

# SENSOR BOX INSTRUCTIONS



LMC 6650 | Seeing Like A Bike | Spring 2017

# OVERVIEW INSTRUCTIONS

Box orientation & directions are made as if you are standing in front of the handlebars and looking down the bike towards the bike rack (example: the “front” panels are closer to the front of the bike; the “back” panels are closer to the very back of the bike; the “left” panel is the rider’s right; the “right” panel is the rider’s left). (See Figure 1)



Figure 1

Every component of each box has the same title (example: Top Lid, Proximity, Air, Middle Tray, Battery, Battery Exterior, Support). When the pieces are laser-cut and etched, the etched markings will be on the inside of the boxes. When assembling each box, align the letters and numbers according to each corner (example: in the Air box, the Air Base corner labeled A1 will align with the Air Back corner A1 and the Air Left corner A1). (See Figure 2)

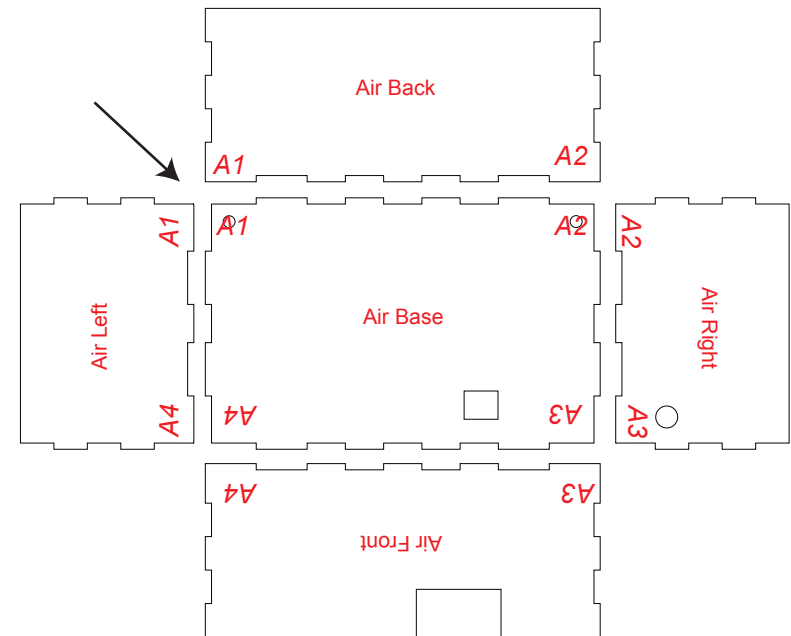


Figure 2

# LASER-CUTTING INSTRUCTIONS

## Materials:

- 1/8" Premium Baltic Birch Plywood (Figure 3)
  - ordered from Amazon
  - files attached are sized for 12"x12" printing (9 sheets)
  - \*make sure the wood measures 0.13" because that is the size the notches are designed to fit inside

## Arrangement:

- Depending on the orientation of the pieces of wood, try to ensure that the longer areas are aligned with the direction of the wood grain. If they go against the wood grain (especially small, long, or thin pieces), they may be more fragile. (See Figure 4)

## Laser-Cutter Settings:

The first box was cut in the prototyping lab in the basement of the TSRB. The recommended settings for 1/8" craft plywood were not strong enough to cut the wood so we used the adjusted settings below.

### Revised Laser Settings:

- Cutting:
  - Speed: 25%
  - Power: 100%
- Etching:
  - Speed: 100%
  - Power: 10%

## Cutting:

- Open the files in Adobe Illustrator and use the laser-cutter instructions.
- For ease of rearrangement, the files have been grouped with red titles (etched lines) and black artwork (cut lines).
- First, ungroup everything and hide or delete the black cut lines. Using the etch settings above, etch everything in the file. Do not move the plywood.
- Next, undo the deleted black lines so they reappear. Delete the red etch lines. Using the cut settings above, cut all the black lines in the file.
- You will probably need 4 or 5 passes of the laser-cutter to fully cut through the plywood. To see if you need to cut again, press your hand firmly down on the center of the plywood so it does not shift, and gently lift up a corner to see which areas fall through.
- As you are cutting, you may seem some of the smaller pieces "fall" or "wobble". This is a good indication that they have been cut completely. To prevent burning these areas excessively after they have been fully cut, delete those areas (typically the small notches or circles on the inside of the box sides) from the Illustrator file before cutting again.



