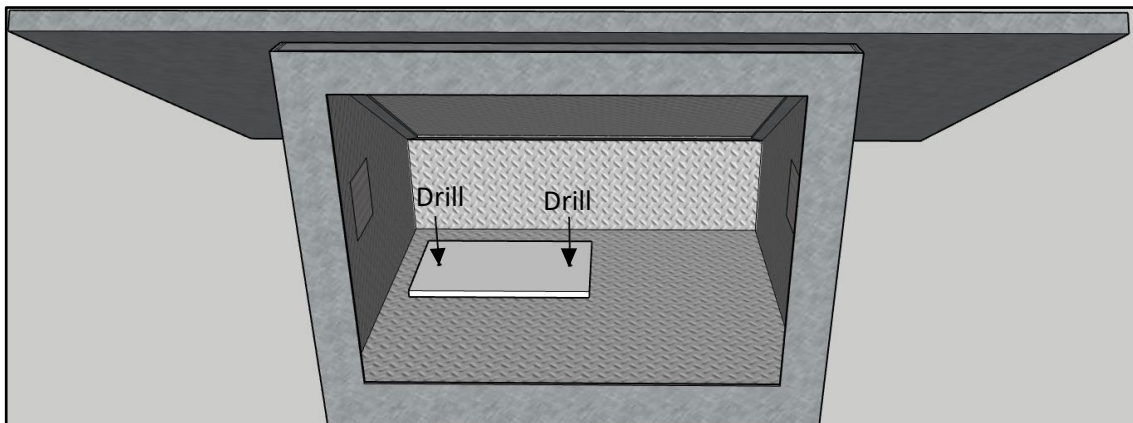


Materials

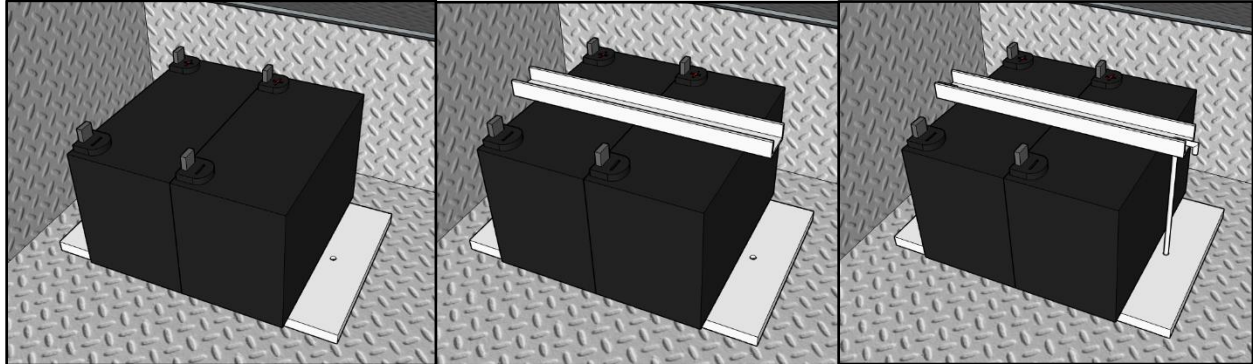
- G. x1 MC channel (2" x 1" x 3/16" x 1' 4")
- H. x1 Battery pad (1'7" x 11 1/2" x 3/4")
- I. x2 Standard washers (3/8")
- J. x2 Hex nuts (3/8")
- K. x2 Lock washers (3/8")
- L. x2 Deep cycle batteries
- M. x2 Battery mount rods (3/8")



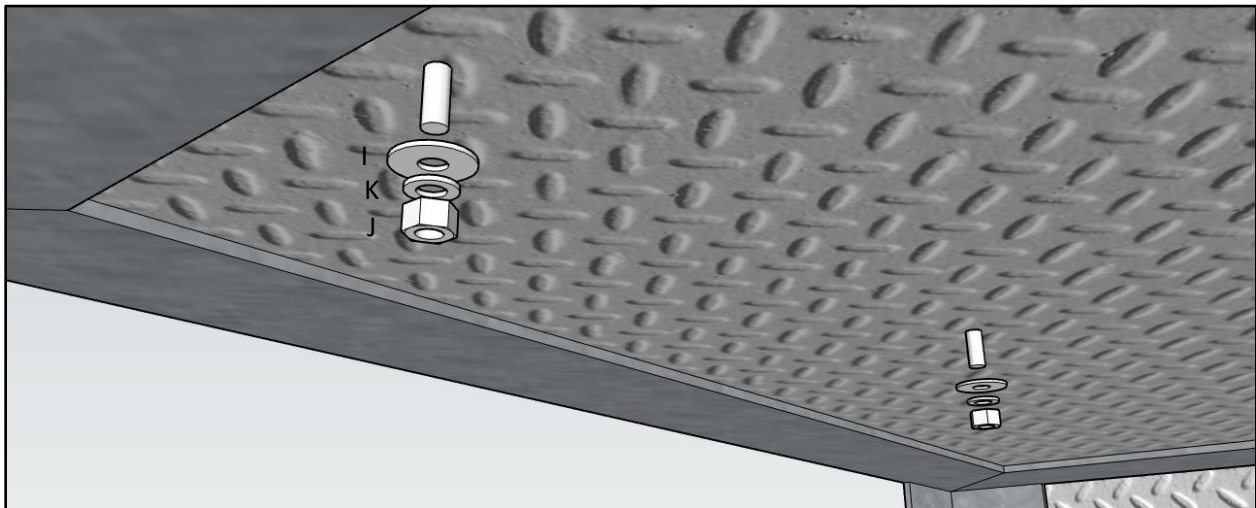
Step 6.1 – Place the battery pad (H) in the back left corner of the base station hut. This will be behind an electronic box (not shown in this picture). Then, using the holes predrilled in the battery pad as a guide, drill two 3/8" holes through bottom of the base station hut.



Step 6.2 – Place the two deep cycle batteries centered on the battery pad. Set the MC Channel across the top of the two deep cycle batteries so the two holes in the MC channel line up with the two holes in the battery pad/floor of hut. Slide the battery mount rods through these sets of holes.

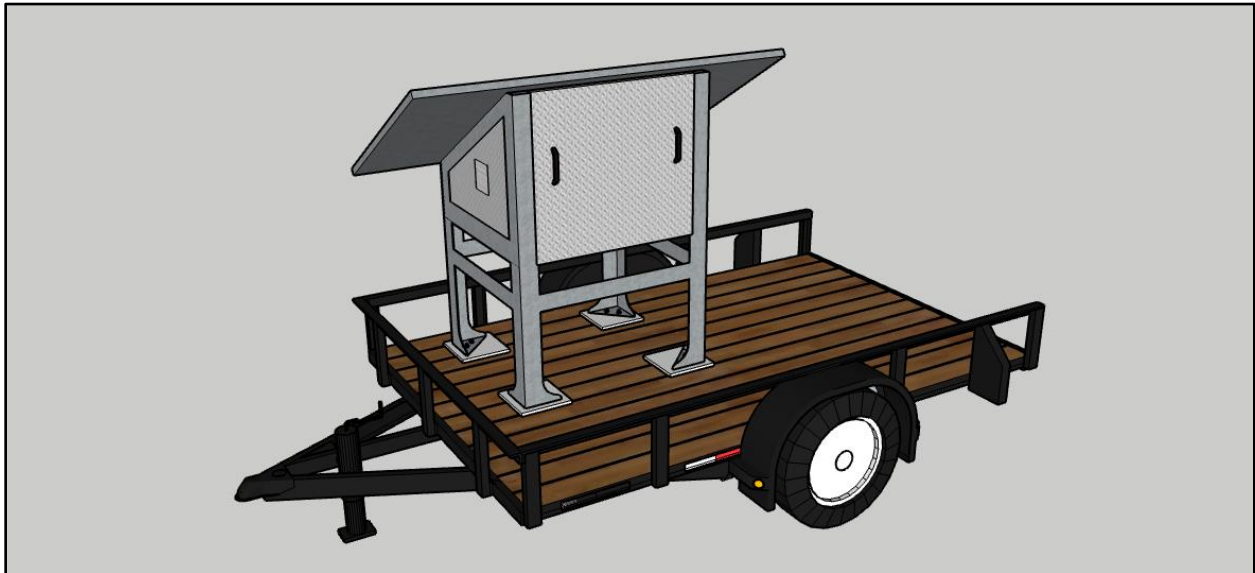


Step 6.3 – Secure the battery mount from underneath the base of the hut. From top to bottom put a standard washer (I) lock washer (K) and a hex nut (J) on the threading of the battery mount rods sticking through the floor of the base station hut.



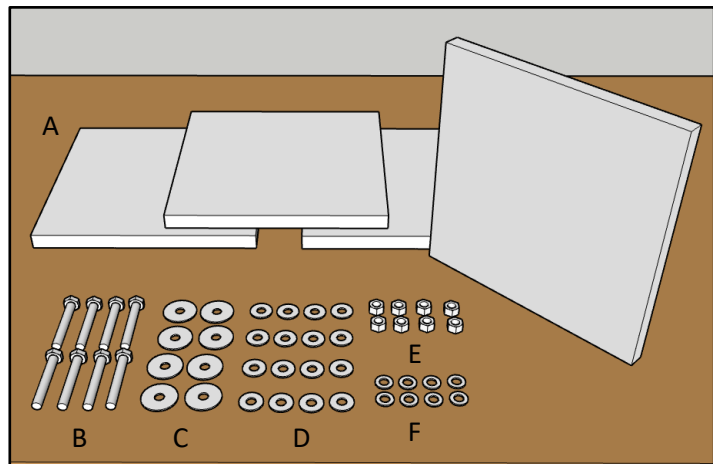
Cautionary Note – At the end of this guide you will be instructed to apply Loctite to all nuts used in the conversion. Although you may need to replace the deep cycle batteries, it is still suggested to apply Loctite to the hex nuts (J) that secure the battery mount and fully tighten. Depending on the type of Loctite used, there are different ways to remove these nuts if replacing the batteries is necessary. It is important these nuts do not loosen to vibration during transit. If the metal MC channel shifts it could create a short between the battery terminals which is a potential fire hazard.

