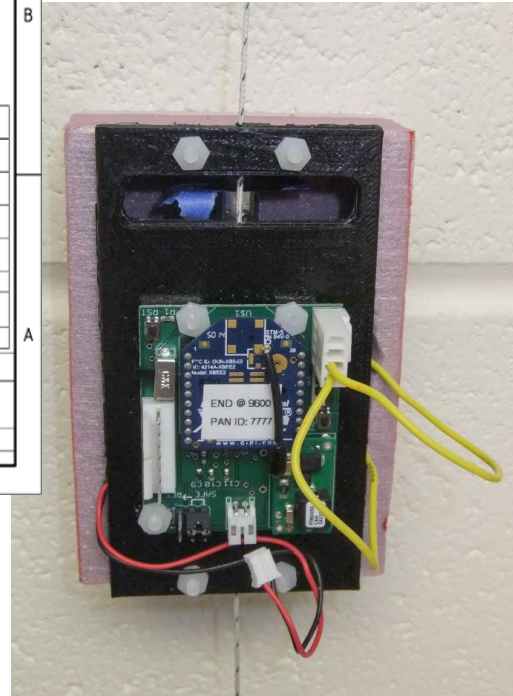
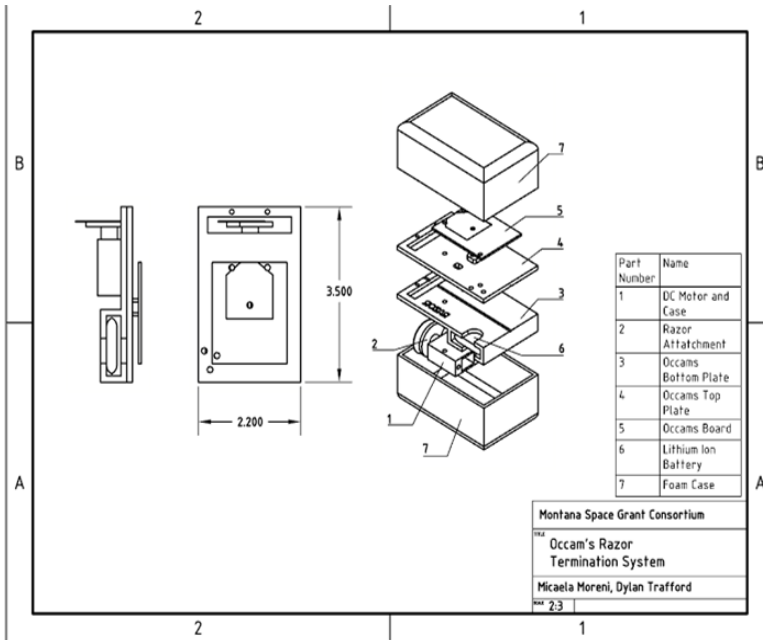


Cutdown Assembly



BE AWARE: ESD Sensitive Components!

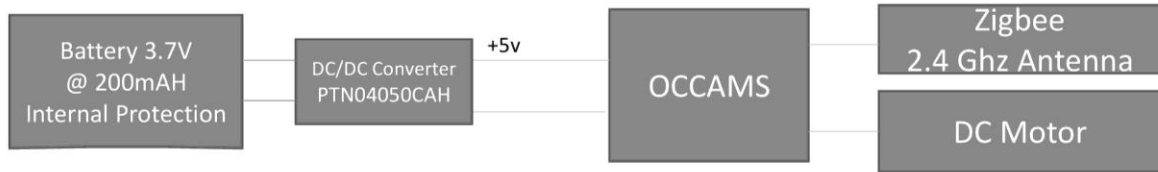
- ESD – Electrostatic discharge

Electrostatic discharge (ESD) is the sudden flow of electricity between two electrically charged objects caused by contact, an electrical short, or dielectric breakdown. A buildup of static electricity can be caused by tribocharging or by electrostatic induction. The ESD occurs when differently-charged objects are brought close together or when the dielectric between them breaks down, often creating a visible spark.

ESD can cause a range of harmful effects of importance in industry, including gas, fuel vapor and coal dust explosions, as well as failure of solid state electronics components such as integrated circuits. These can suffer permanent damage when subjected to high voltages. Electronics manufacturers therefore establish electrostatic protective areas free of static, using measures to prevent charging, such as avoiding highly charging materials and measures to remove static such as grounding human workers, providing antistatic devices, and controlling humidity.

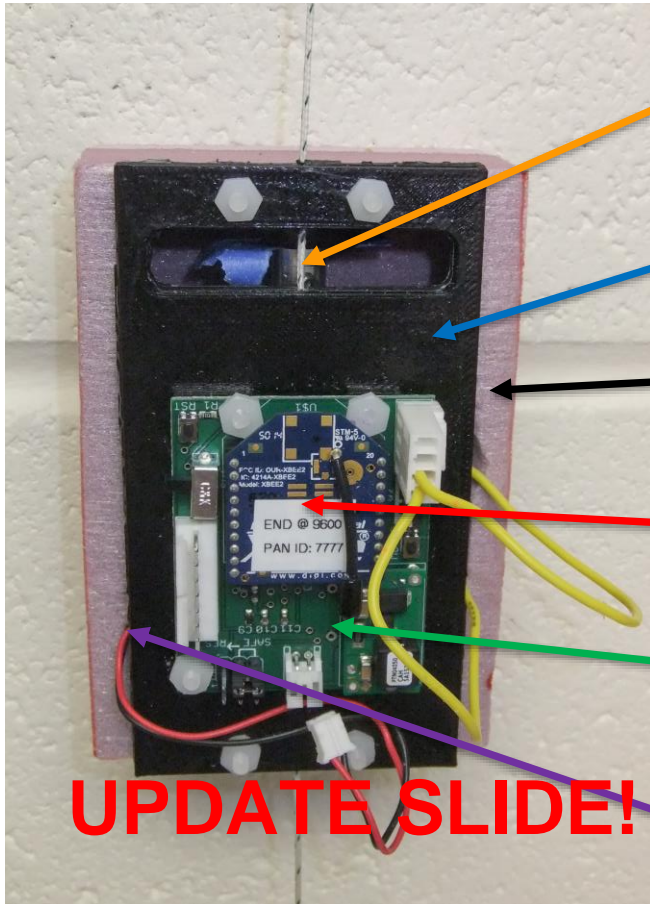
- Use grounding straps when handling/touching components such as the Pi, RFD 900+ modems, modems, power boards, etc. and place them on the ESD rubber mat when not in use.

Functional Block Diagram of Cutdown



Basic Termination System Block Diagram Rev 2 (11-19-15)

