

Using the Cutdown System

Threading the lead line through cutdown

Attaching to the parachute

Resetting the timer

Testing and flight day operations

BE AWARE: ESD Sensitive Components!

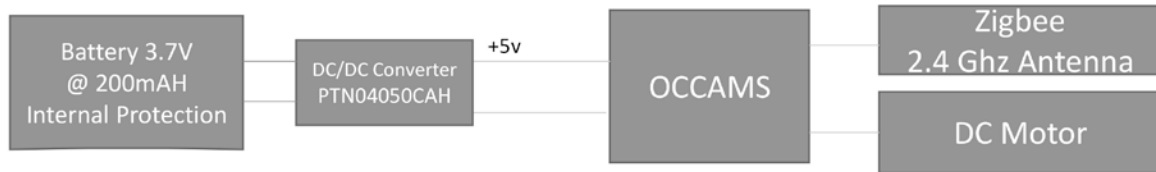
- ESD – Electrostatic discharge

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 vapour 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.

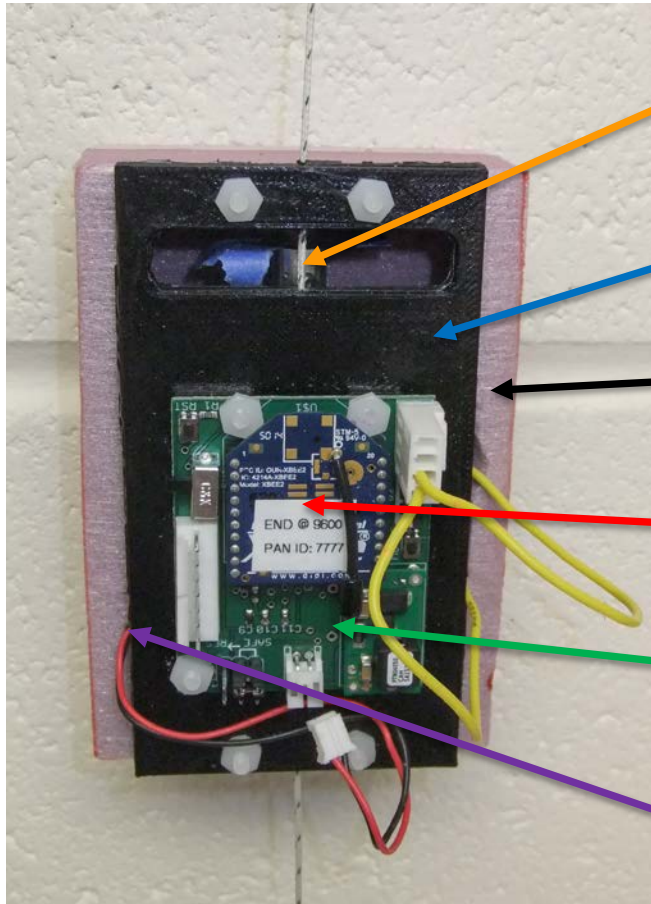
- Use grounding straps when handling/touching components such as the Pi, RFD 900+ modems, modems, power boards, etc. and place them on the ESD rubber mat when not in use.