Step 7 – Mounting the base station

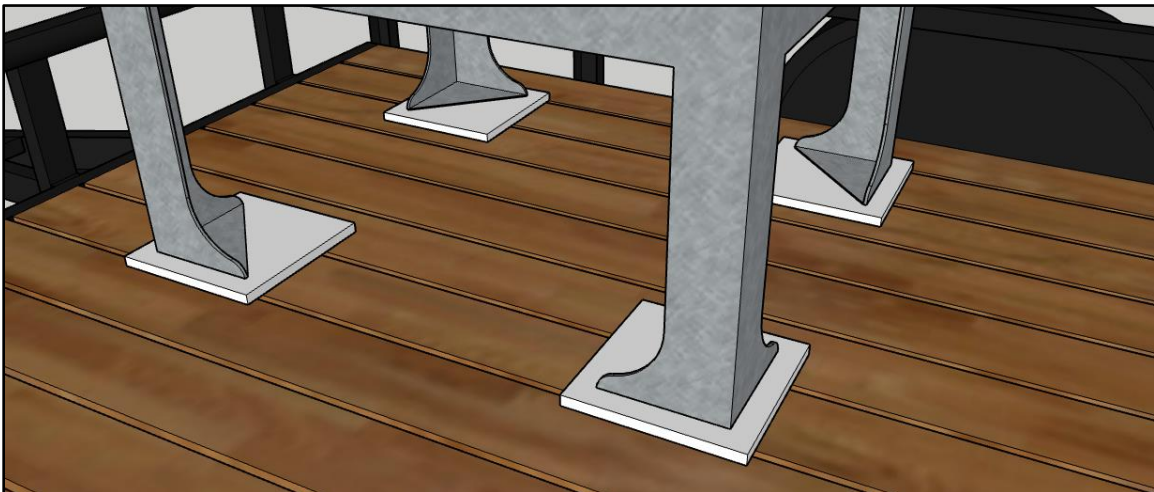


Materials

- A. x4 Vibration pads (11"x11"x 3/4")
- B. x8 Hex bolts (3/8" x 3 1/2")
- C. x8 Large washers (3/8")
- D. x16 Standard washers (3/8")
- E. x8 Hex nuts (3/8")
- F. x8 Lock washers (3/8")



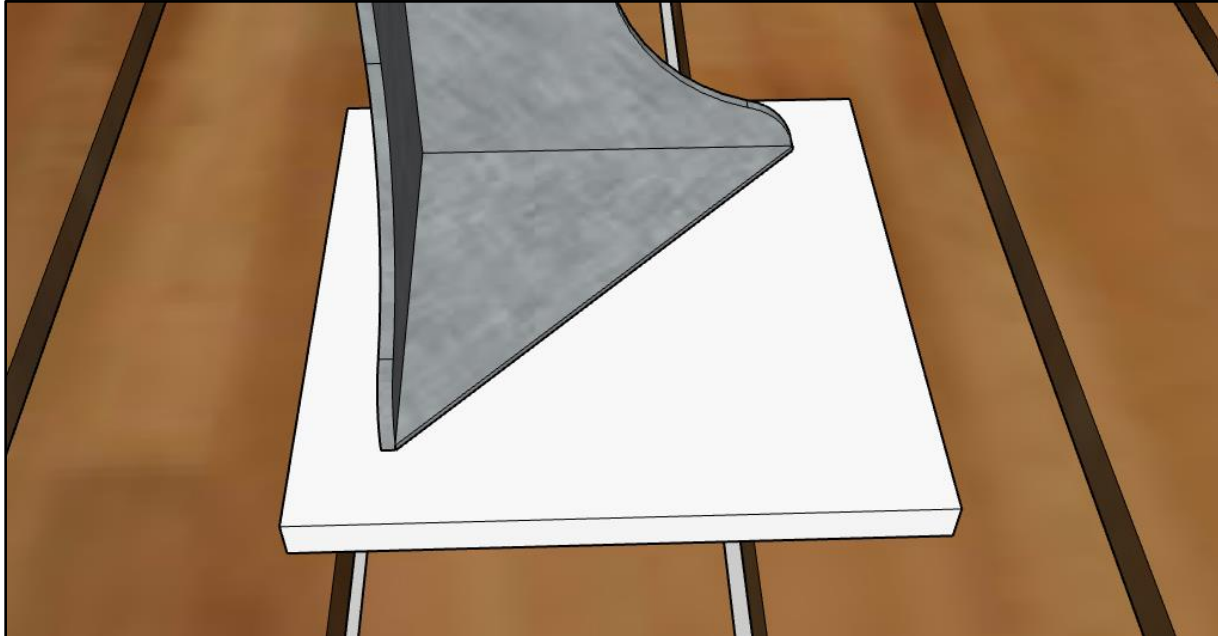
Step 7.1 – Set base station on the front right corner of the trailer with one pad squared under each foot.



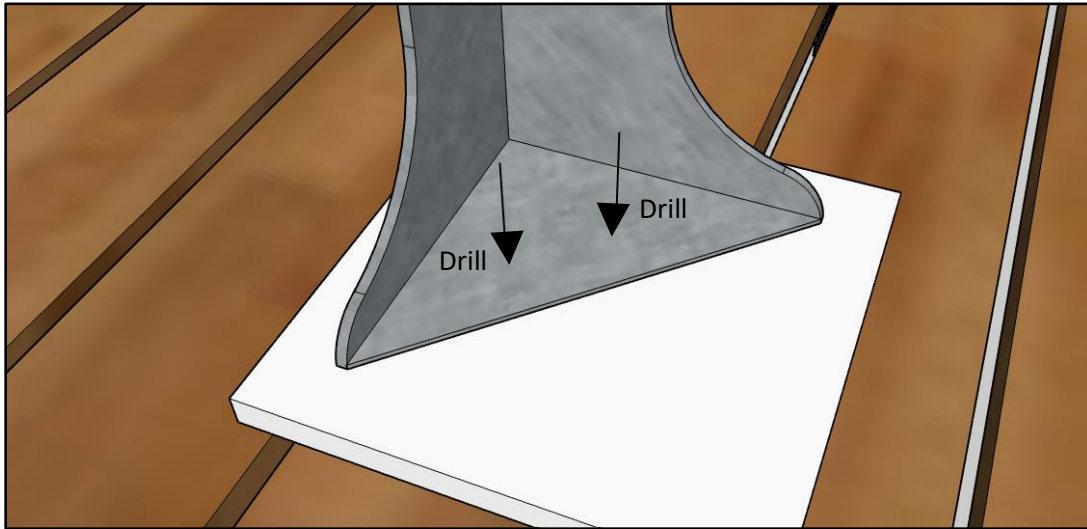
Step 7.2 – Try to get the base station as far forward and to the right side as possible while still making sure no part of the solar panel extends over the edge of the trailer. This is important to allow space on the left side of the trailer for the antenna mount and cradles.



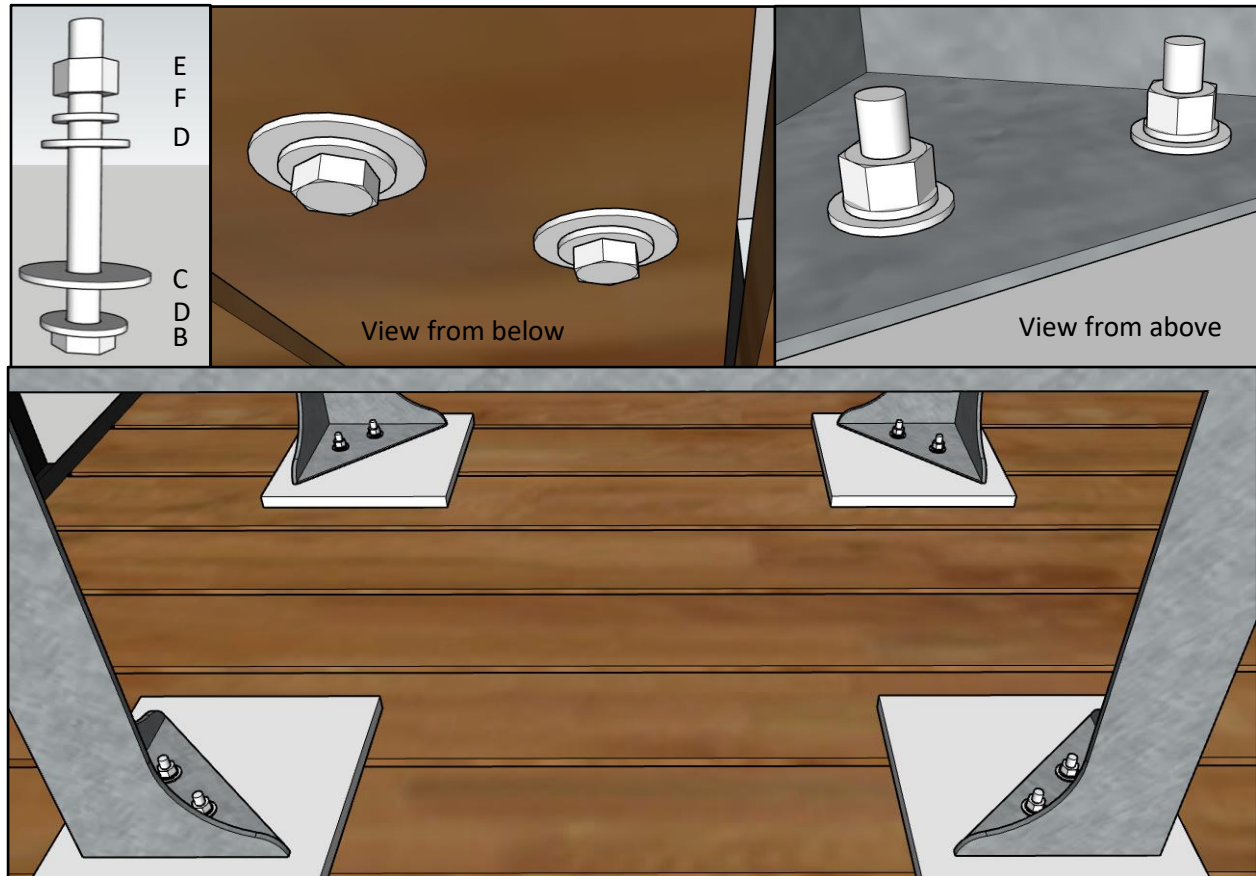
You will need to slightly shift the base station and pads to the left or right so that each foot is either centered on a wooden floorboard or relatively evenly spaced between two. The important part is to make sure you will be able to put two bolts through each foot and be able to get a good bite of the wood beneath.