Completed System



Cutting Wheel and DC motor

3D Printed front/back cutdown housing

Foam Housing

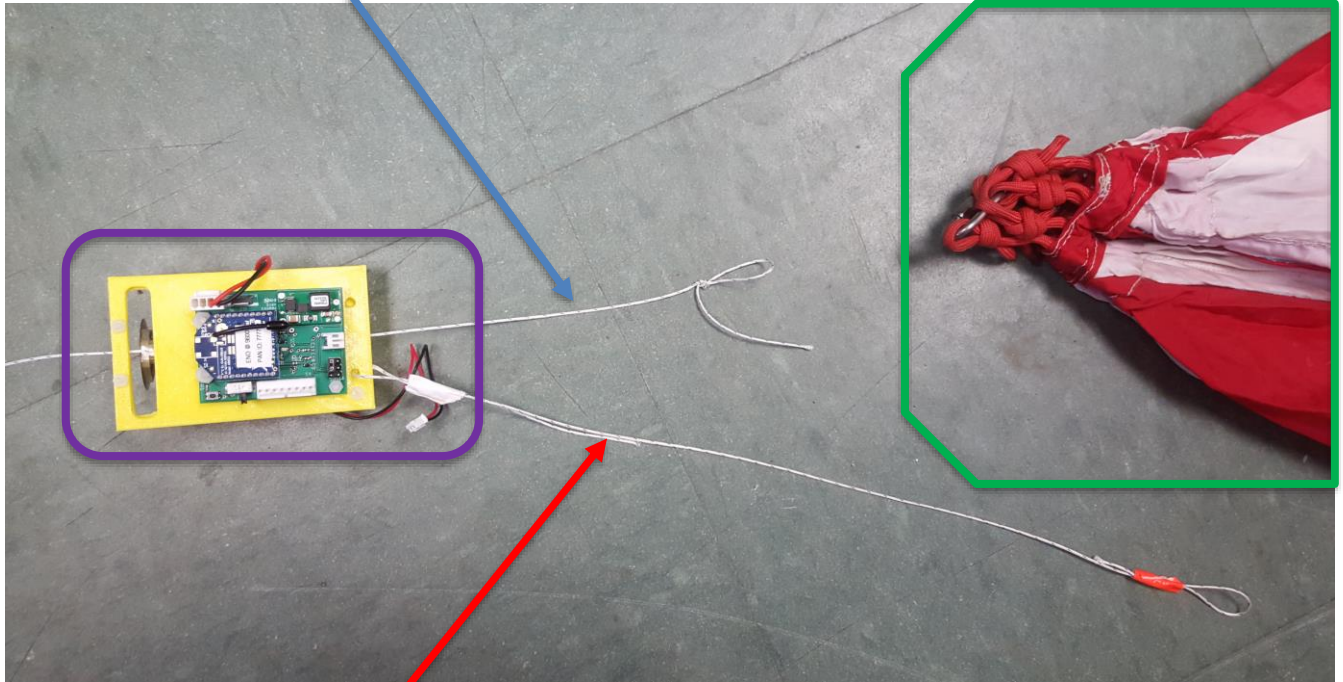
Xbee Antenna

OCCAMS Board

UPDATE SLIDE! Battery and battery housing

Completed System

Cutdown Line (Parachute to balloon)



Housing Line (Parachute to cutdown)

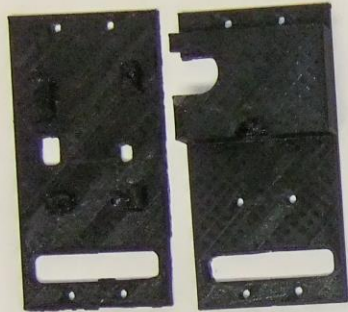
Introduction to the Build

This is only a start

- **This cutdown system allows you to terminate a flight should you so choose.**
- **Each team will build their cutdown assembly**
- **It is expected that all Solar Eclipse teams will use this cutdown system during the August 21, 2017 flight**
- **There are 20 steps to this build**

Cutdown Part List

WARNING! The Cutting Wheel is VERY sharp!



front
back
3D printed mount plates –
H11

Occams
board – **H12**



Cutting
Wheel –
H9



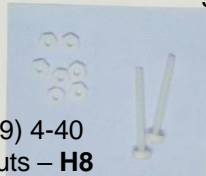
Protective Housing –
H13



Lithium
Battery –
H3



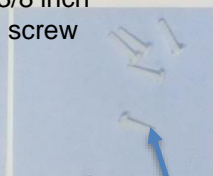
Detachable
XBEE- with **H12**



(9) 4-40
nuts – **H8**



(2) 4-40
1.25 inch
threaded
rod –
H16



(1) 6-32
1/8 inch
screw –
H10

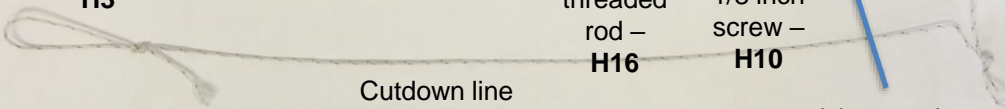
Mounting
Hub
and set
screw – **H4**



30 rpm DC
motor – **H1/H5**



DC Motor
Housing – **H2**



Cutdown line

(1) 4-40 1/2
inch screw
– **H6**

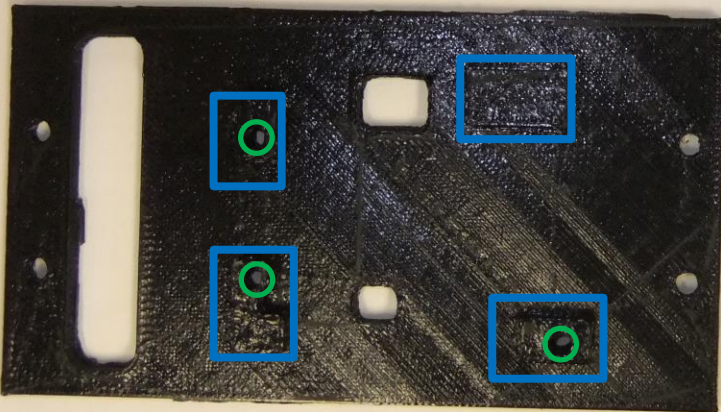
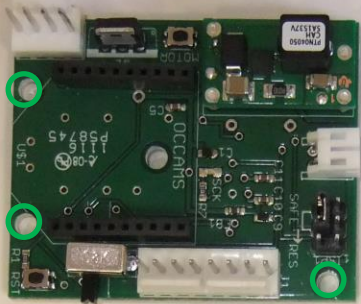
Step 1

Begin by removing the **XBEE antenna** from the OCCAMS control board assembly (H12) board carefully. Pull it straight up to remove the XBEE antenna from OCCAMS.



Step 2

Take the OCCAMS board and place it on the **standoffs** on the front mount plate lining up the **screw holes**.



3/8 inch nylon
screw (H14)
and nylon nut
(H8)

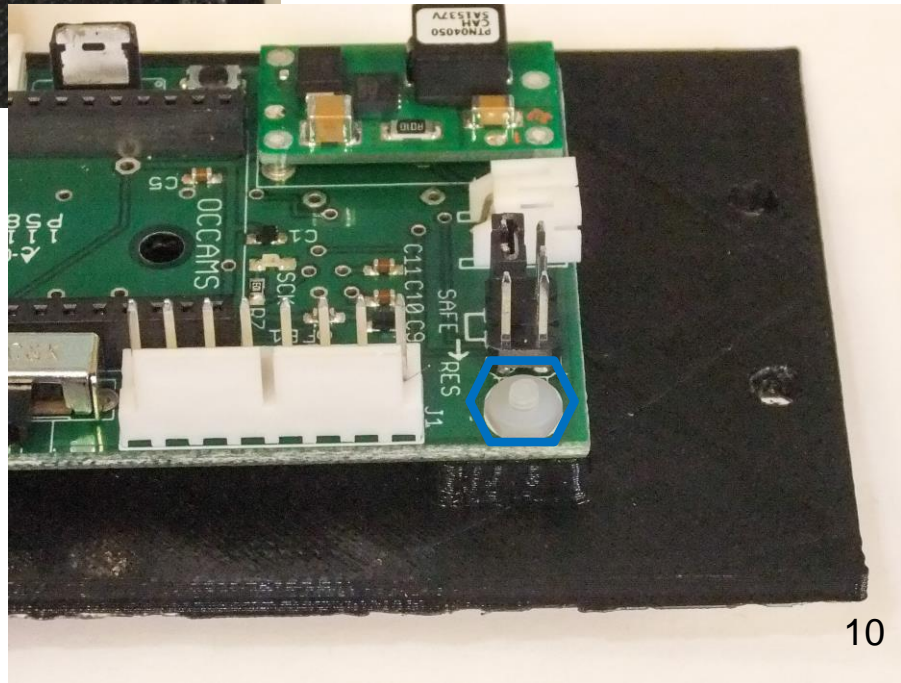




Insert a 3/8 inch nylon screw (H14)

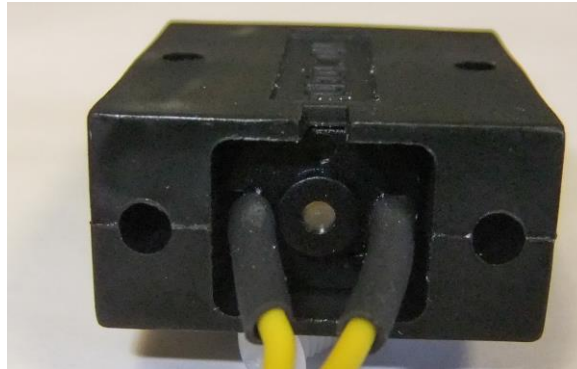
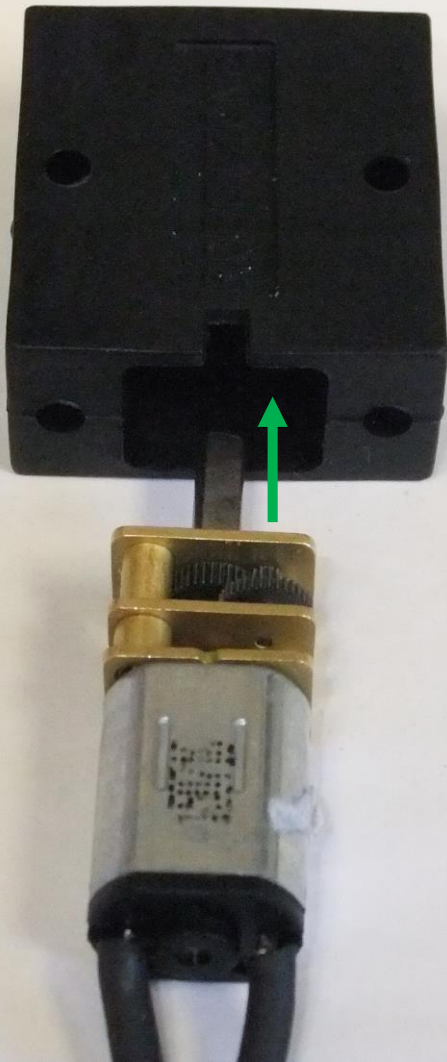
Step 3