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

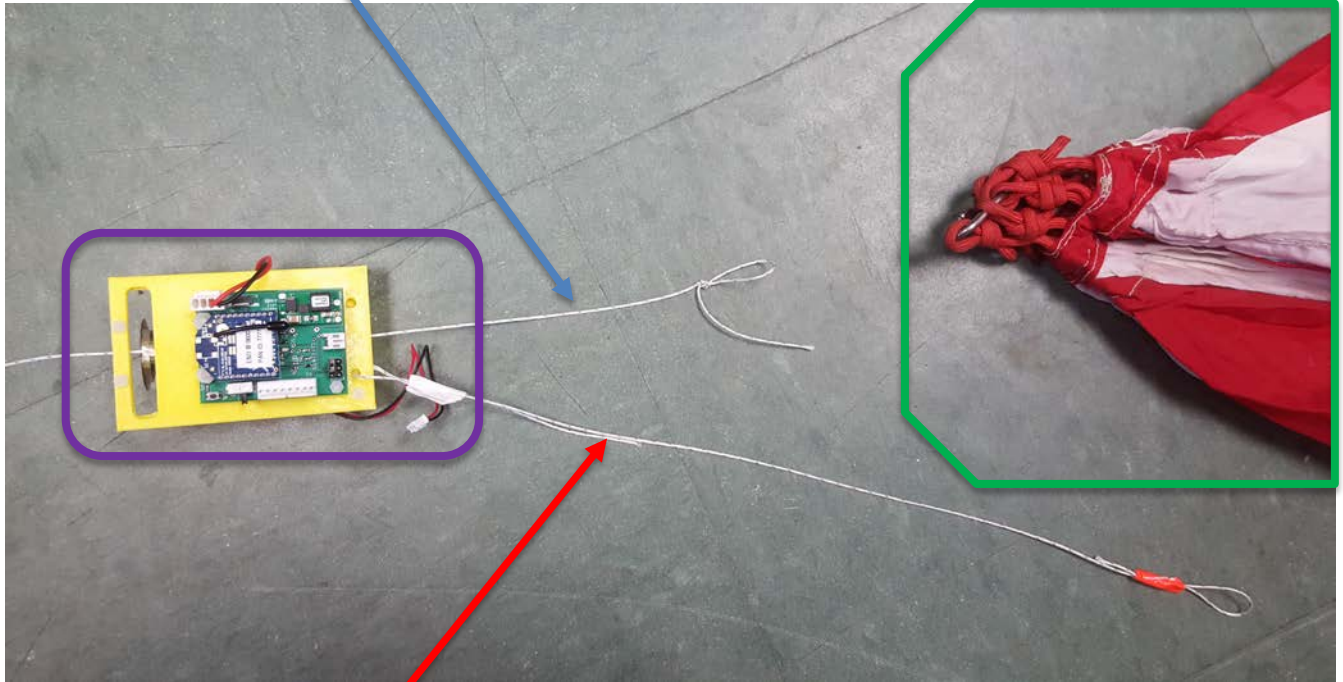
Xbee Antenna

OCCAMS Board

Battery and battery housing

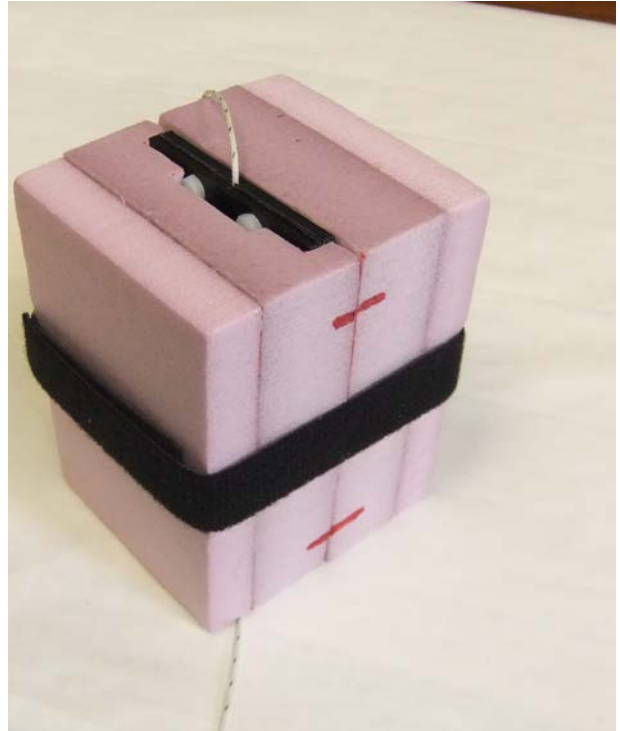
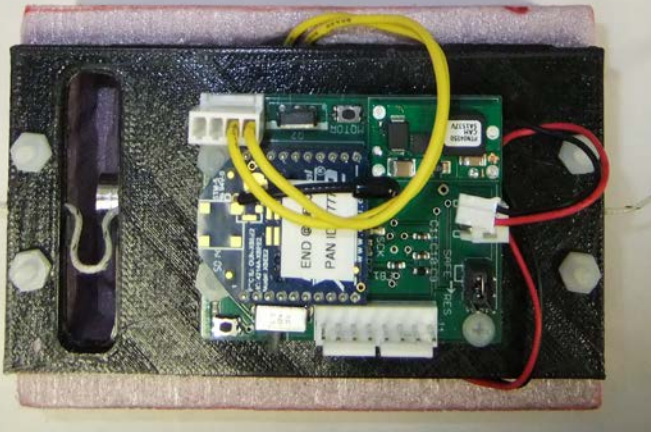
Completed System