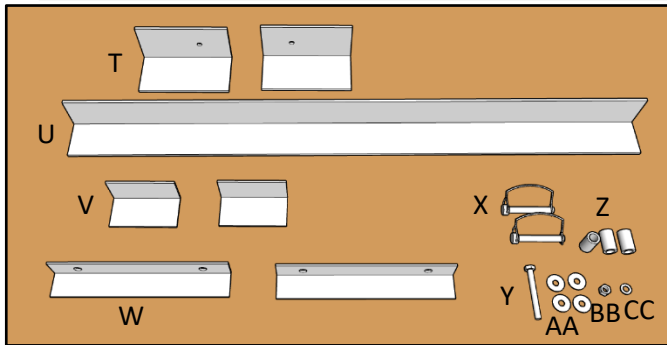
Step 7.3 – Drill two 3/8” holes straight through the base station foot, vibration pad and wooden floorboard. Repeat for each of the four feet.



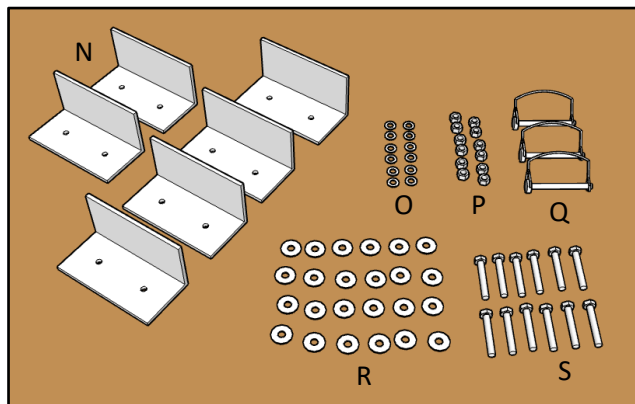
Step 7.4 – Putting in the bolts is most easily done with a partner. Have one person crawl under the trailer with x8 hex bolts (B), x8 large washers (C) and x8 standard washers (D). Put one standard and one large washer on each bolt and push them through the newly drilled holes from the bottom one at a time. Have your partner on top of the trailer first put on a standard washer (D) then a lock washer (F) and finally a hex nut (E). Repeat this process for all 8 bolts.



Step 8 – Antenna mount and cradles installation



Antenna Mount Materials	
T.	x2 Angle irons (6" x 3" x 3/16")
U.	x1 Angle iron (3' x 2 1/2" x 3/16)
V.	x2 Angle irons (4" x 2" X1/8")
W.	x2 Angle irons (10" x 1 1/2" x 1/8")
X.	x2 PTO pins (3" x 3/8")
Y.	x1 Hex bolt (5/16" x 3")
Z.	x3 Bushings (1 1/4" x 3/4")
AA.	x4 Standard washers (5/16")
BB.	x1 Hex nut (5/16")
CC.	x1 Lock washer (5/16")



Antenna Cradle Materials	
N.	x6 Angle irons (5" x 2 1/2" x 3/16")
O.	x12 Lock washers (1/4")
P.	x12 Hex nuts (1/4")
Q.	x3 PTO pins (1/4" x 3")
R.	x24 Standard washers (1/4")
S.	x12 Hex bolts (1/4" x 2 1/2")



Antenna Materials		
DD.	x3 PTO pins (3" x 3/8")	EE. Modified outer pole
		FF. Modified inner pole

IMPORTANT – The process of assembling the antenna mount and cradles on the trailer will vary based on the wooden paneling and framing on the trailer that your conversion is on. Because of this, exact measurements won't be specified.

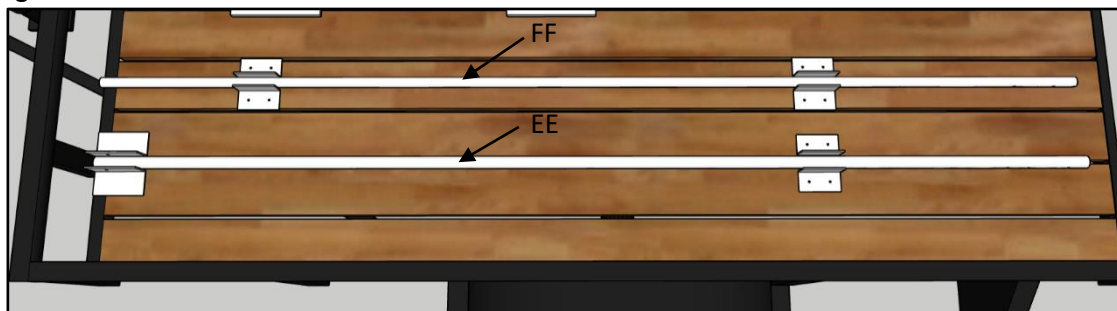
Step 8.1 – Lay out the angle irons that make up the base of the antenna mount (T) and the cradles (N) on the trailer to make sure you have enough space and available wooden paneling.



You will want the angle irons that make up the base of the antenna mount (T) to be backed by a vertical steel beam that's part of the trailer frame.



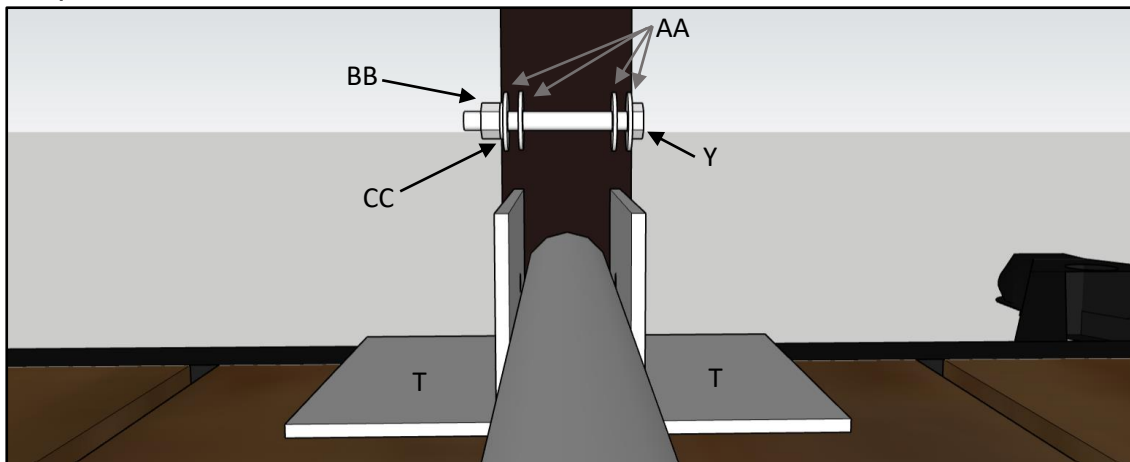
Lay out the inner (FF) and outer (EE) antenna poles to make sure you have enough space between the angle irons that make up each cradle and that the holes on the bottom face of each angle iron have a good bite of wooden paneling beneath to drill through.



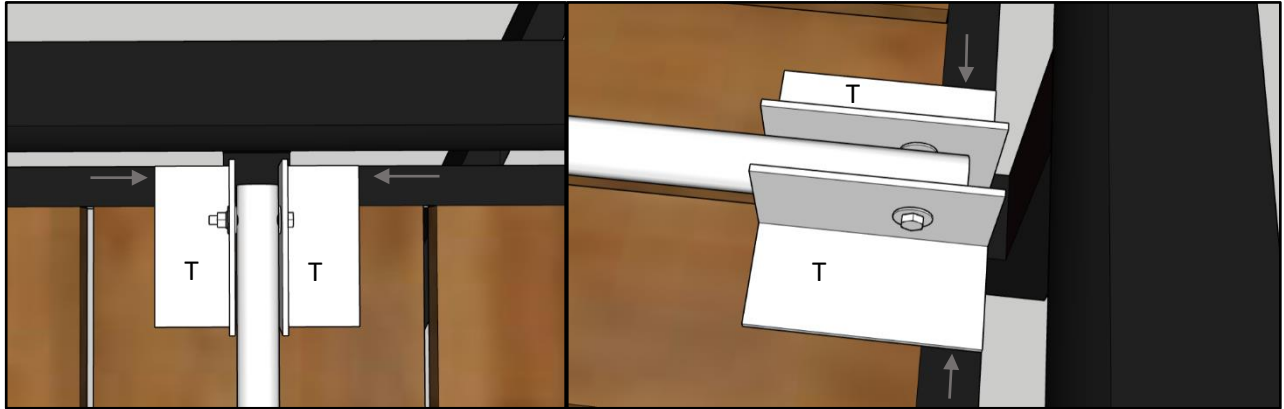
Step 8.2 – Once you're happy with everything laid out. Mark the location of each hole on the wooden paneling with a sharpie. Remove the inner antenna pole and angle irons that make up the cradles and wait to drill these twelve holes in the wooden paneling until you have the antenna mount finalized.