Fasten in place with a nylon nut on the bottom of the front mount plate (H8)



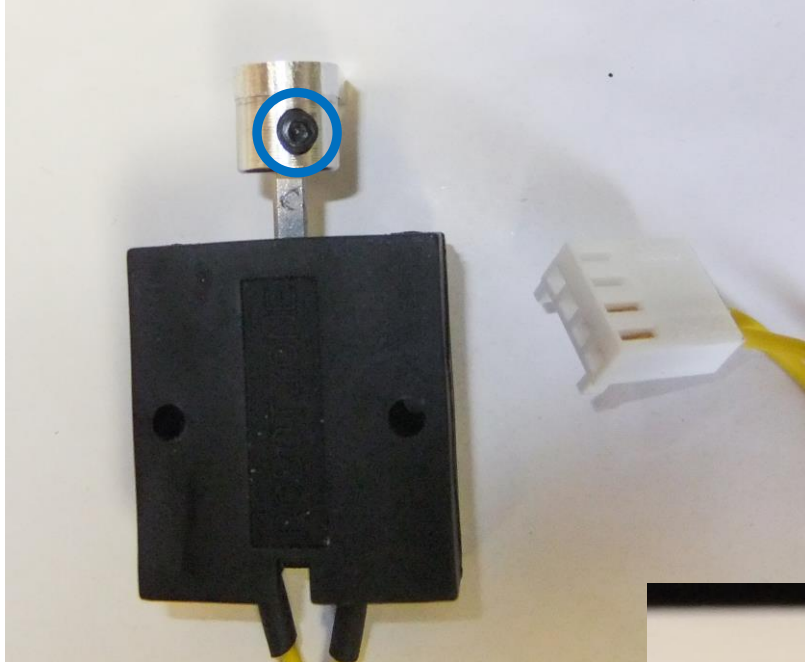
Step 4

Slide the motor (H1) into the motor housing (H2) until is fully inserted

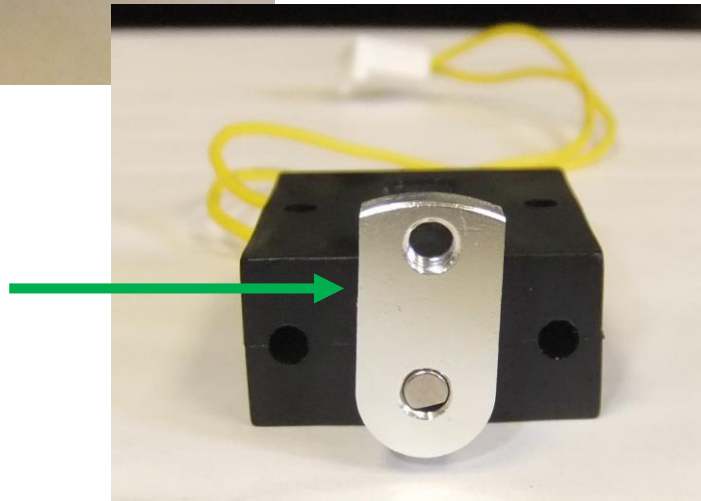


Step 5

Insert the mounting hub (H4) on the driveshaft of the motor so the **mounting screw** is flush against the flat part of the driveshaft. Slide the mounting hub down so it rests against the motor housing and tighten the mounting screw with a 1/16 inch Allen wrench



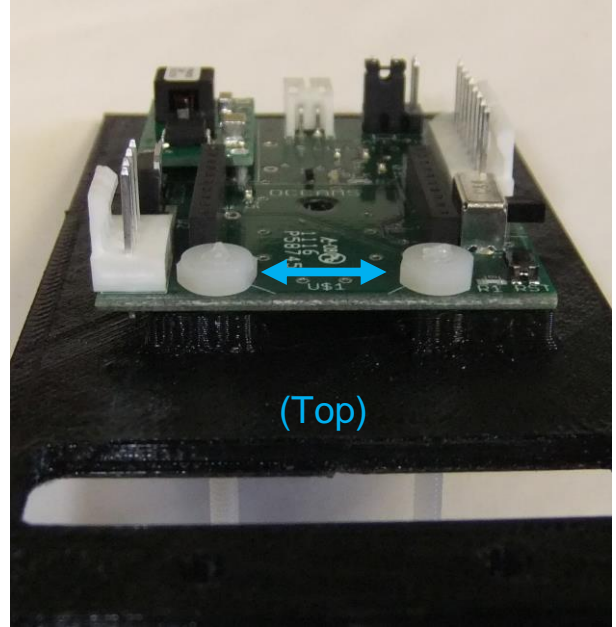
Using your fingers, orient the mounting hub so that it is perpendicular with the motor housing as shown.



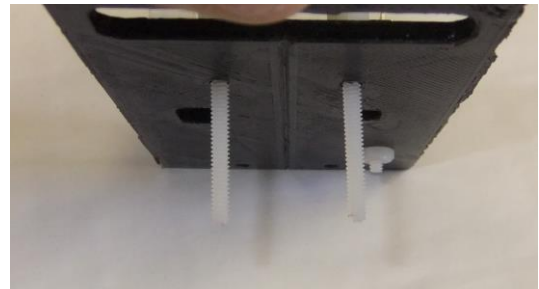
Step 6



Screw two nylon nuts (H8)
over the ends of the 1.25
inch threaded rods (H16)

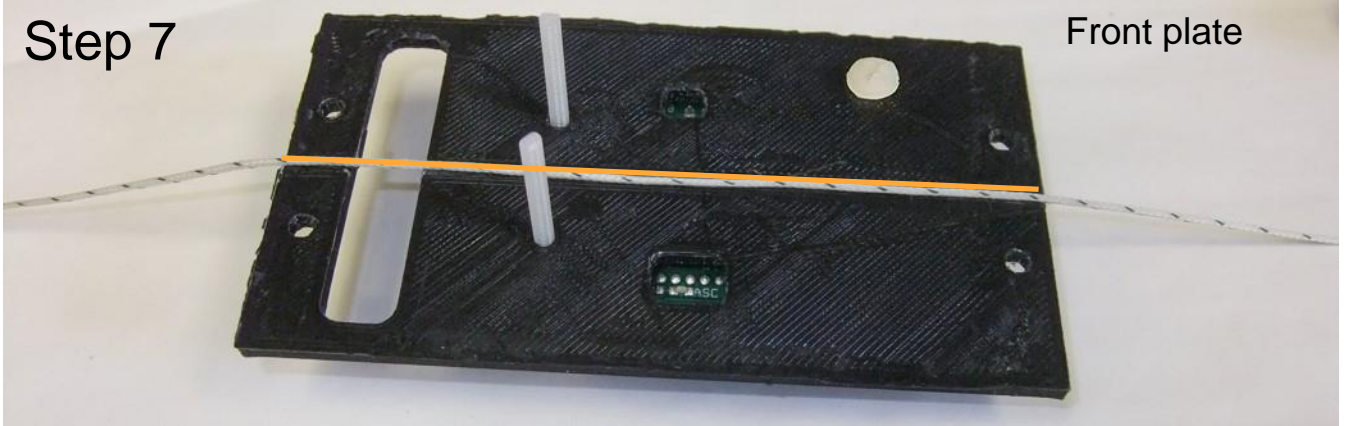


Stick the 1.25 inch screws with
nylon nuts through the top two
holes on the OCCAMS board