Figure 3

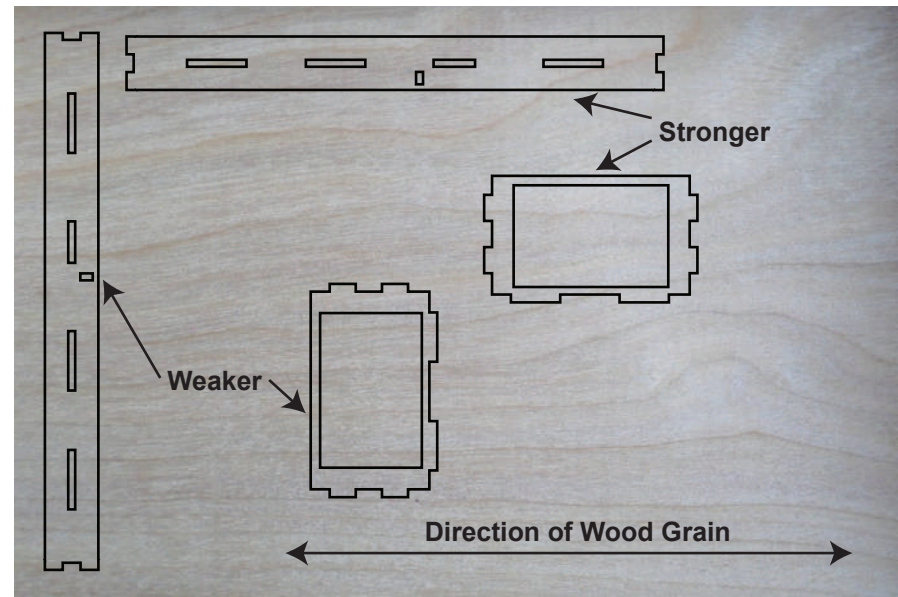


Figure 4

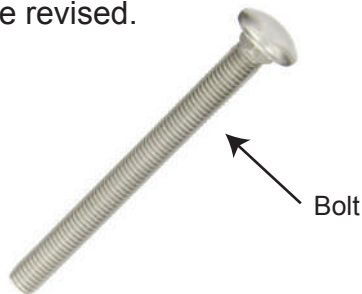
# ASSEMBLY MATERIALS

## Materials:

- Wood glue
  - to glue the wood together
  - we used Elmer's wood glue
- 4: 1/4" bolt (minimum 6.5" long)
  - to hold the boxes together in the corners
  - we used 12" threaded zinc rods from Home Depot
- 12: 1/4" nuts
  - to tighten the bolt
- 8: 1/4" lock washers
  - to add an extra-secure hold
  - don't put the lock washers directly against the wood or they may damage it
- 8: 1/4" washers
  - to keep the nuts flat against the surface
- 4: 1/4" wing nuts
  - to hold the threaded rods tightly against the boxes

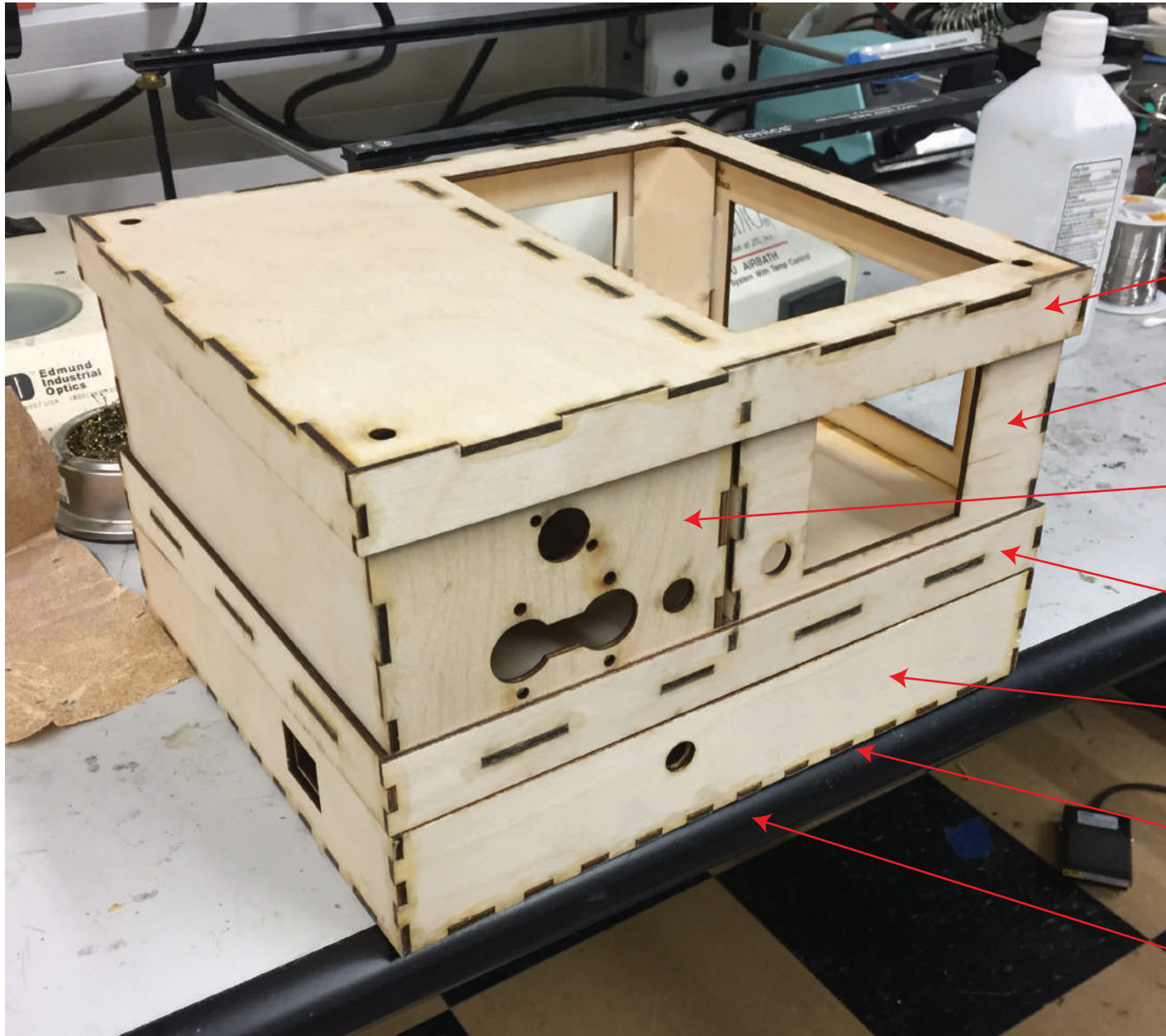
## Other Options:

- The nuts on the ends of the threaded rod may wiggle loose over time. You could try using epoxy (2 part Loctite works very well) to glue the nut/washer on the bottom. If the 12" rod is too long, you could also use a hacksaw to make the rod shorter (cut the bottom in case sawing the metal prevents nuts and washers from fitting on that end).
- A 1/4" bolt that is 7-8" long is probably ideal, but Home Depot did not sell that length in 1/4" at the time of assembling the first box. Home Depot sells 5/8" bolts, but the corner holes in the laser-cut files will need to be revised.





# ASSEMBLY LAYOUT



Top Lid

Air

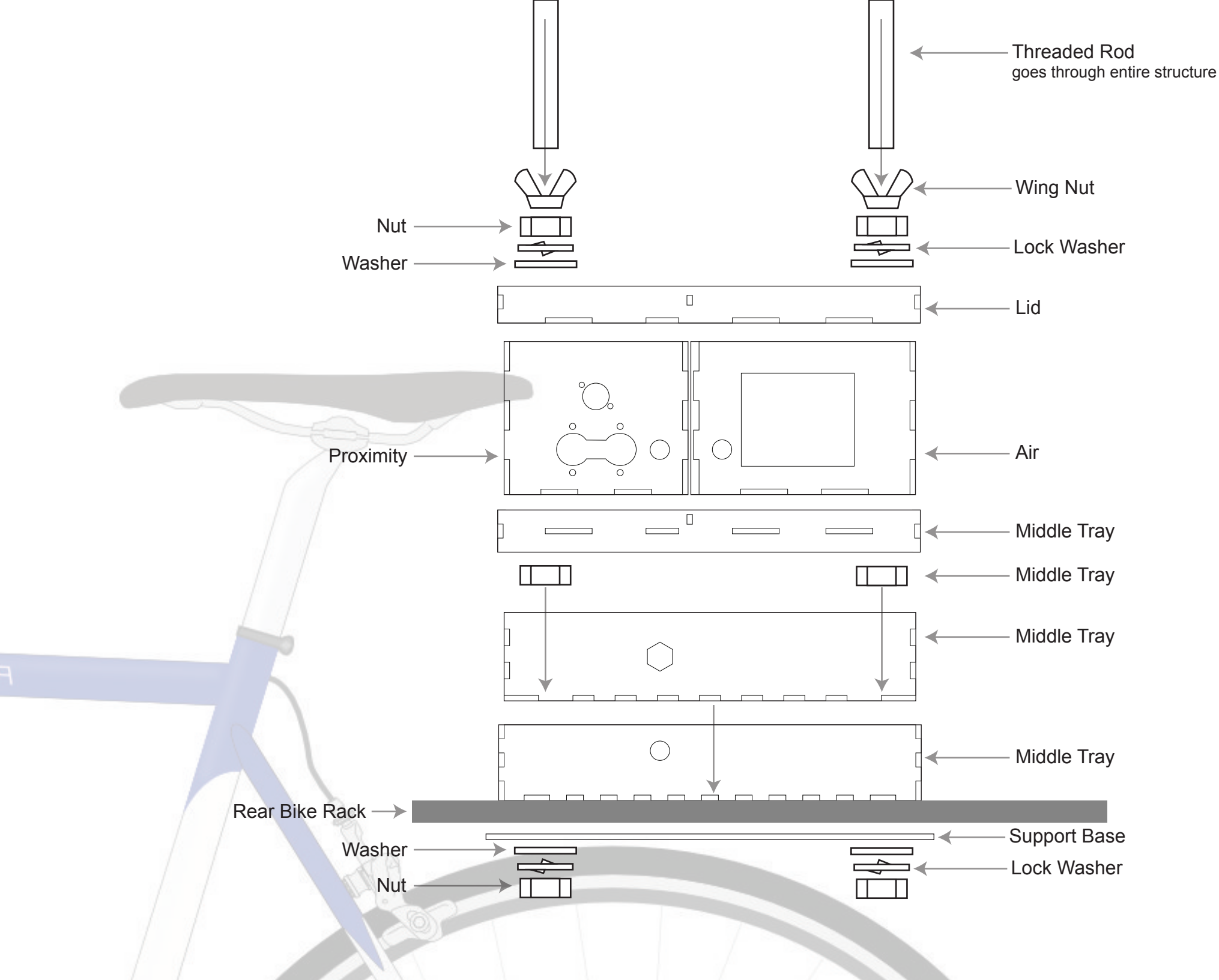
Proximity

Middle Tray

Battery

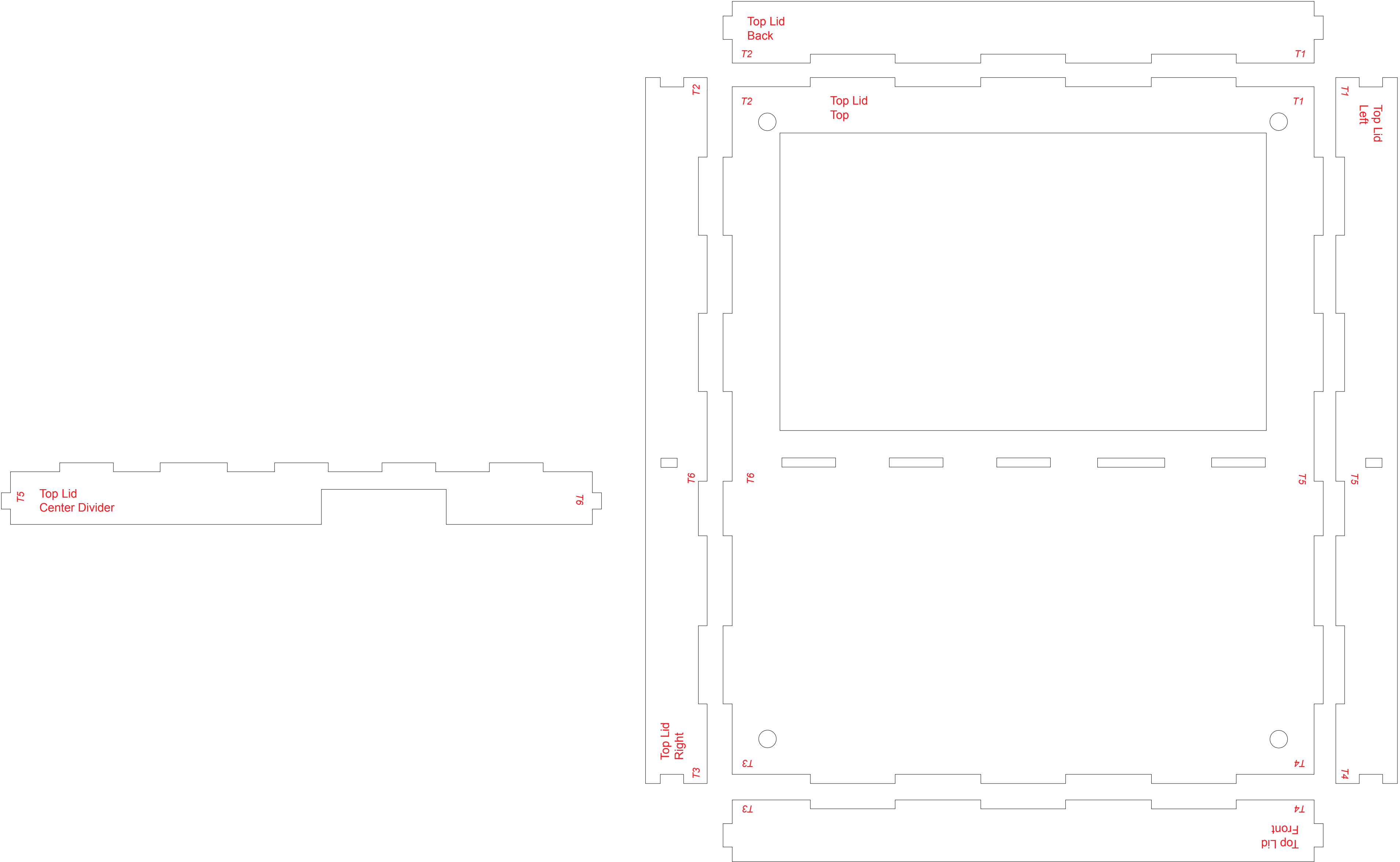
Battery Exterior  
(fits around Battery box)

Support Base  
(not pictured)