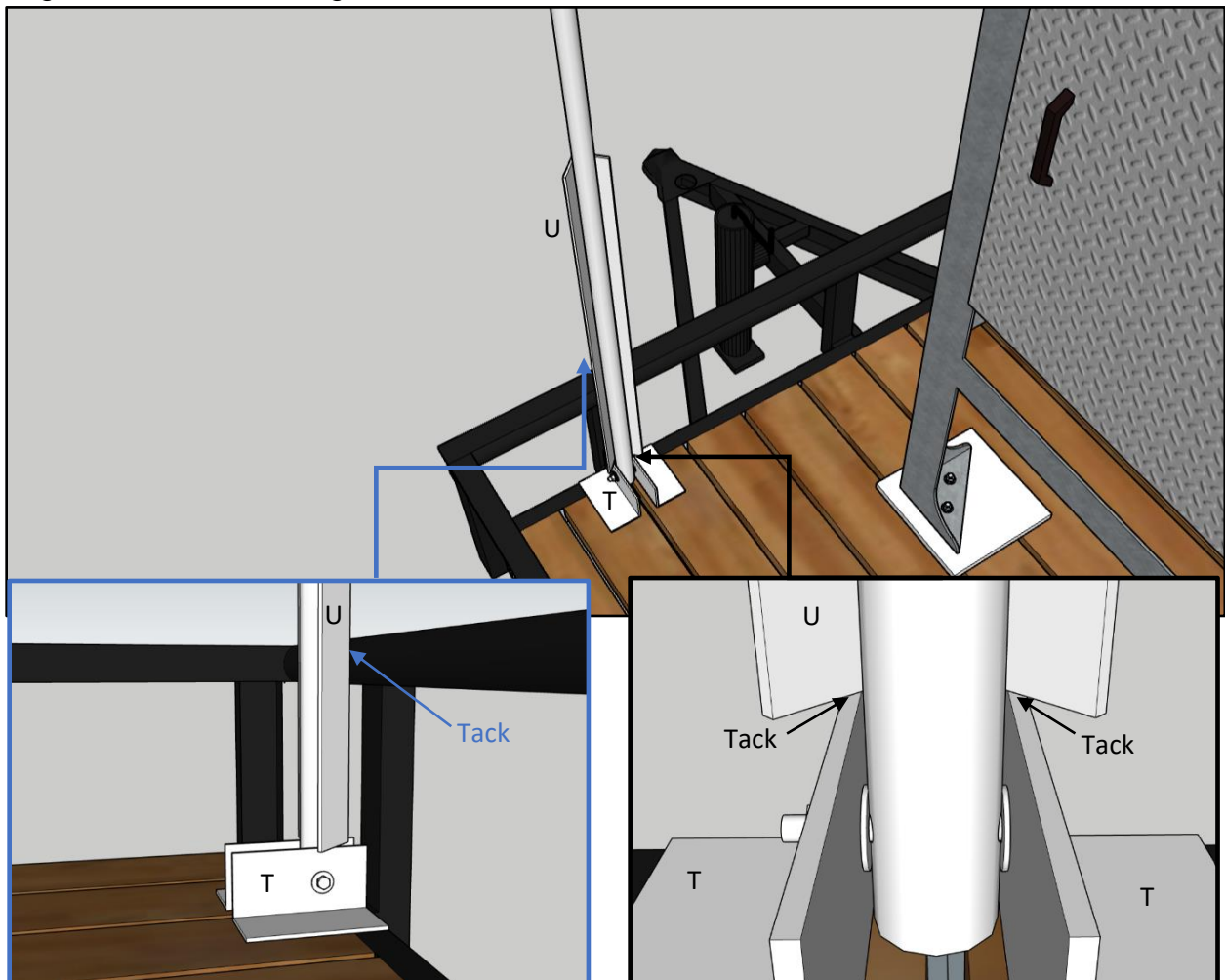
Step 8.3 – Fit the hardware that secures the outer antenna pole to the angle irons that make up the base of the antenna mount.



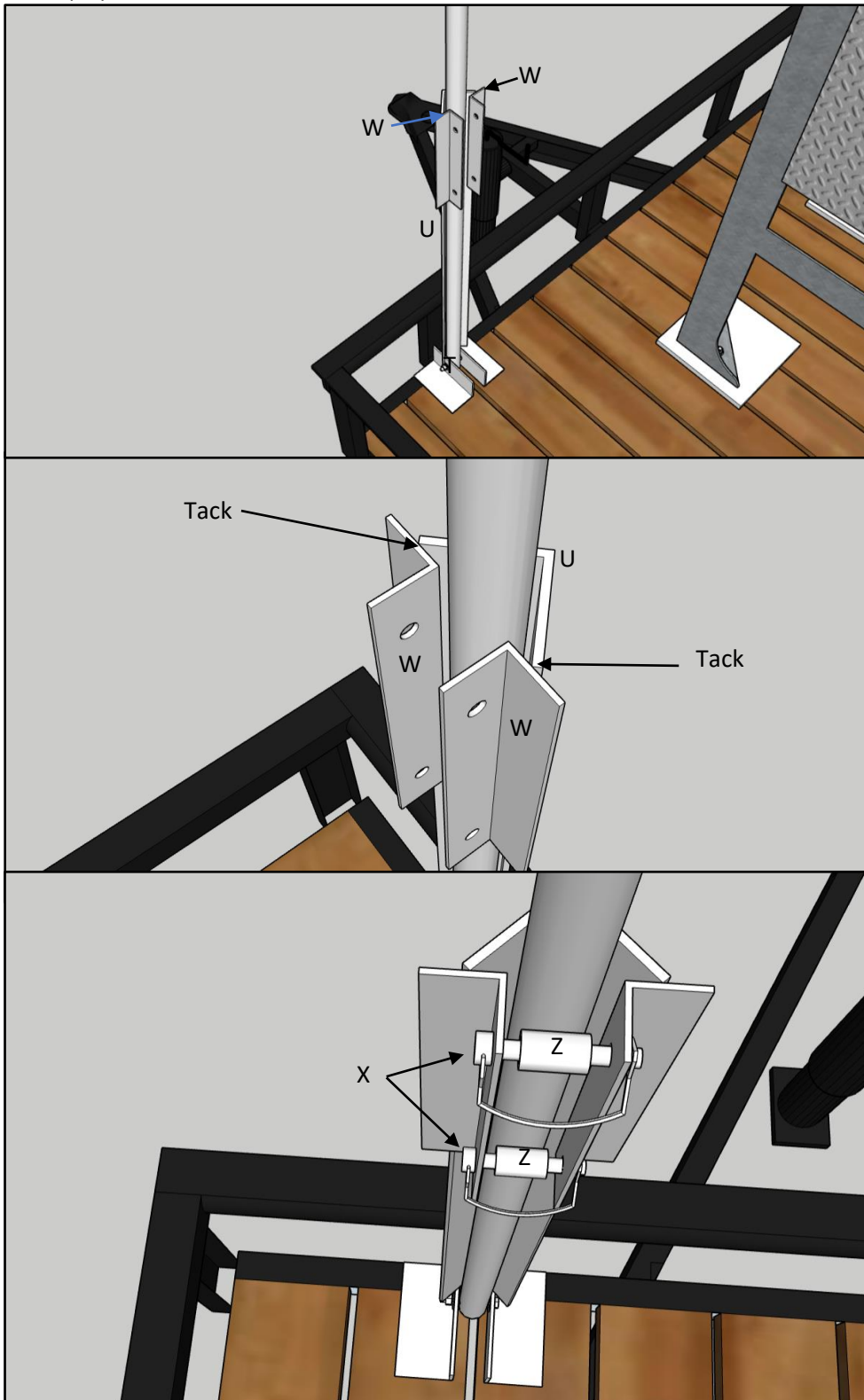
Step 8.4 – Tack weld the angle irons that make up the base of the antenna mount to the trailer frame. Once tacked in place make sure the pole hinges with no problems.