Step 7

Front plate

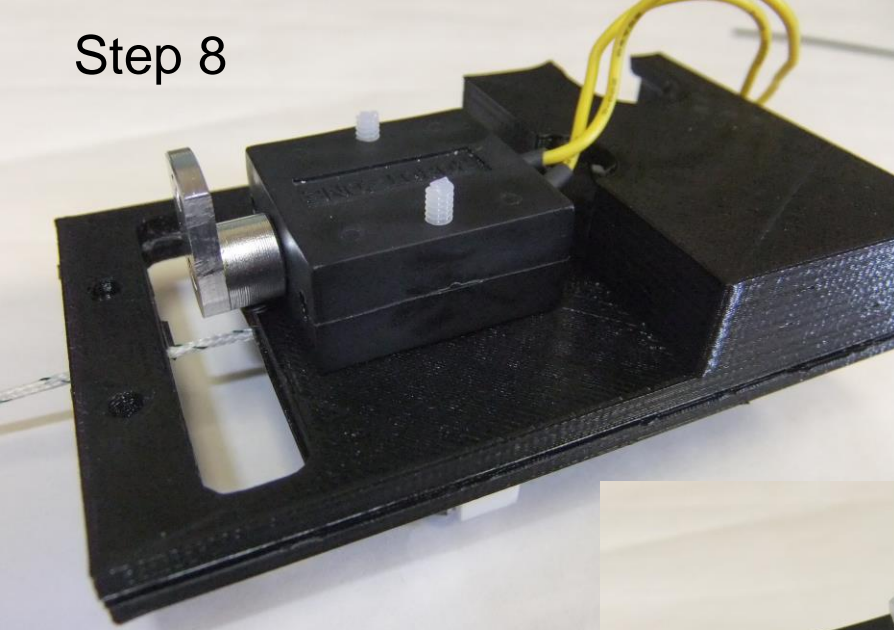


Place the cutdown line on the back of the 3d printed housing front plate with it resting within the **groove**. Place the top 3d printed housing plate matching its groove with the cutdown line while inserting the 1.25 inch threaded rods through the pre-drilled holes.



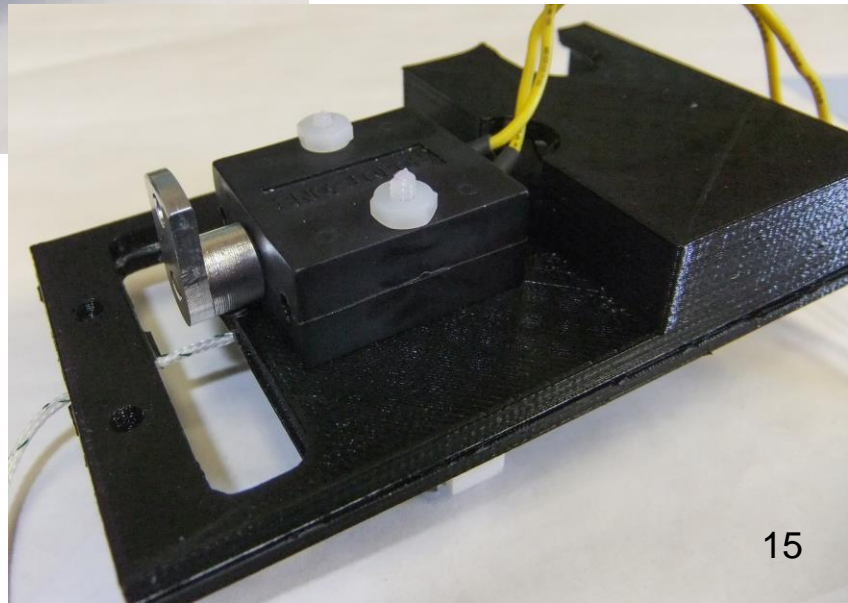
Back plate
on top of
front plate.

Step 8



Insert the motor housing with motor through the 1.25 inch screws

Thread two nylon nuts (H8) onto the 1.25 inch screws and tighten snugly.



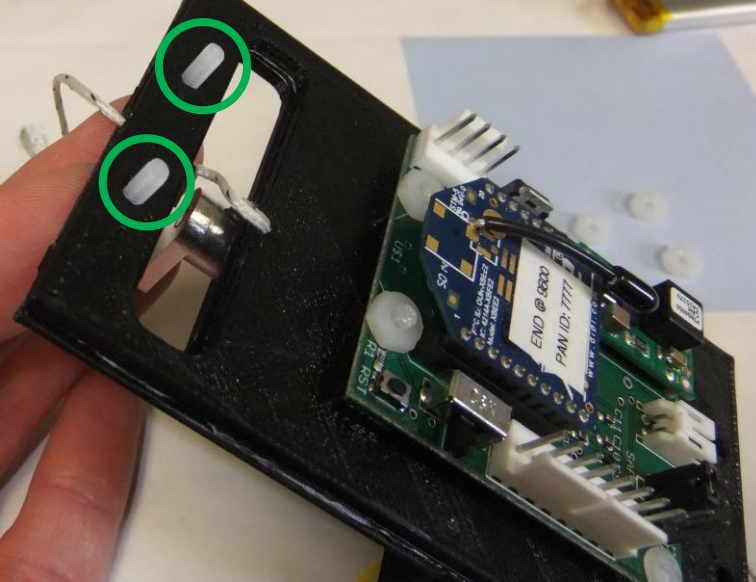
Step 9

Insert the **XBEE** antenna **back** into the OCCAMS board

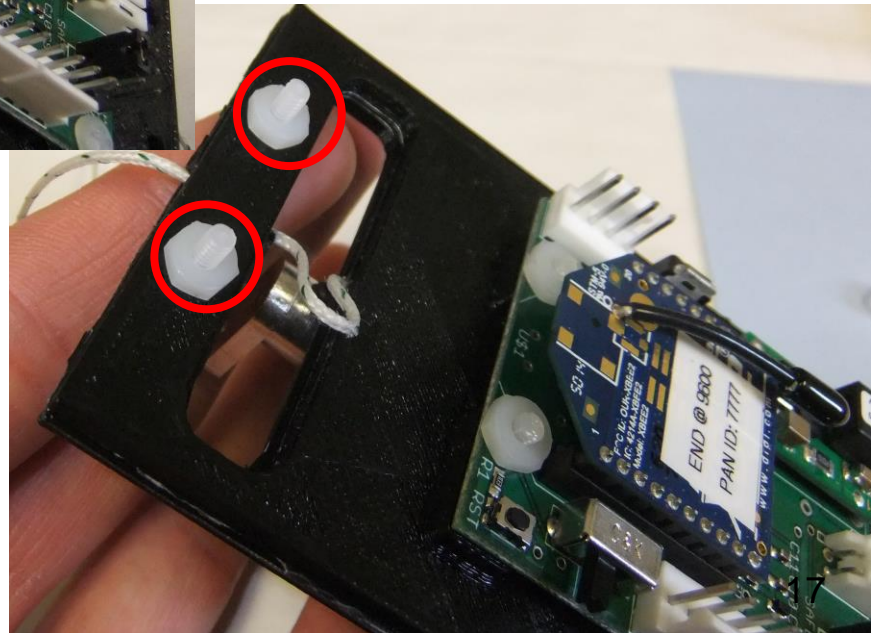


Step 10

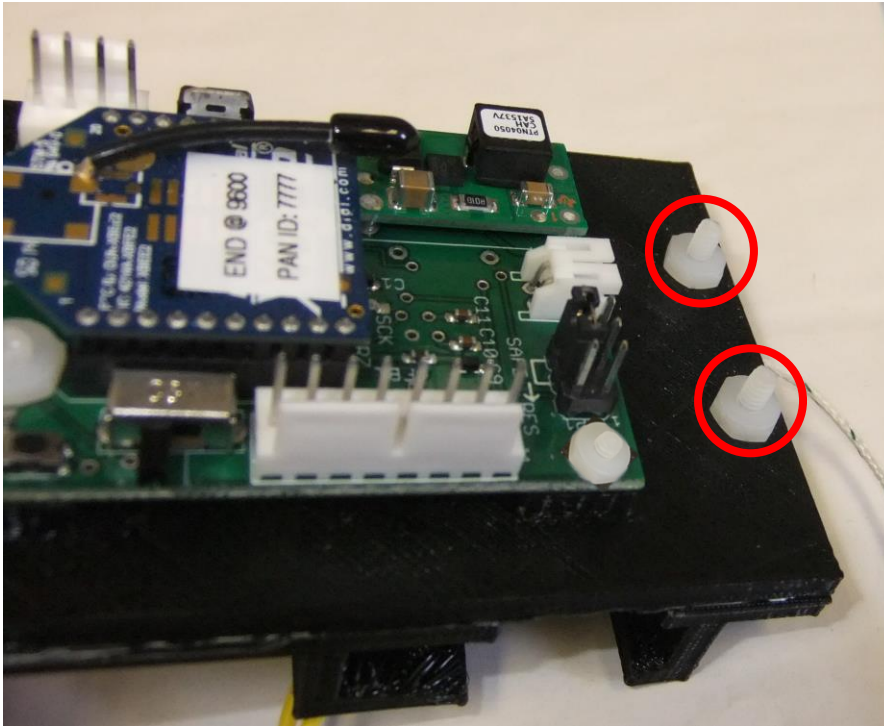
Insert two 3/8 inch screws (H14) through the **two top screw holes**. Insert from battery side.