Lead Line (Parachute to balloon through cutdown)



Seatbelt Line (Parachute to cutdown)

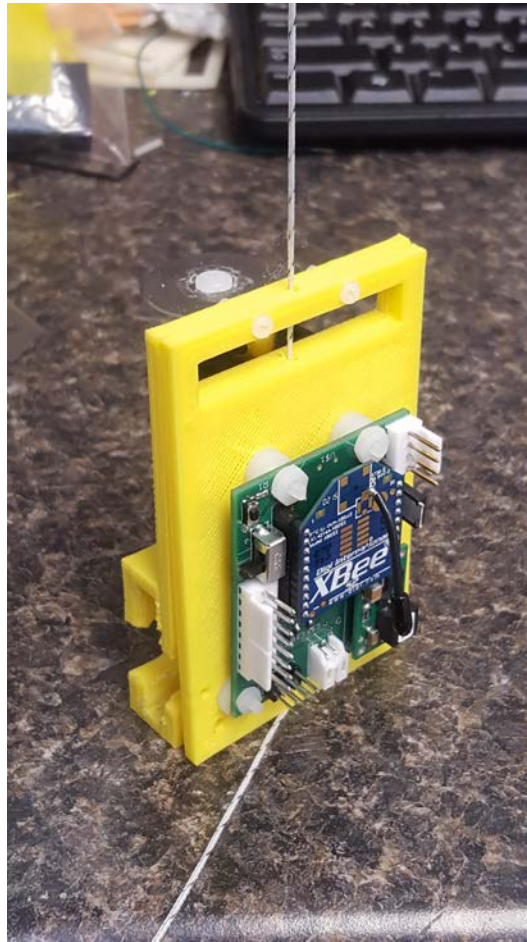
Completed System: Cutdown Enclosure



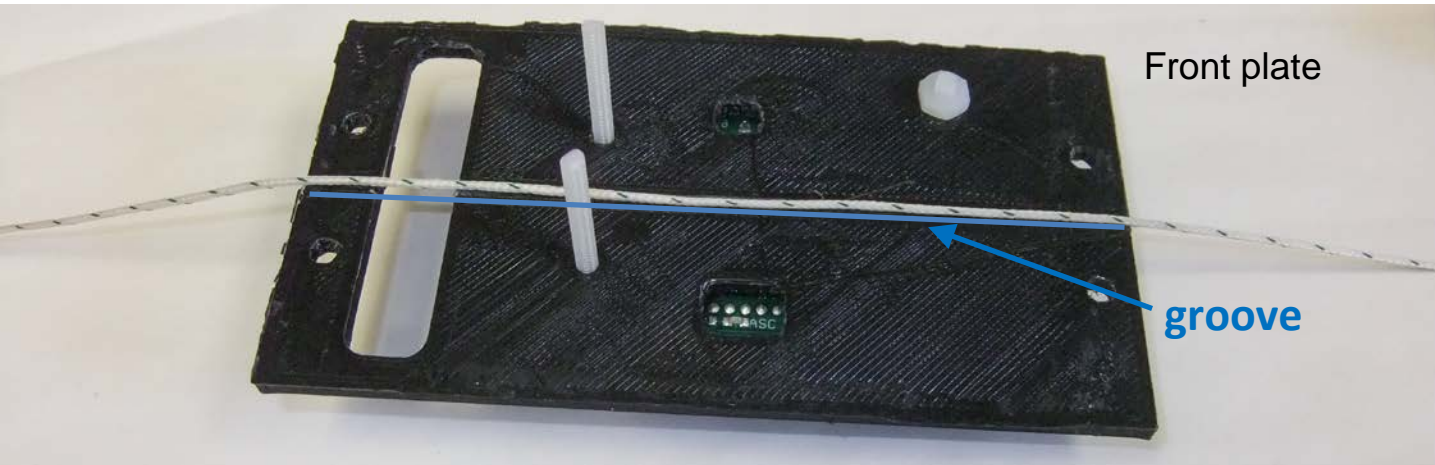
Introduction to the Build

- **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**

Inserting the Lead Line Through Cutdown

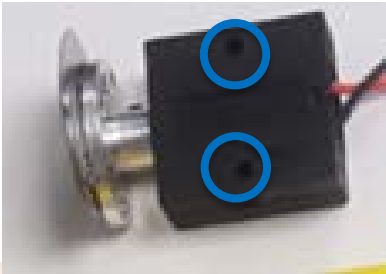


Remove the motor and back plate to gain access to the front plage and the cudown line groove.