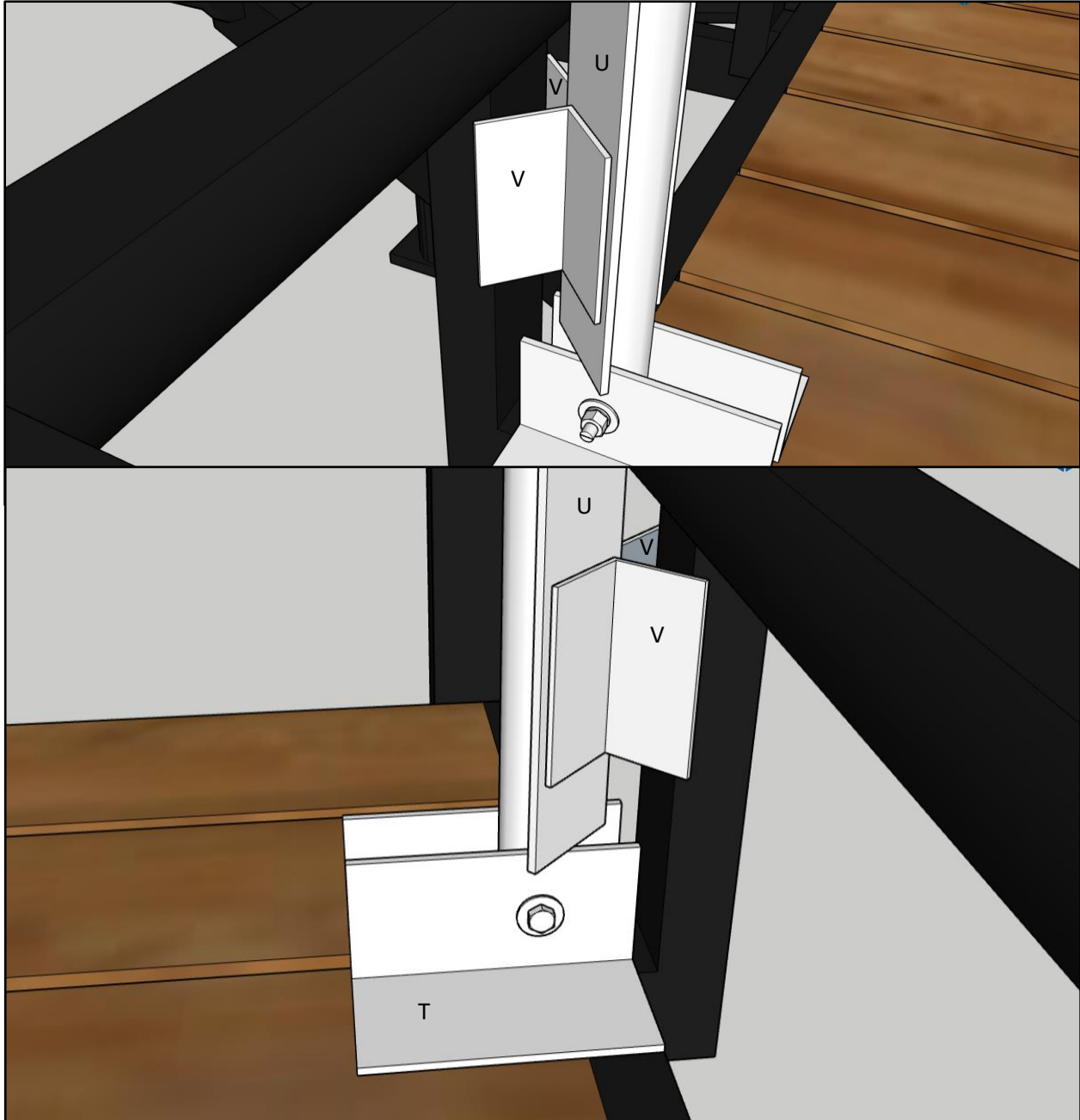
Step 8.5 – Stand the outer antenna pole up and level it vertically with a bubble level. Once you like how everything looks tack weld the angle iron (U) that supports the antenna pole vertically. Tack welds should be between the (U) angle iron and the angle irons that make up the base of the mount (T) and between the back edge of the (U) angle iron and the railing of the trailer frame.



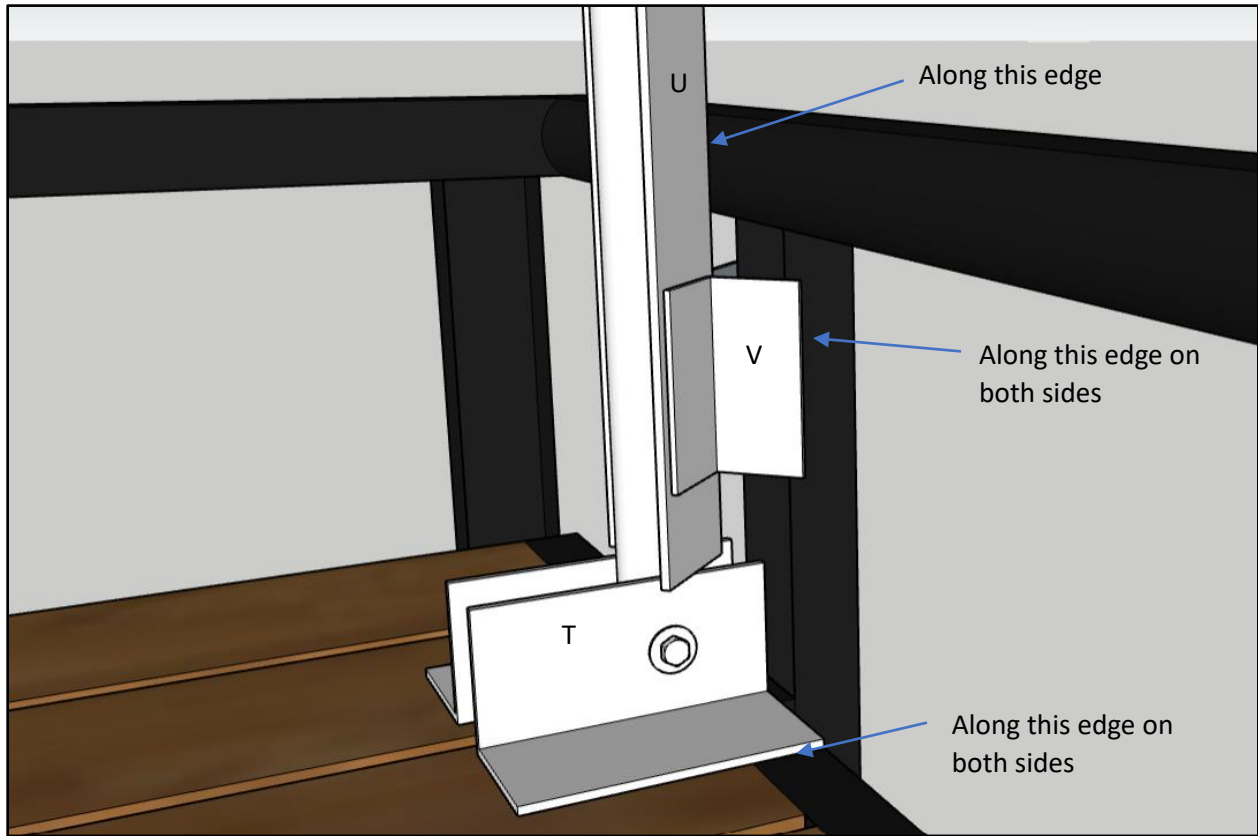
Step 8.6 – Tack weld the angle irons (W) that will secure the antenna pole in the upright position. Then make sure x2 PTO pins (X) and x2 bushing (Z) fit through the securing angle irons (W).



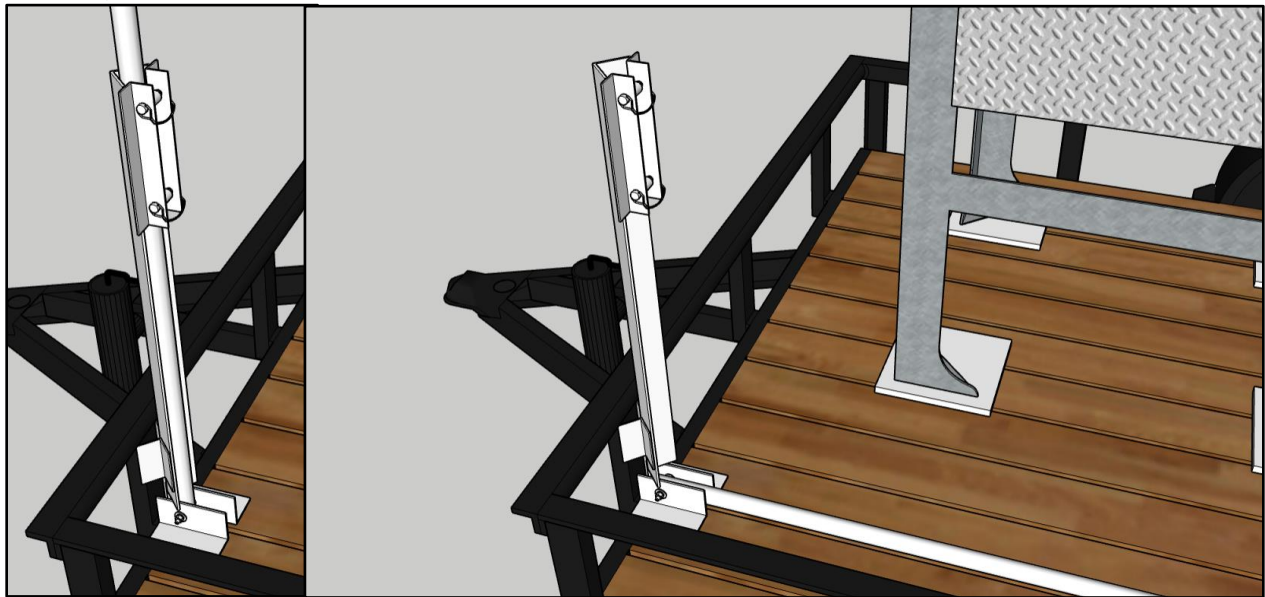
Step 8.7 – Tack weld the extra support angle irons (V) that will secure the antenna mount to the vertical beam behind it. The location of these angle irons will depend on the distance between the (U) angle iron and the vertical beam behind it and this will vary depending on the trailer you are doing the conversion on. The important part here is to find enough spots to weld the antenna mount to the trailer frame.



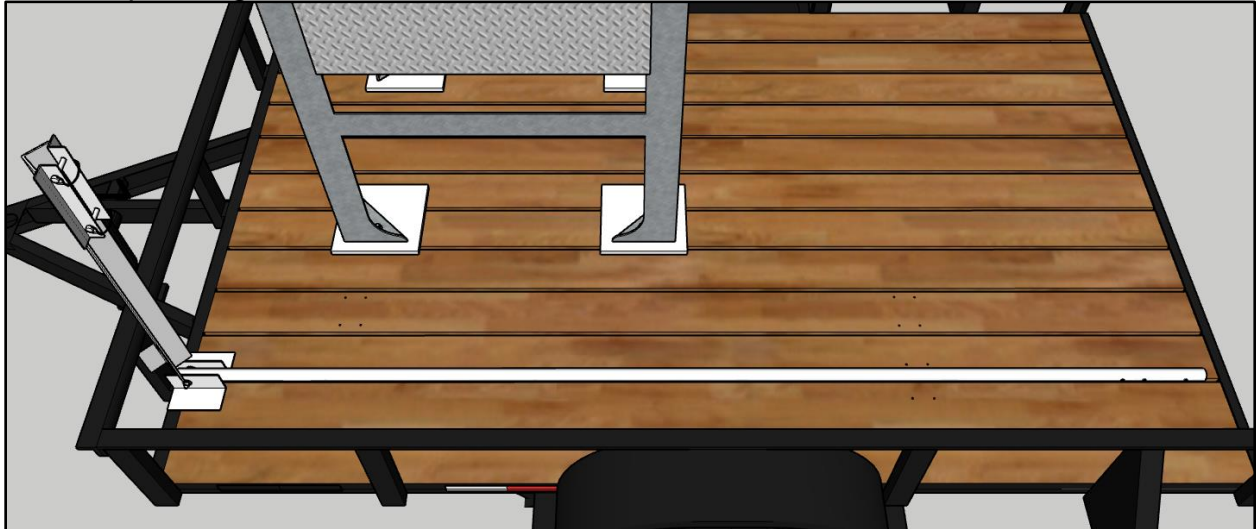
On our setup we have five locations where the antenna mount is welded to the trailer frame.