Screw on **two nylon nuts (H8)** and tighten snug.



Step 11

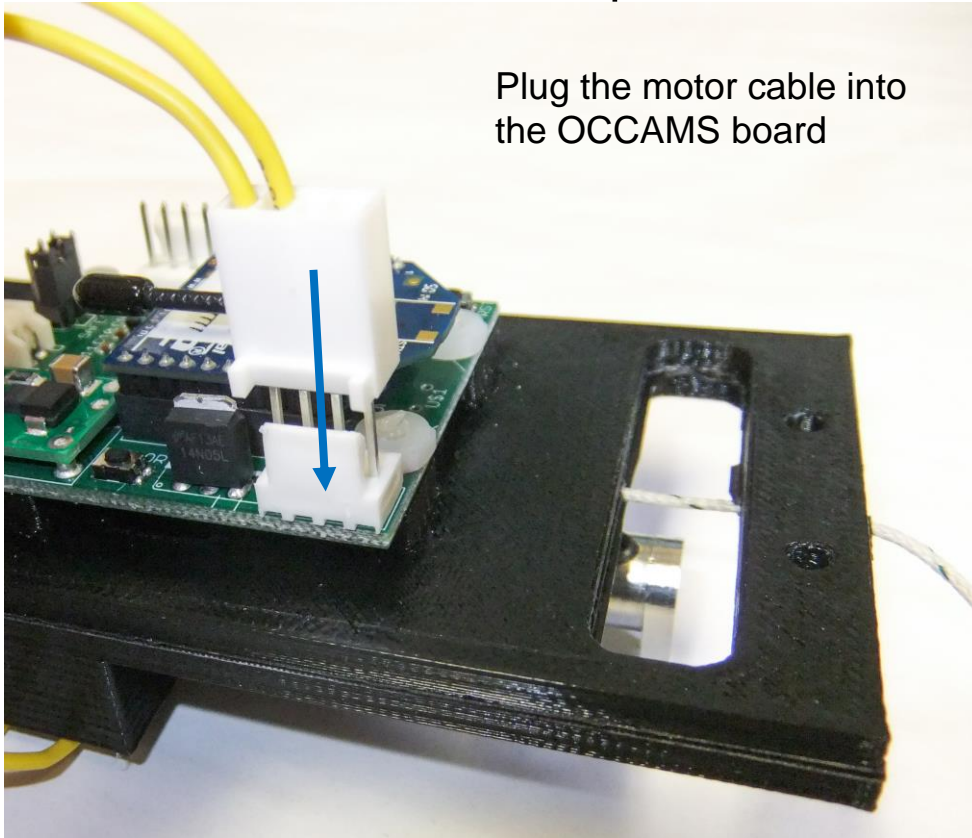


Do the same with the bottom **two screw holes** (3/8 inch screw (H14) with nut (H8)). **Note that either one of these can be removed and used to fasten the seatbelt.**

As you prepare for a flight, remove one of these nuts and screw. The hole will be used to tie the seatbelt line to the cutdown. The seatbelt line runs from the cutdown system to the parachute in order to save the cutdown after flight termination. For more information, see *Using the Cutdown System*.

Step 12

Plug the motor cable into the OCCAMS board



To prevent potential leaking, overheating or explosion of batteries please be advised to take the following precautions:

WARNINGS!

- Do not immerse the battery in water or seawater, and keep the battery in a cool dry environment during stand-by periods.
- Do not use or leave the battery near a heat source such as fire or heater.
- When recharging, use the battery charger specifically for that purpose.
- Do not reverse the positive (+) and negative (-) terminals.
- Do not connect the battery to an electrical outlet.
- Do not dispose of the battery in fire or heat.
- Do not short-circuit the battery by directly connecting the positive (+) and negative (-) terminal with metal objects such as wire.
- Do not transport or store the battery together with metal objects such as necklaces, hairpins etc.
- Do not strike or throw the battery against any hard surface.
- Do not directly solder to the battery and pierce the battery with a nail or other sharp object.
- The outer metal conductor should never contact the aluminum laminate film, especially with electrification, since this can result in “black spots” and/or gas release (swelling).
- Do not use sharp things to hit the battery.

To prevent potential leaking, overheating or explosion of batteries please be advised to take the following precautions:

CAUTIONS!

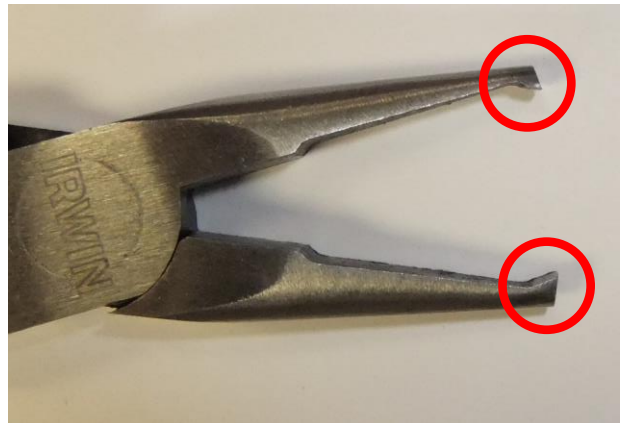
- Do not use or leave the battery at very high temperature (for example, in strong/direct sunlight or in a vehicle in extremely hot weather). Otherwise, it can overheat or catch fire or its performance will be degenerate and its service life will be shortened.
- Do not use it in locations prone to static electric discharges, otherwise, the safety devices may be damaged, causing a harmful situation.
- In case the electrolyte gets into the eyes due to the leakage of battery, do not rub the eyes!
- Rinse the eyes with clean running water, and seek medical attention immediately. Otherwise, it may injure eyes or cause a loss of sight.
- If the battery gives off an odor, generates heat, becomes discolored or deformed, or in any way appears abnormal during use, recharging or storage, immediately remove it from the device or battery charger and place it in a contained vessel such as a metal box.
- In case the battery terminals are contaminated, clean the terminals with a dry cloth before use.
- Otherwise power failure or charge failure may occur due to the poor connection between the battery and the electronic circuitry of the instrument.
- Be aware that discarded batteries may cause fire - tape the battery terminals to insulate them before disposal.

Taking Care of your Batteries

- Be careful plugging the batteries into the power board and un-plugging from the power board.
- Repeatedly pulling/pushing on the wires can cause them to be pulled from the connector (rendering the battery useless) and/or cause a dangerous short.
 - This can also wear out the male power connector on the power board
- We have a few tools and techniques to help keep your batteries in good shape...

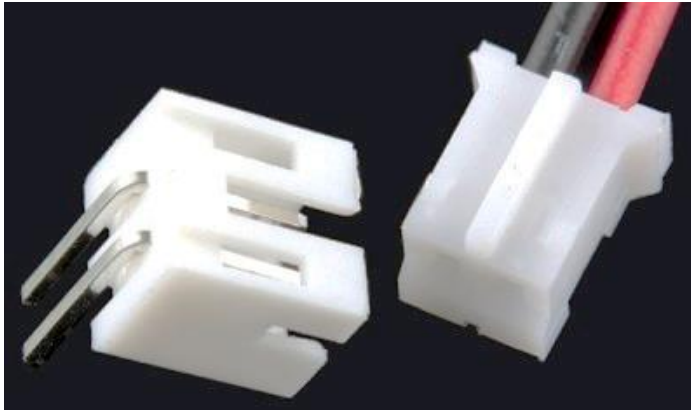
Transverse End Cutter Pliers = Great “Connector Pullers”

- The tool we will use as a “connector puller” is a transverse end cutter pliers, should you need to get a replacement
 - These work well because you are able to grab the connector firmly and pull the connector out, lessening the risk of slipping off the connector and damaging the wires.
 - These are not cheap! Try and take care of the one in your kit.
 - Should you buy a new connector puller, take a metal file and file down the sharp “teeth” of the pliers so they don’t cut into the connector.