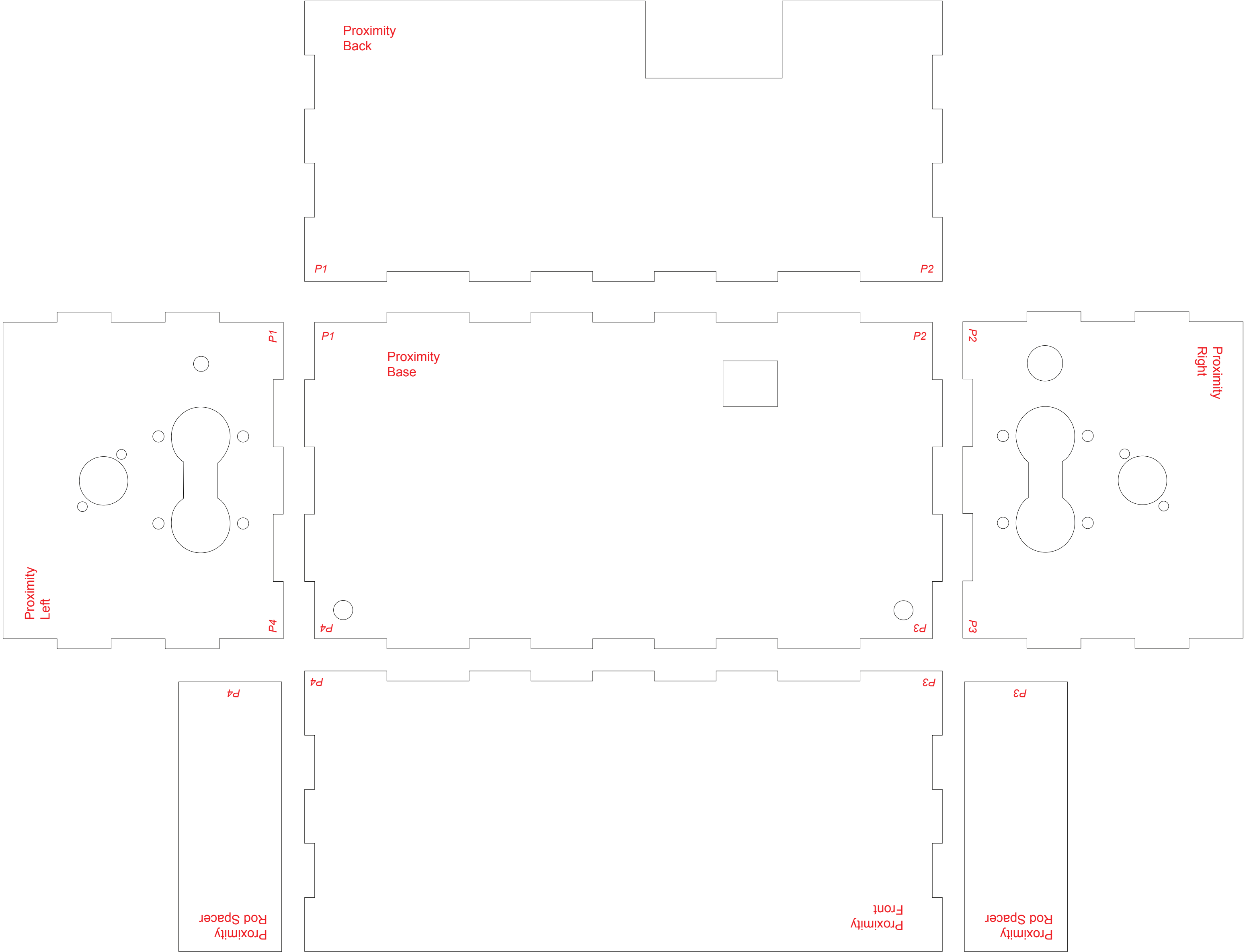
# TOP TRAY

(View looking up into the inside of the lid if the lid was on the sensor boxes)