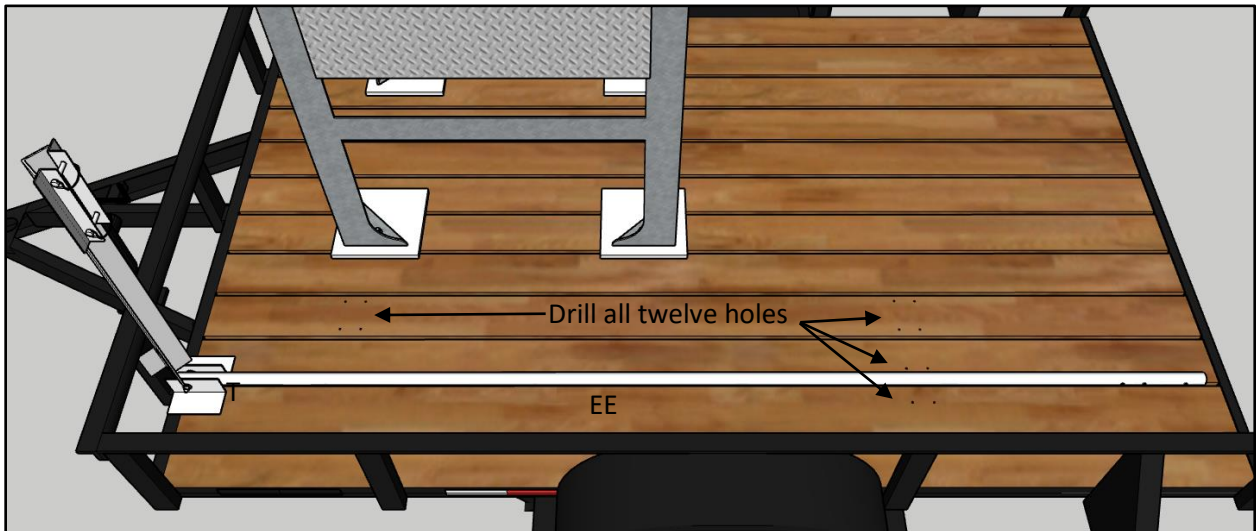
Step 8.8 – After all angle irons are tacked and the antenna pole can successfully hinge from a vertical position to horizontal position and be well secured with PTO pins and bushing when in the vertical position, make final welds.



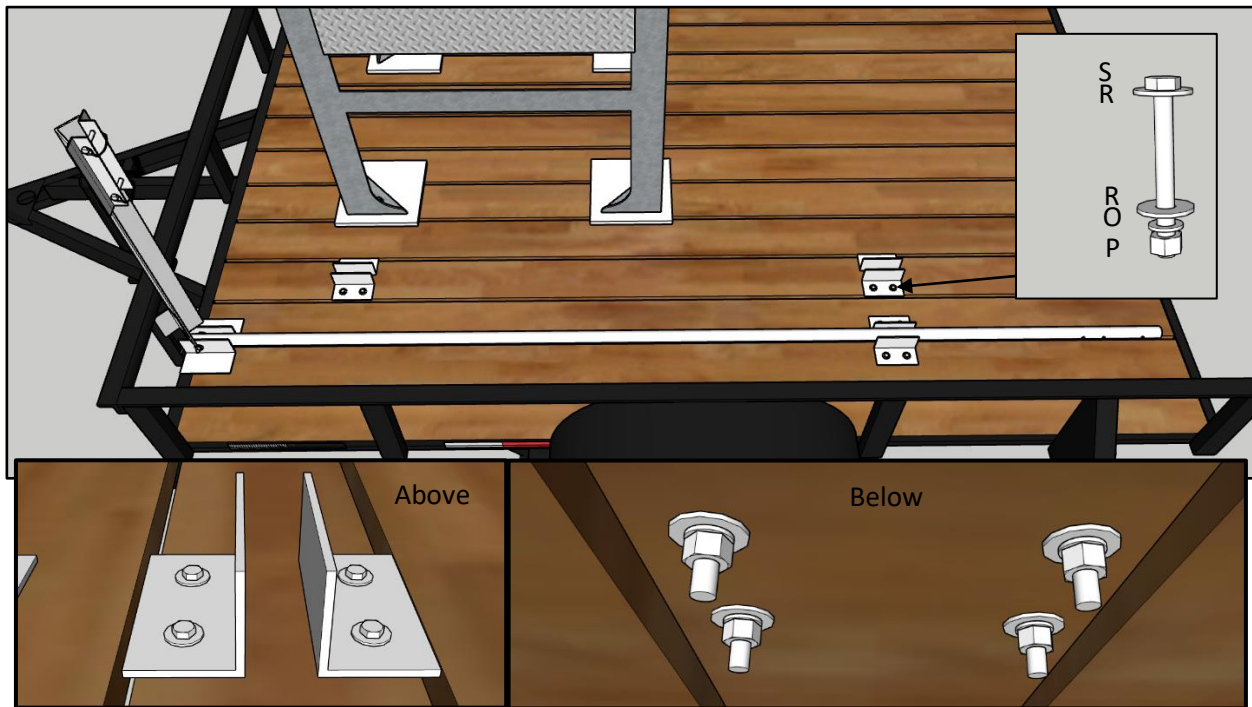
At this point your trailer should look something like the image below, with the antenna mount assembled and welded to the trailer frame, the outer antenna pole hinged on the base of the antenna mount and locations for the antenna cradles clearly marked on the wooden paneling.



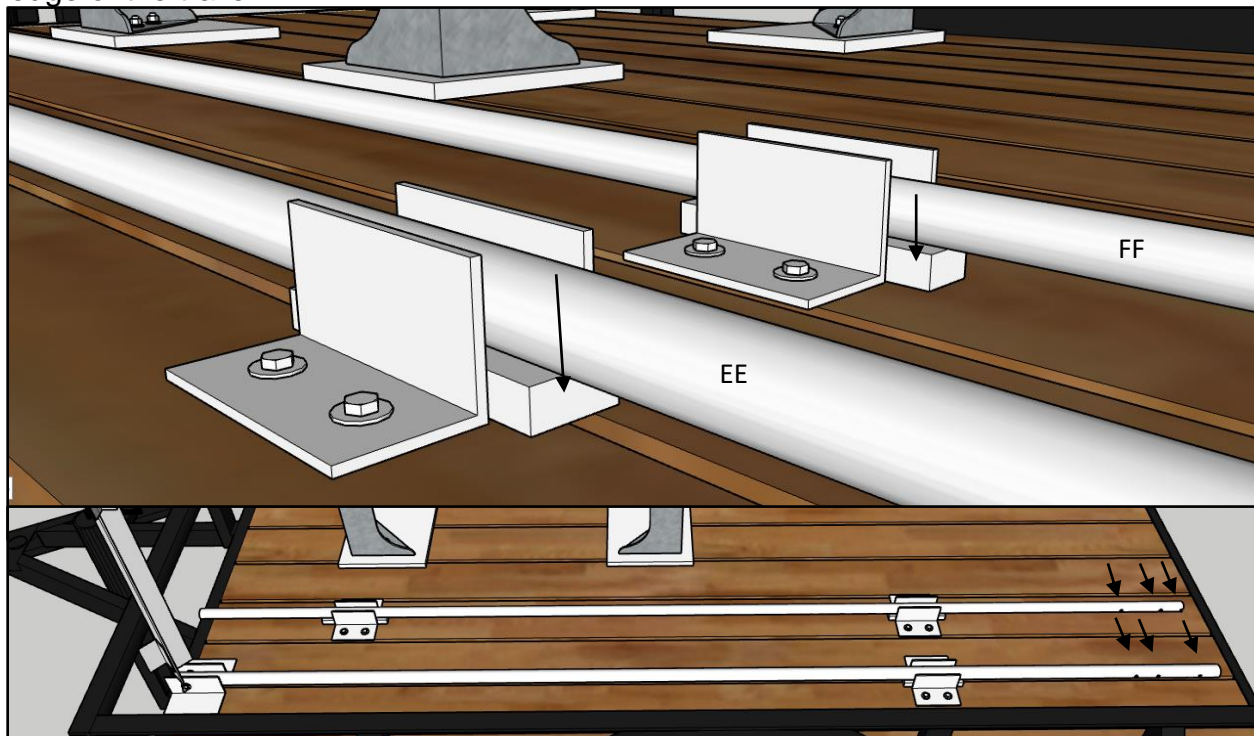
Step 8.9 – Drill all twelve $\frac{1}{4}$ " holes through the wooden paneling for the antenna cradles. If you had to make any adjustments to the angle irons that make up the antenna mount base (T) then you may need to realign the angle irons that make up the cradles that will secure the other end of the outer antenna pole (EE) and remark drill locations.