Connector “Gender”

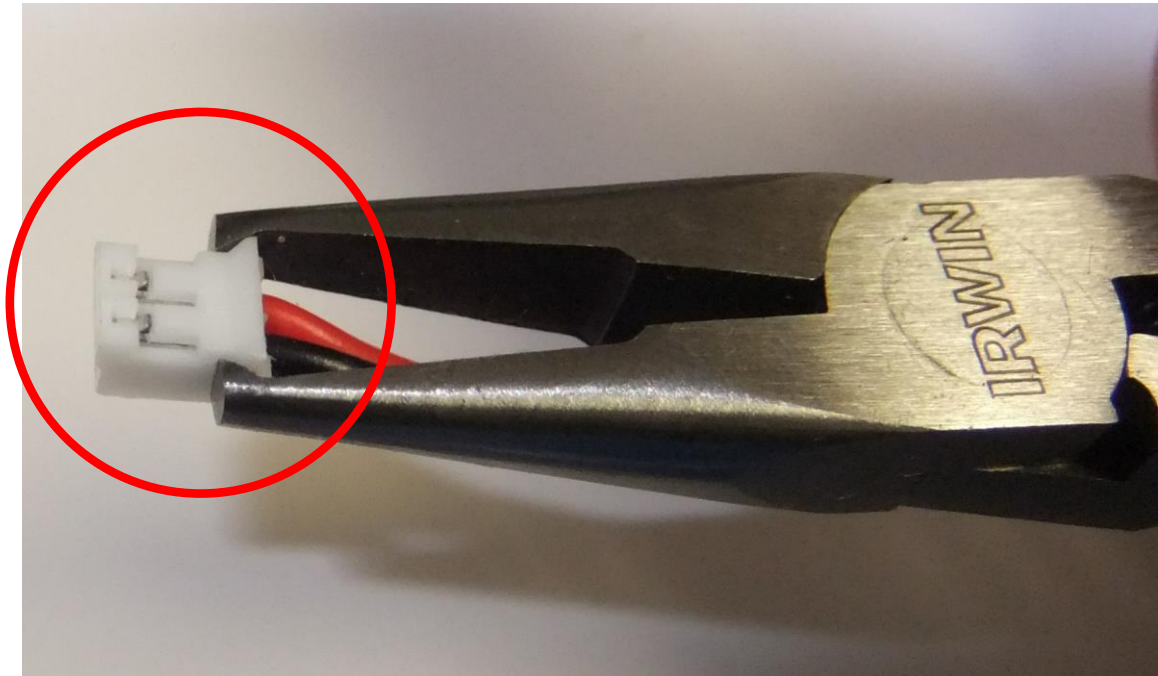
Gender - The gender of a connector refers to whether it plugs in or is plugged into and is typically male or female, respectively (kids, ask your parents for a more thorough explanation). Unfortunately, there are cases where a connector may be referred to as “male” when it would appear to be female



Male (left) and female 2.0mm PH series JST connectors. In this case, gender is determined by the individual conductor.

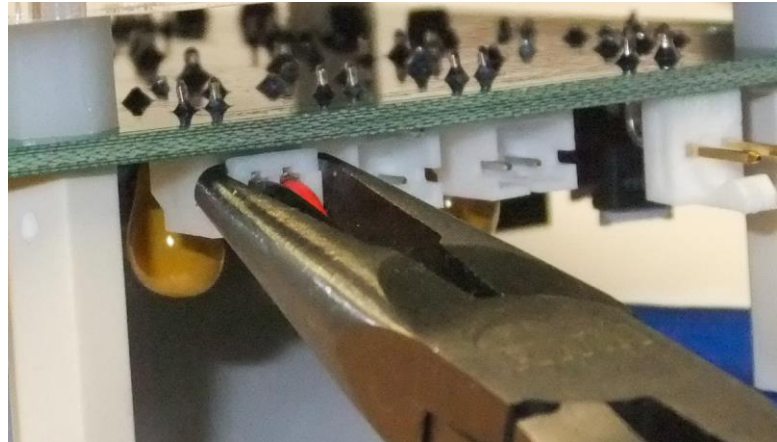
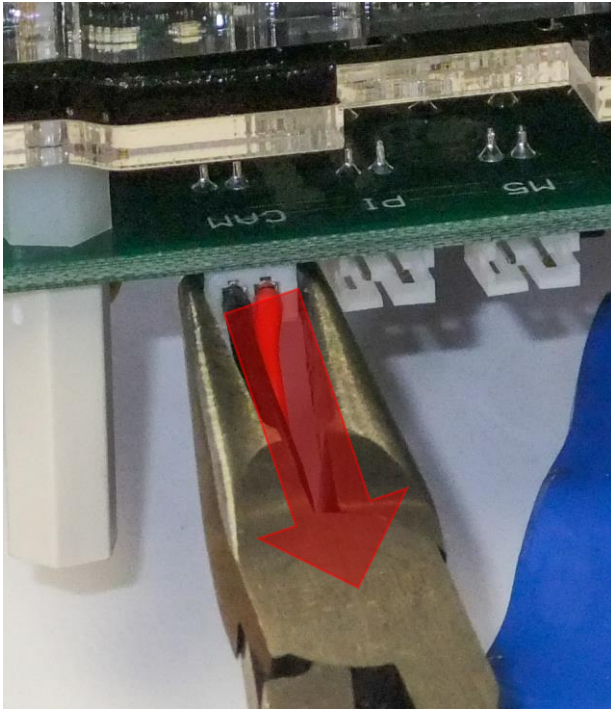
Using the Connector Pullers

You can use these to both insert the battery connectors or to remove the battery connectors from the power boards. Grab the connector right behind the connector where it flares out. Don't squeeze the connector too tight lest you cut into the connector.



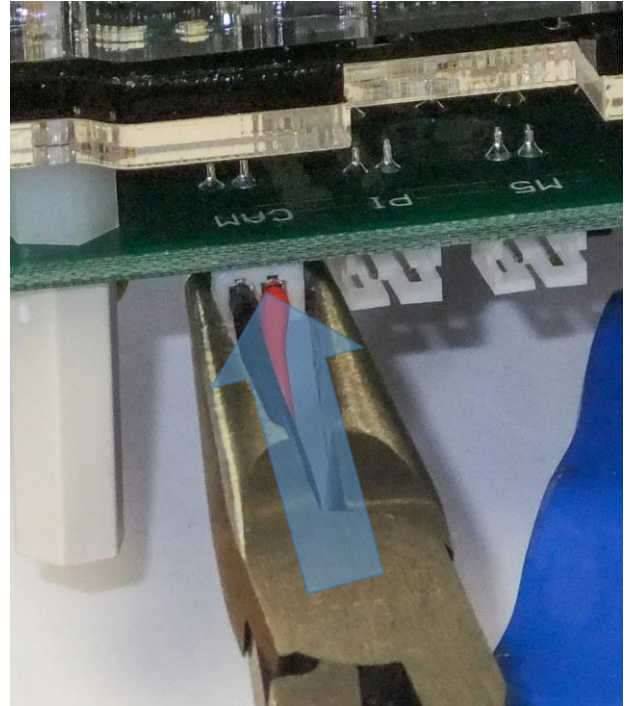
Using the Connector Pullers

To remove the battery connector, grab the connector right behind where the end “flares” out and gently pull straight out. Make sure you grip just the female connector which is connected to the battery wires and not the male end connected to the power board.