# PROXIMITY BOX

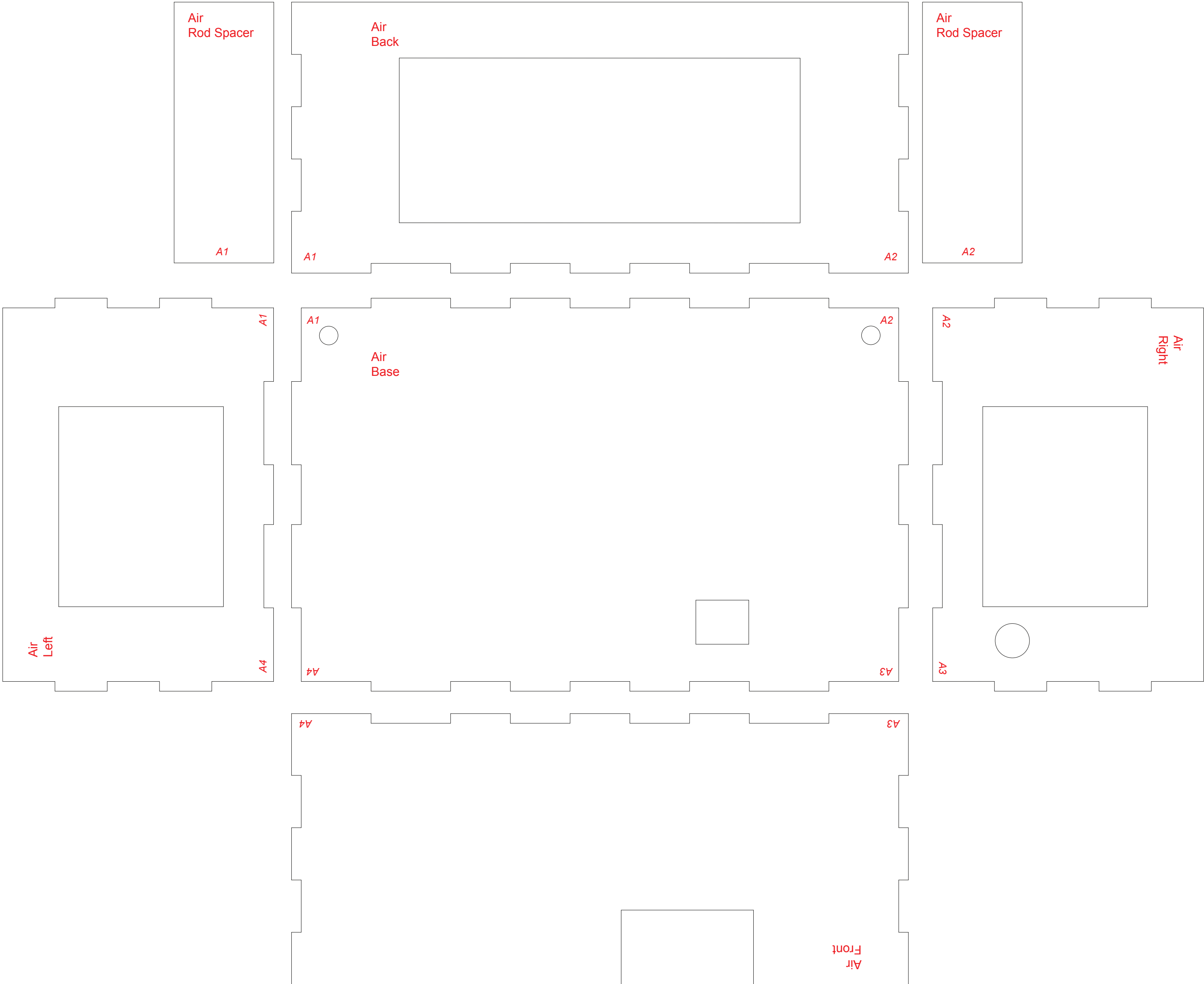
(View looking down into the inside of the box)