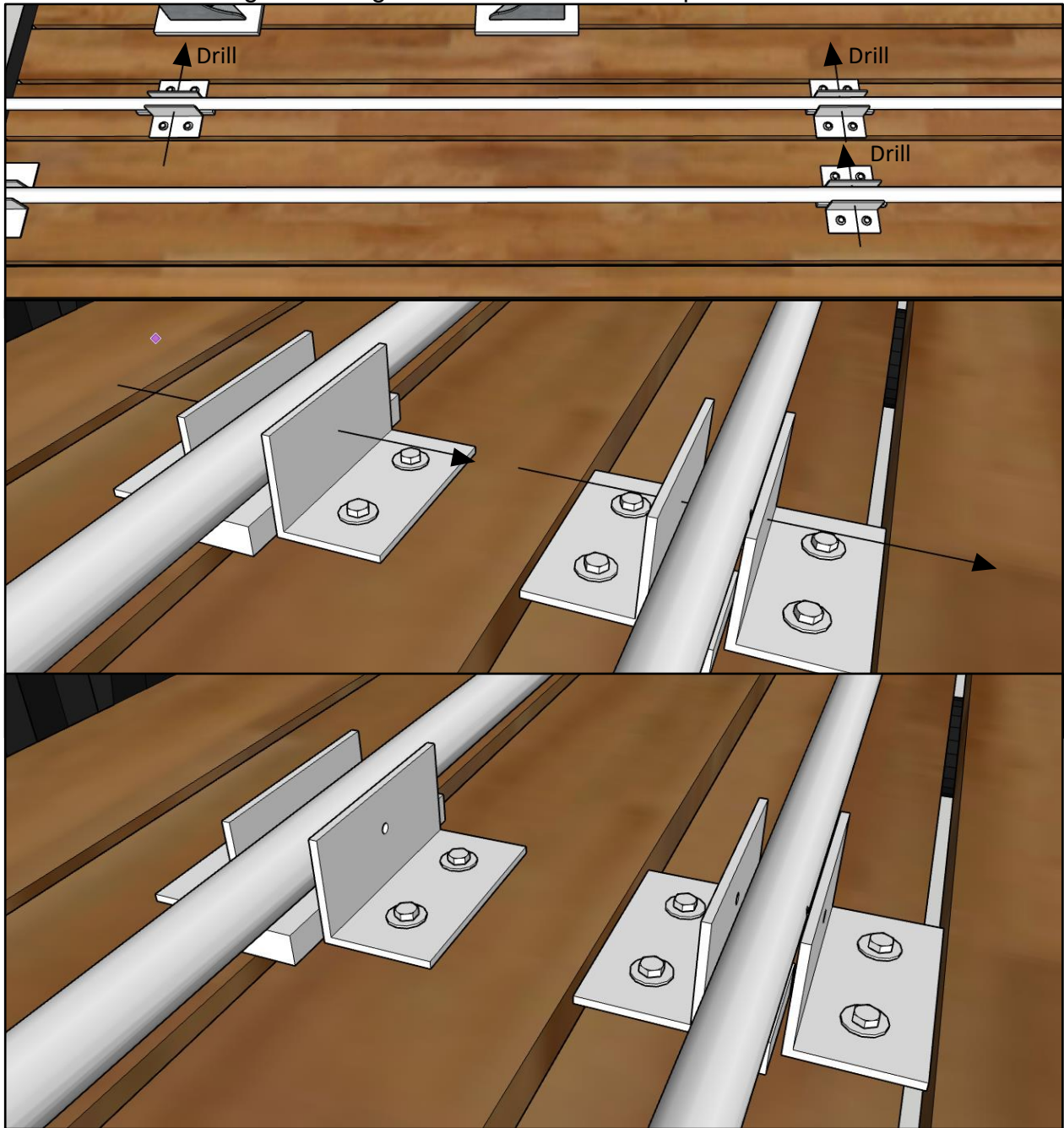
Step 8.10 – Secure cradles with hardware.



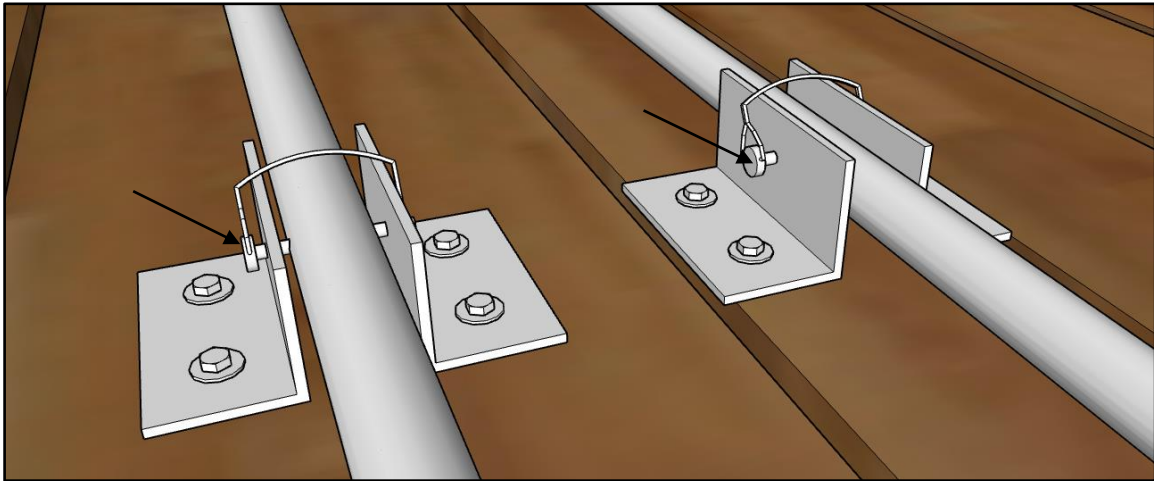
Step 8.11 – Place 3/4" tall spacers in between the angle irons that make up each of the three cradles and rest the antenna poles in between the cradles on top of the spacers. Make sure the three holes in the inner antenna pole (FF) are on the same side as the three holes in the outer antenna pole (EE) and the inner pole doesn't extend over the edge of the trailer.



Step 8.12 – Drill holes through cradles and antenna poles with a ¼” drill bit. For each cradle drill straight through from the angle iron that makes up one side of the cradle, through the antenna pole and the angle iron that makes up the other side of the cradle. Make sure the hole goes through the full diameter of the pole.



Step 8.12 – Secure poles in cradles with PTO pins (Q).

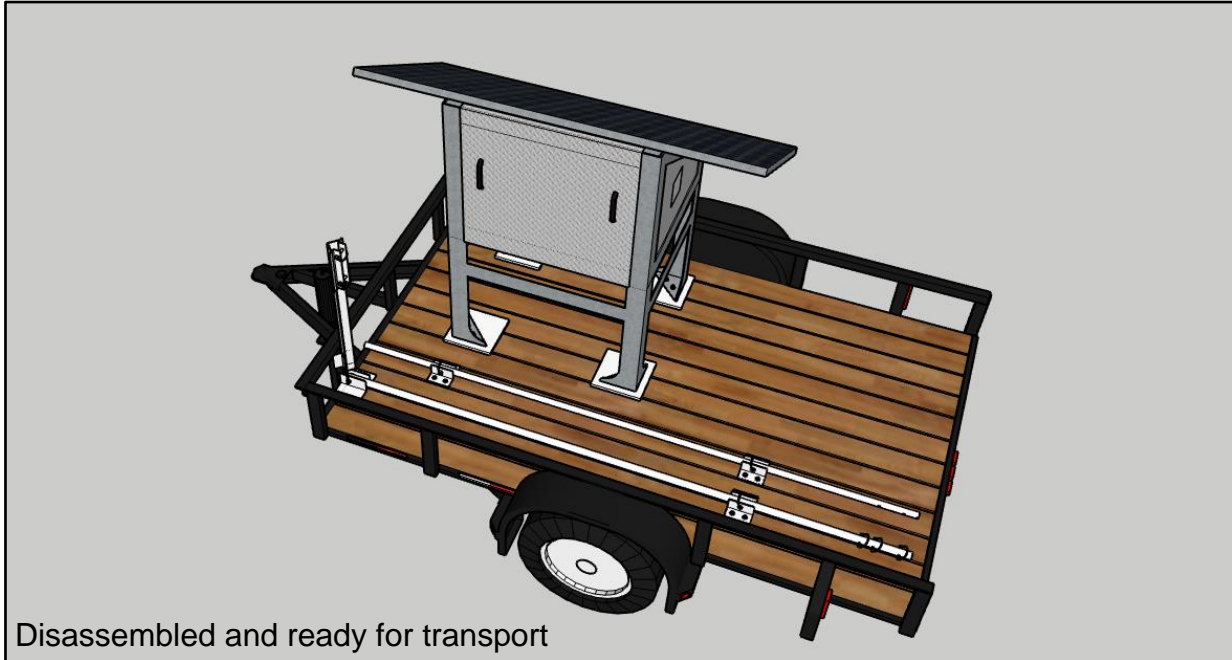


Step 8.13 – **IMPORTANT!** This guide does not go into the full process of running the cable up the antenna poles as that is covered in the instruction manual provided with your base station and the process will essentially be the same. However, the antenna provided by the vendor isn't designed to be separated into two pieces or mounted within cradles during transit and you will need to allow an extra section of slack in the cabling to accommodate the space between the two antenna sections when mounted within the cradles. The image below shows the basic direction for the wiring. **EXTRA IMPORTANT!** It has been reiterated by the vendor that the antenna cabling is **VERY** sensitive to kinking. If the cable gets kinked, you're going to lose a significant amount of performance.



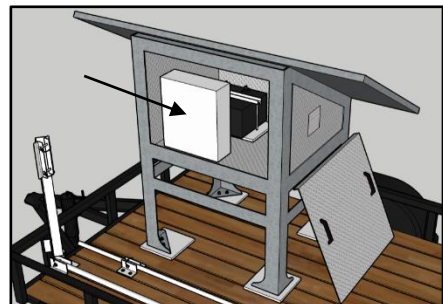
Step 8.14 – Once conversion is complete. One at a time, remove all hex nuts, coat thread with Loctite and re-tighten to make sure no hardware will loosen to vibration during transit. In addition to all nuts used in the conversion, apply Loctite to the nuts securing the solar panel to the base station hut.