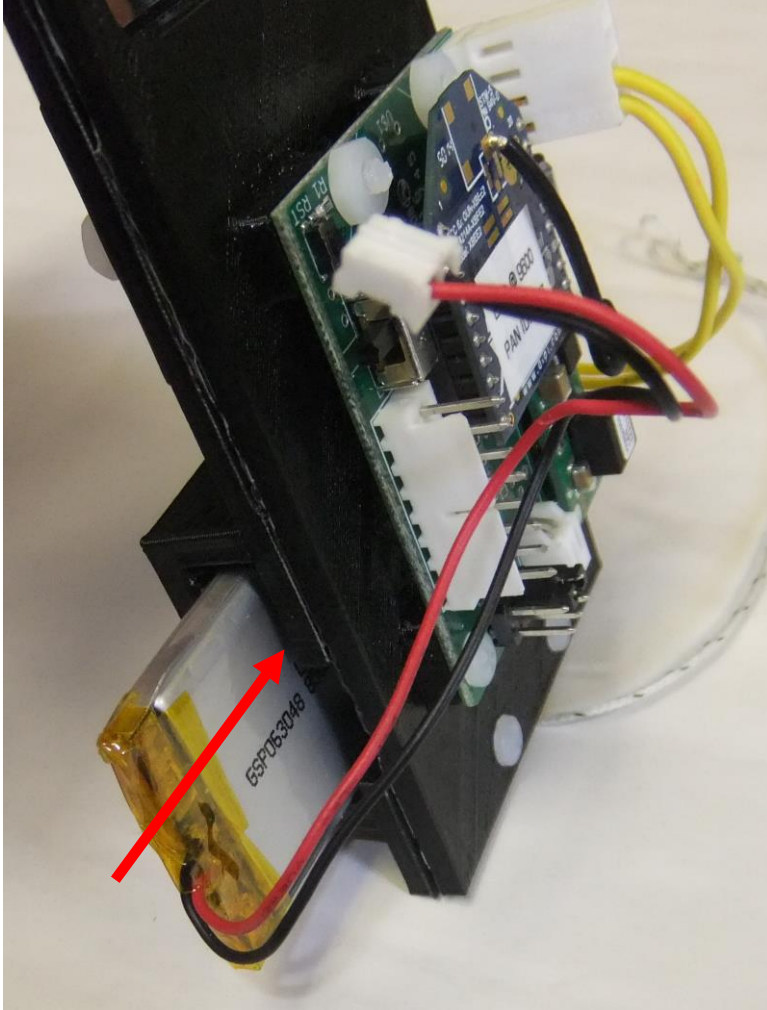
Using the Connector Pullers

To insert the battery connector, grab the connector right behind where the end “flares” out and gently push it in. Don’t push too hard as you can damage the male connector on the power board.

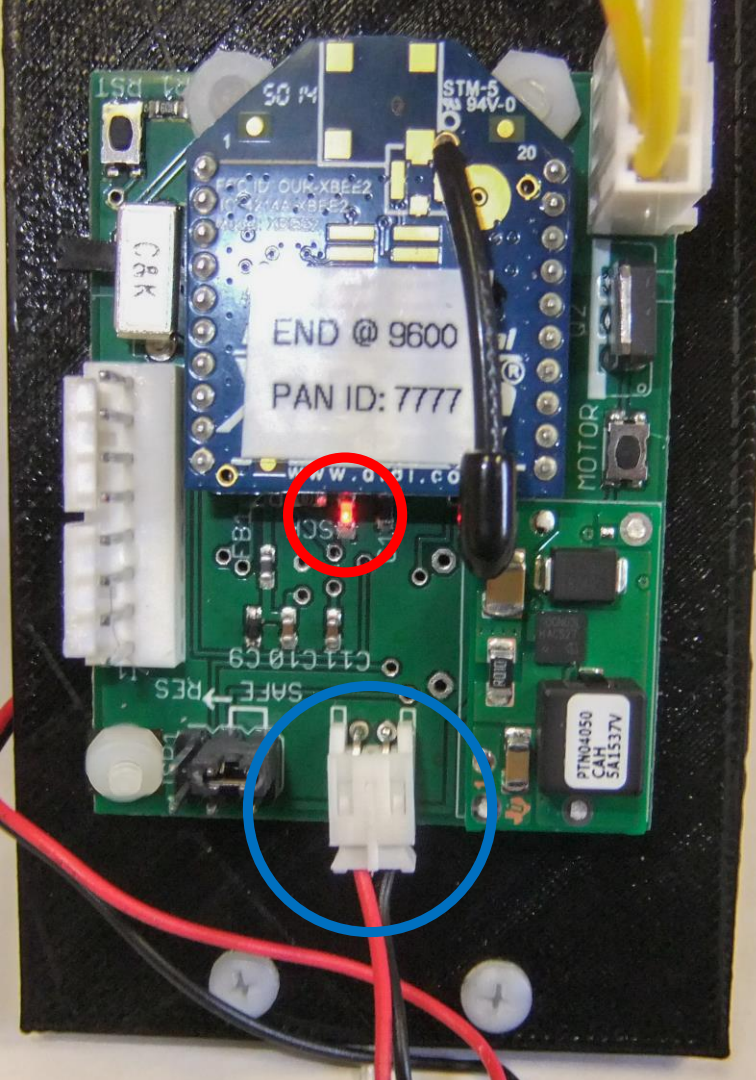


Step 14

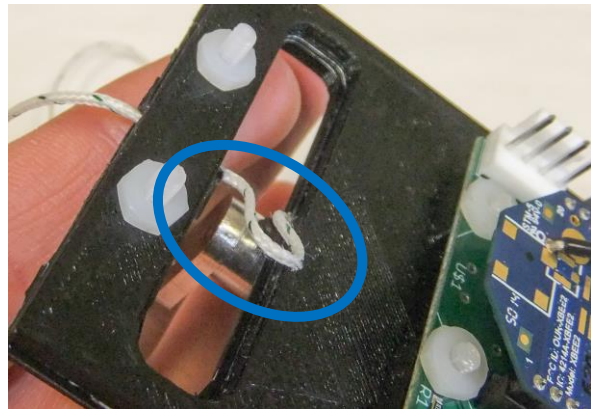
Slide the battery (H3) into the battery slot on the back plate.



Step 15



Plug in the battery. You will begin to hear a beep and the **red LED** will flash. Cutdown is now active.



Step 16

Pushing the **motor button** will spin the motor. Make sure the **cutdown line** is out of the way so the mounting hub won't catch on it. **Do not push the motor button with the cutting wheel attached.**

UNPLUG THE BATTERY.

We will now be attaching the cutting wheel.

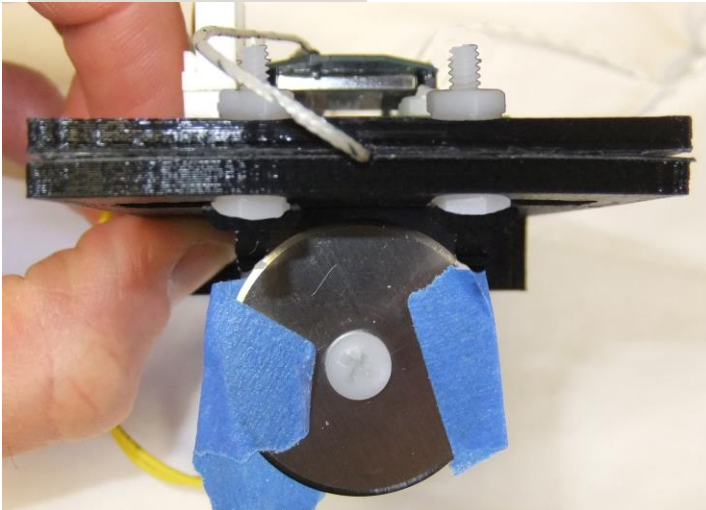
**WARNING! The Cutting
Wheel is VERY sharp!**

WARNING! The Cutting Wheel is VERY sharp!