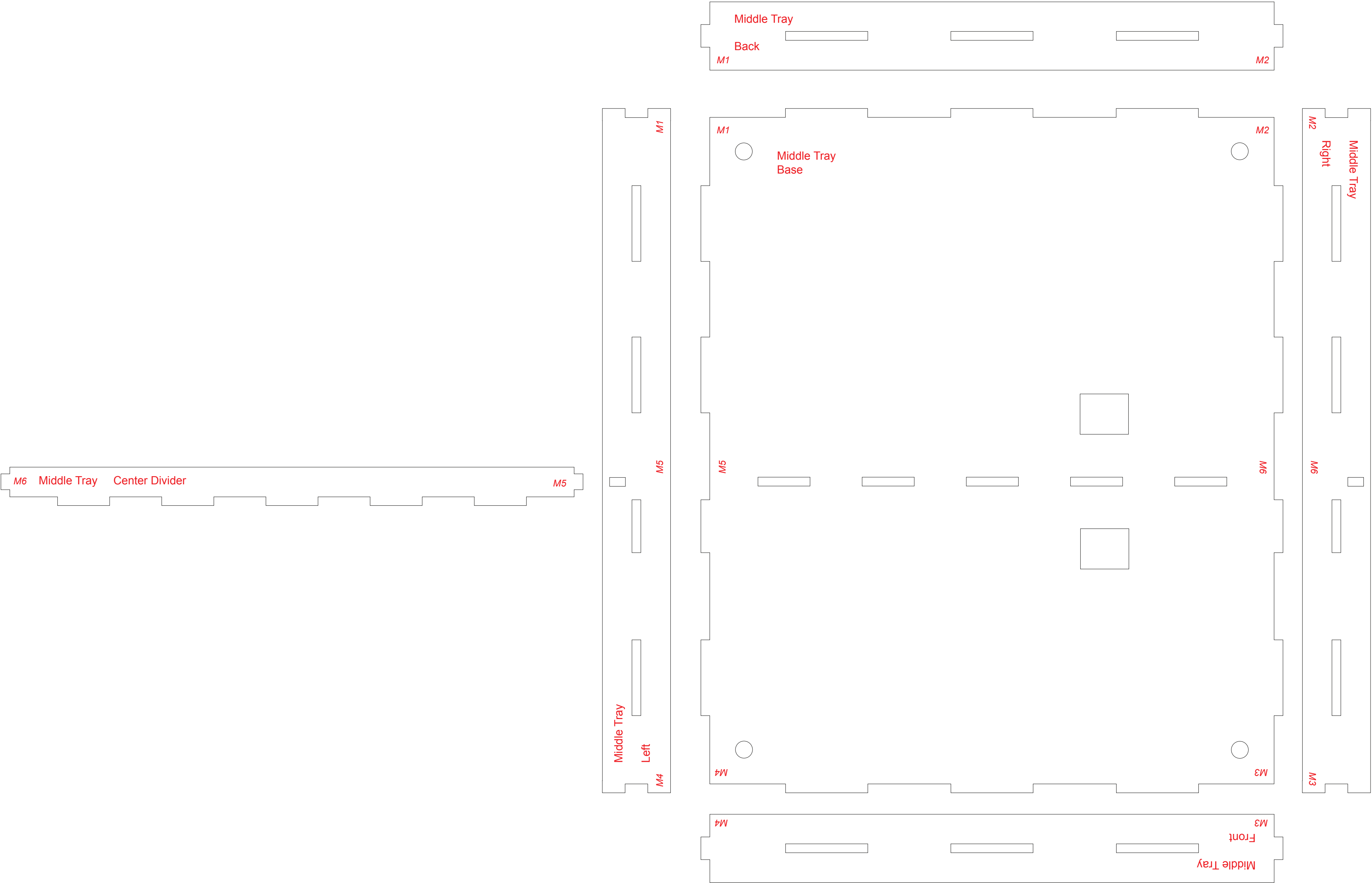
# AIR BOX

(View looking down into the inside of the box)