Setup and takedown

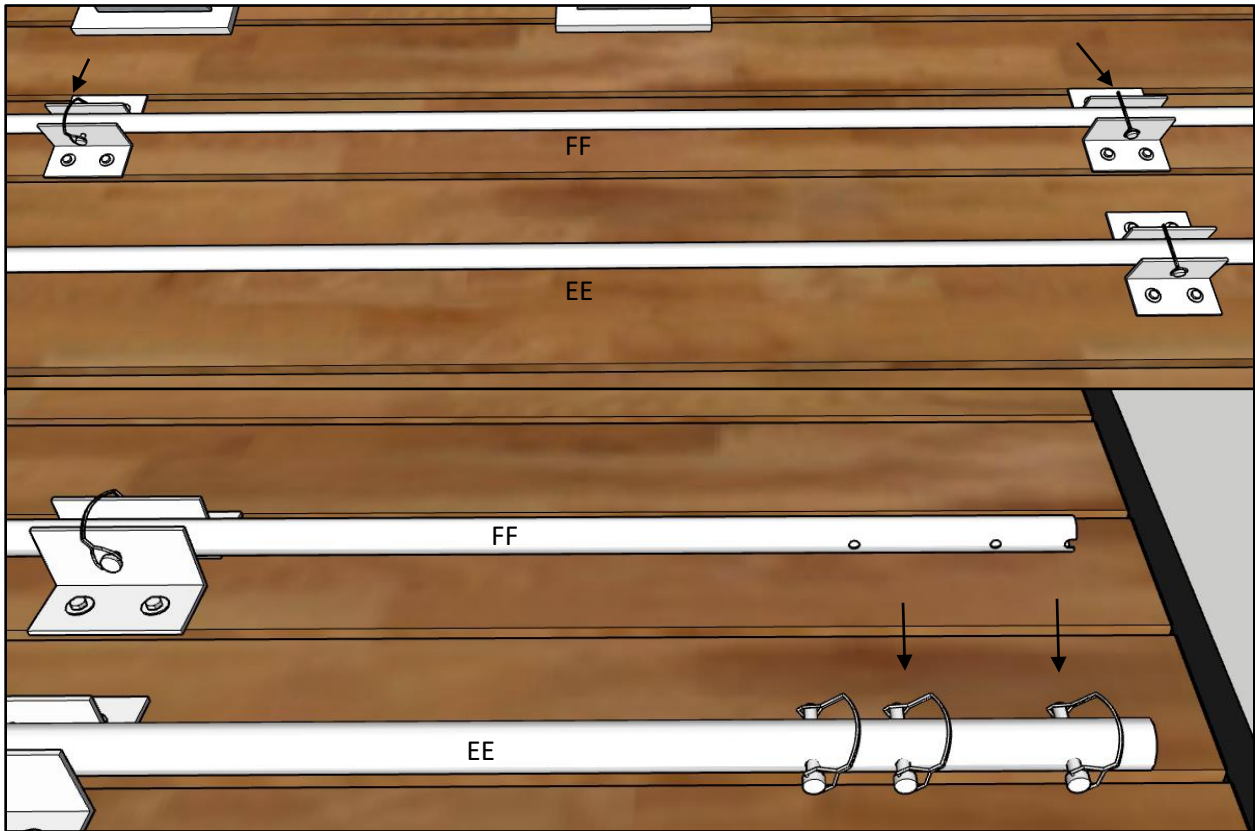


Long Distance & Rough Roads Recommendation

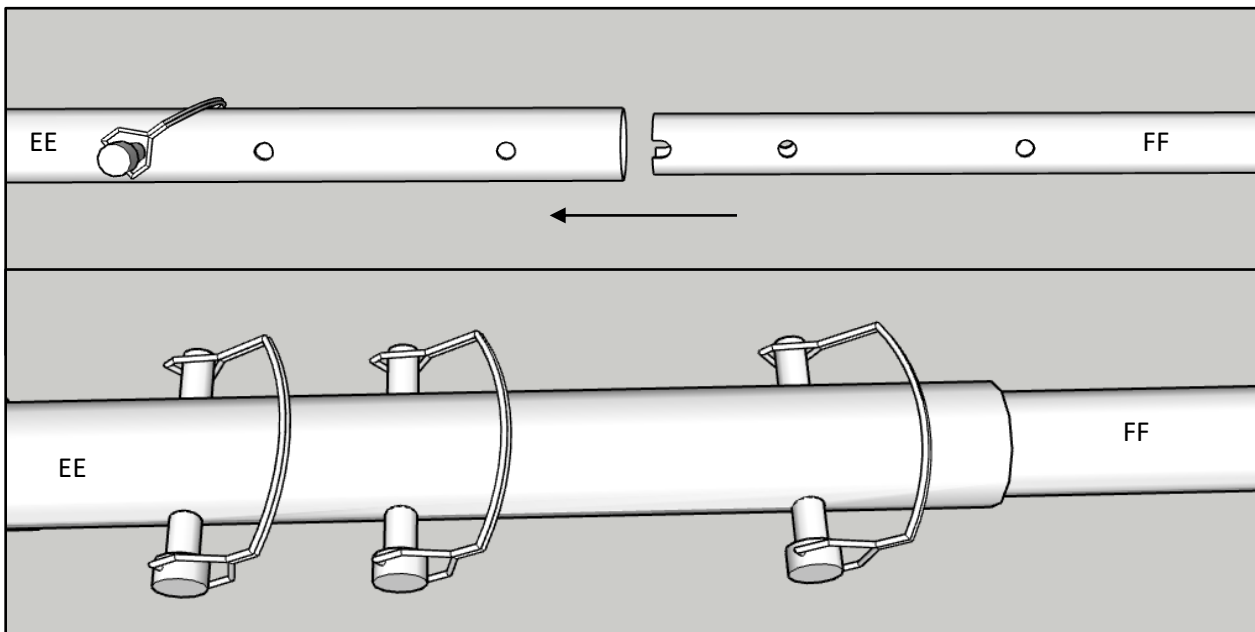
Although we have not removed the comms cabinet (pictured on right) from the base station hut for transit, this is recommended by Vence Corp when transporting over long distances or on particularly rough terrain. Other users have added a bracket to the top of the comms cabinet to help secure it during transit.



To set up the antenna for use, remove PTO pins securing the inner antenna pole (FF) within its cradles and two of the three PTO pins in the end of the outer antenna pole (EE).



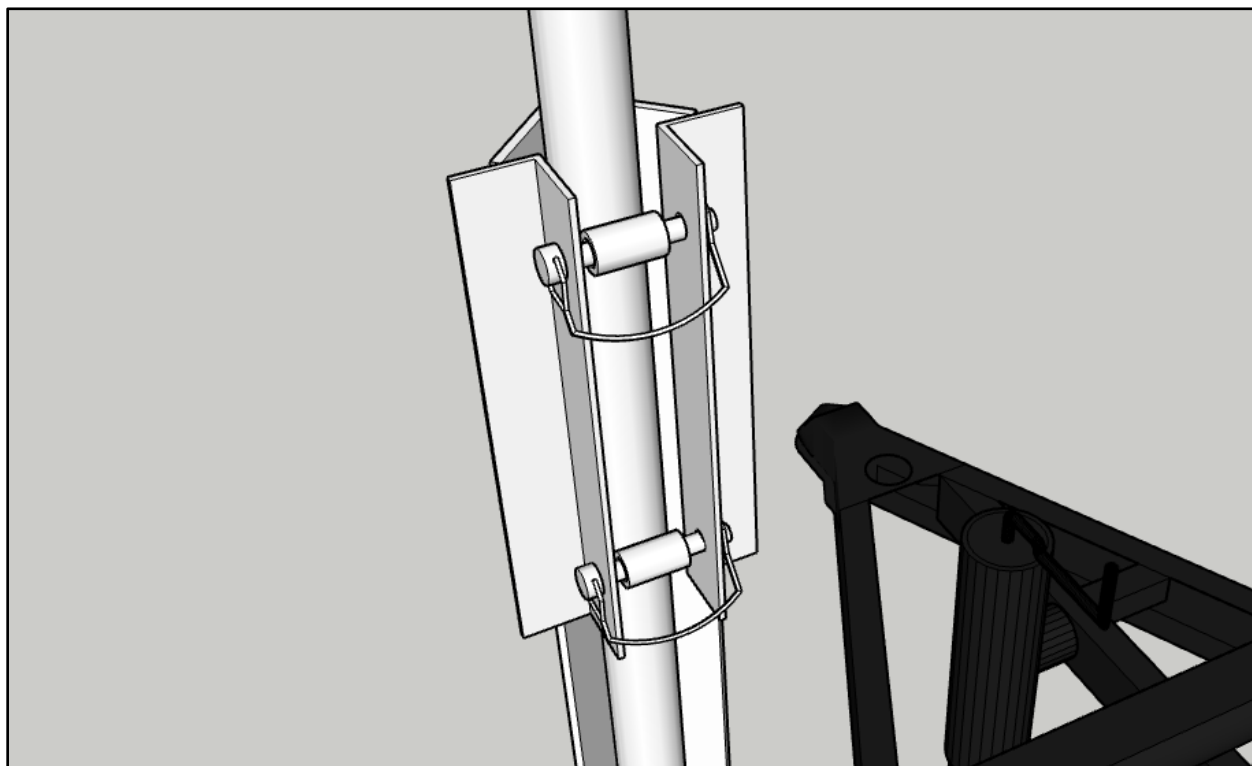
Slide the inner pole into the outer pole until the holes on the edge of the inner pole lock into the PTO pin in the outer pole. Then put the other two PTO pins back through.



Swivel the entire antenna upright on its hinge until it rests comfortably in the antenna mount.



Secure the antenna in the upright position with the two associated PTO pins and bushing.



Install grounding rod included with the vendor supplied equipment.