Step 17



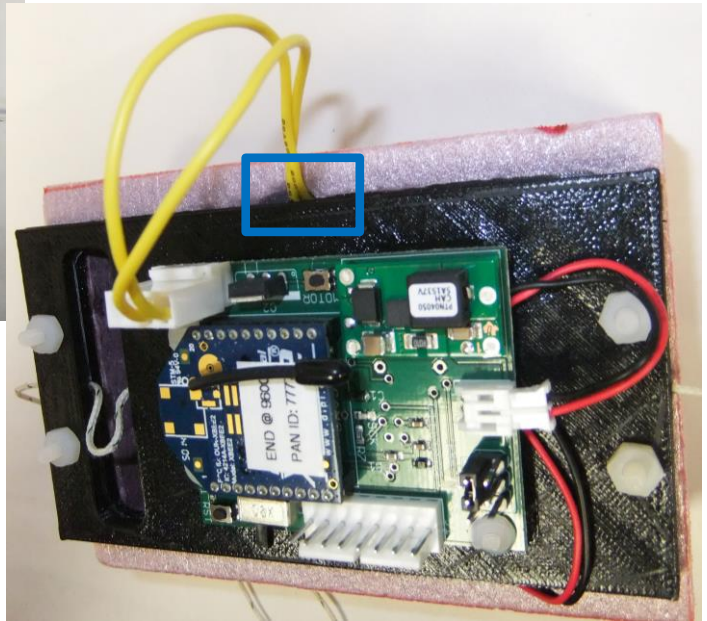
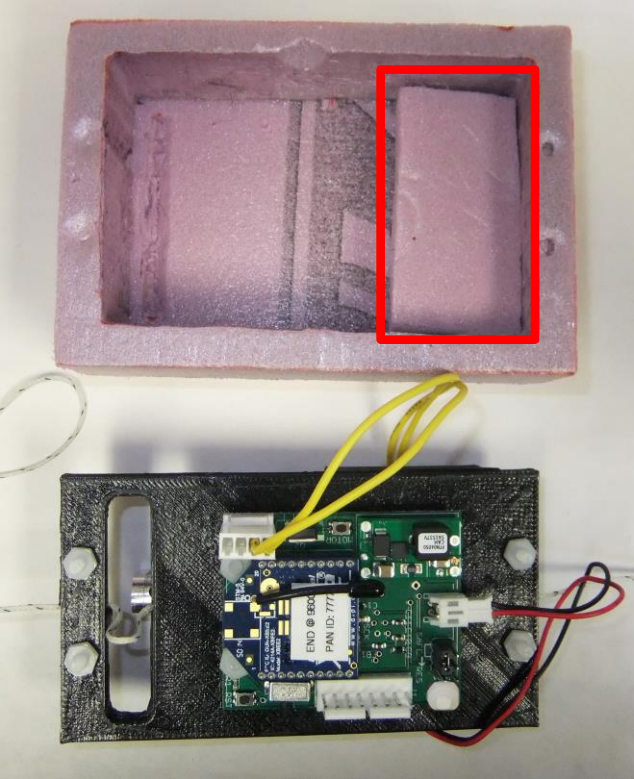
Place tape on the sides of the cutting wheel (H9) to make it easier to handle safely.



Place the 1/8 inch screw (H10) through the cutting wheel and the mounting hub and tighten snug.

Step 18

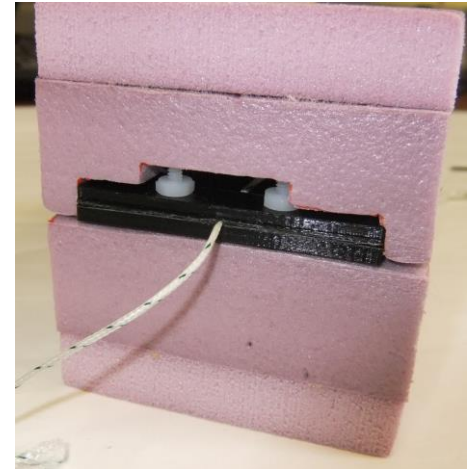
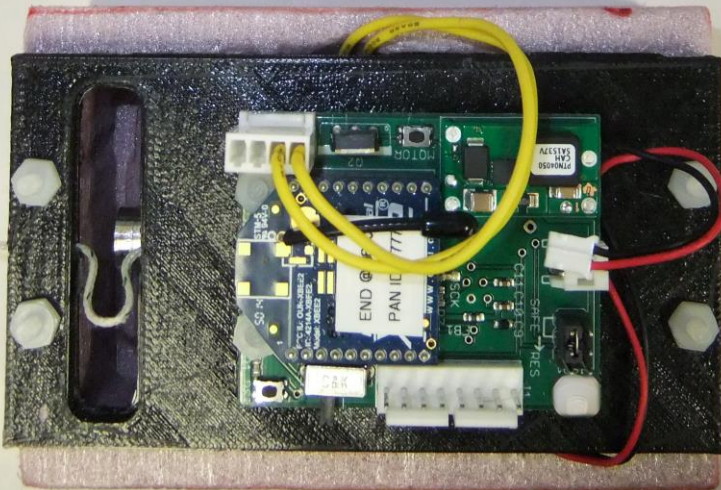
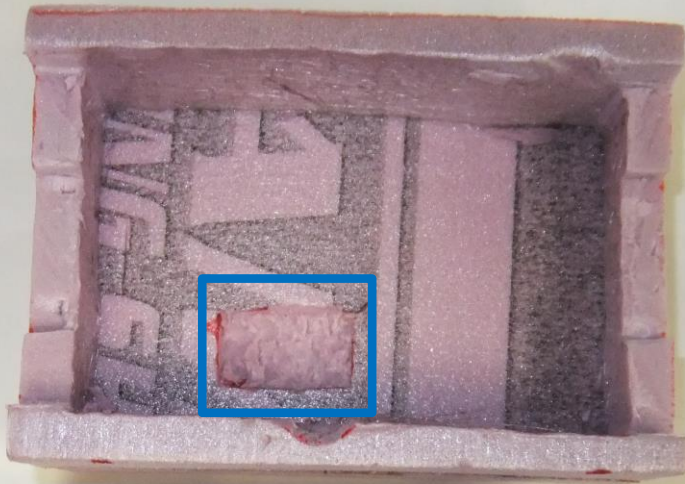
Place the cutdown system into bottom section of the foam protective housing. The bottom section has a “**bed**” for the battery compartment to rest upon.



Notice the **small cutout** for the motor wire. You can gently push the wire into this slot to remove the excess wire on the OCCAMS side. You can also use a small piece of tape to restrain it on the motor side if you wish.

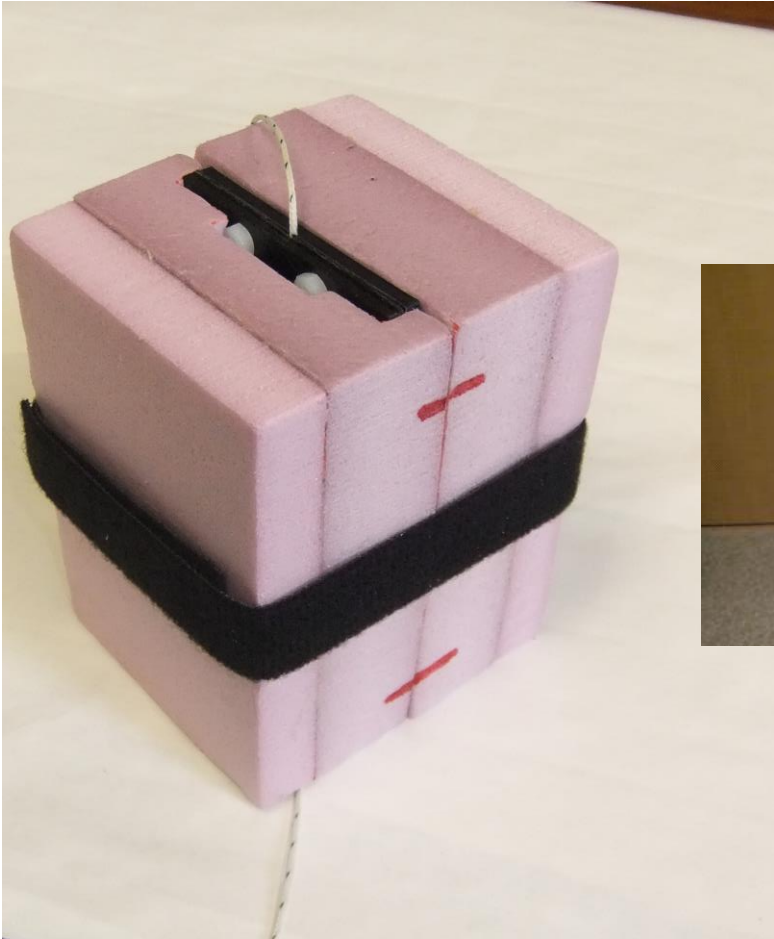
Step 19

Place the top protective housing on top of the OCCAMS side of the shutdown system. Notice the **notch** for the motor connector.



Make sure the housing sits flush against itself and that no cables are pinched between them.

Step 20 Finally, hold the protective housing together using a strip of Velcro.



Congratulations! You have finished constructing one (of two) of your cutdown system. Jedi Cat Approves!