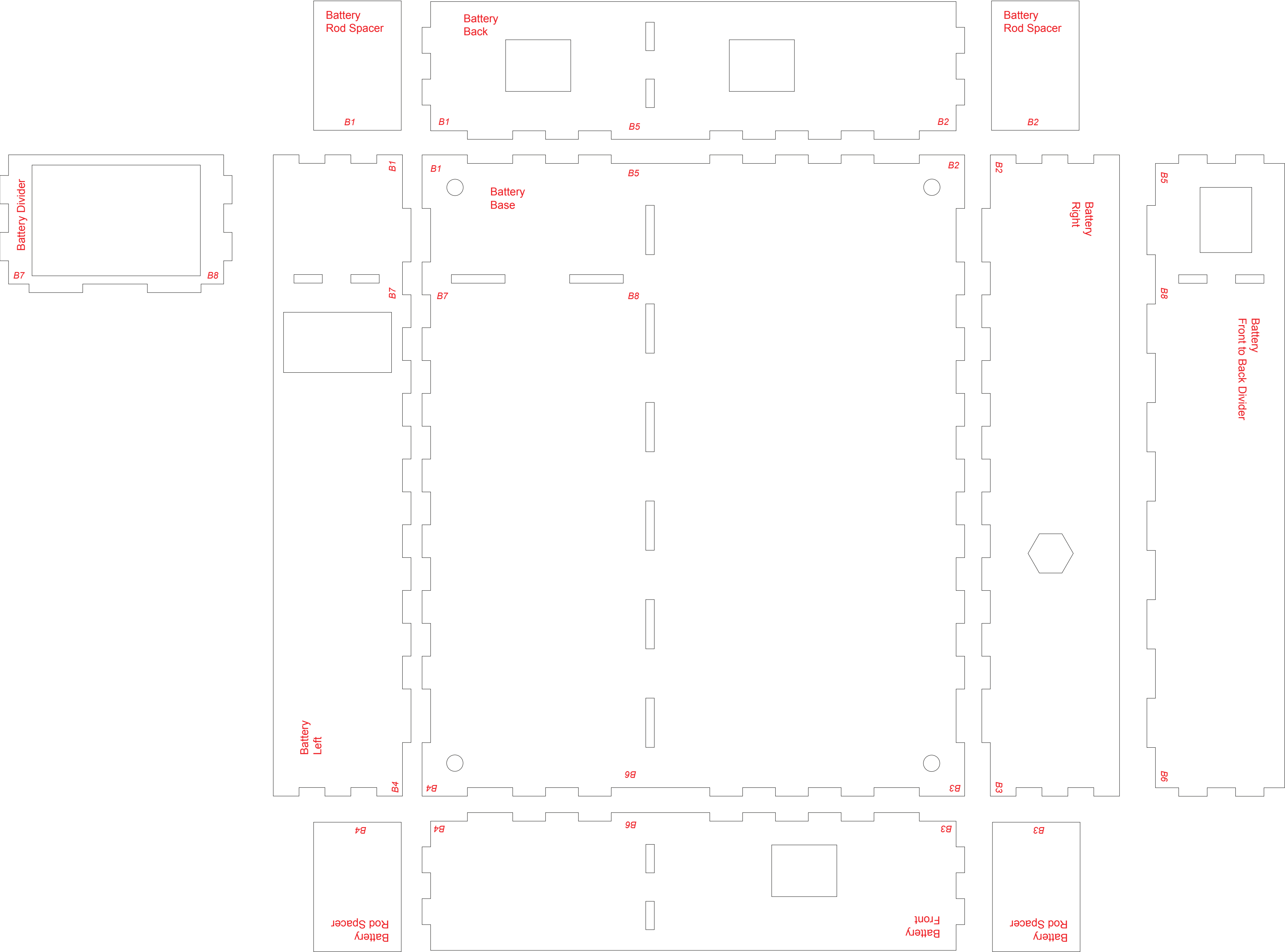
# MIDDLE TRAY

(View looking down onto the inside of the top of the tray)



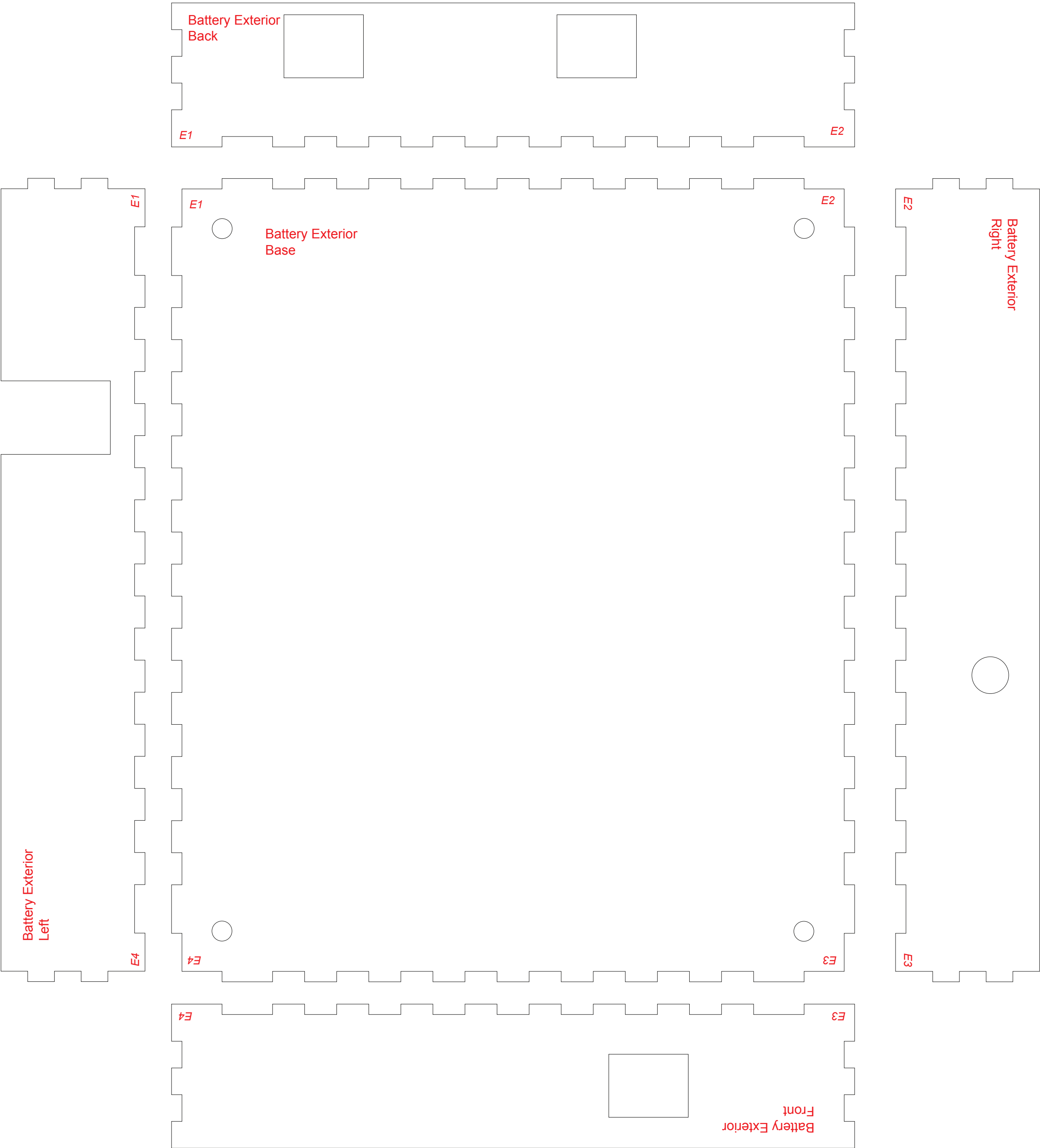
# BATTERY BOX

(View looking down into the inside of the box)



# BATTERY EXTERIOR

(View looking down into the inside of the box)



# SUPPORT BASE

(View looking down onto the top of the base)