Thread the lead line between the two 1.25inch threaded rods and the four mounting holesscrews along the **groove**

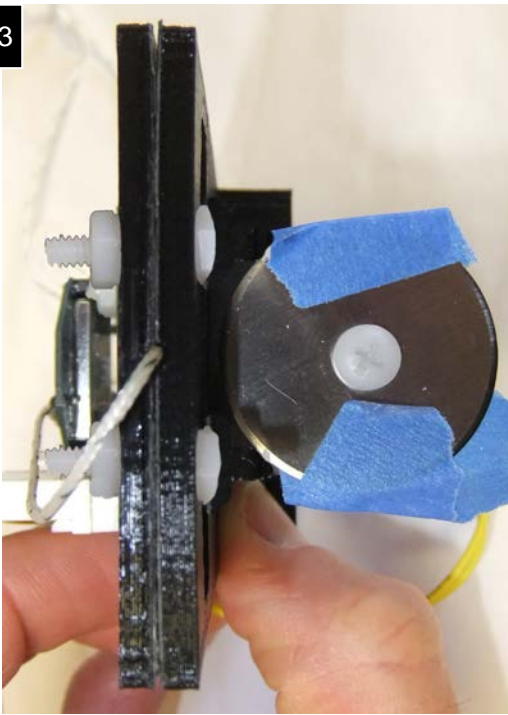
Replace the back plate and **mortor and use two nylong nuts to secure.**



Replace the four 3/8 inch nylon screws and fasten with the nylon nut

Do not tighten yet!

3

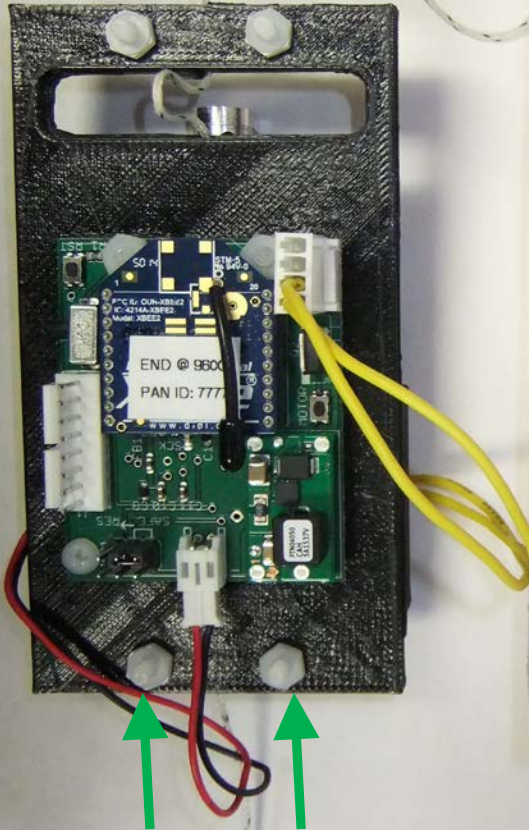


Reattach the back plate and motor, making sure the blade does not interfere with the line. Before tightening hardware pull the line back and forth between the plates to insure it can move freely. Tighten the nuts snug.

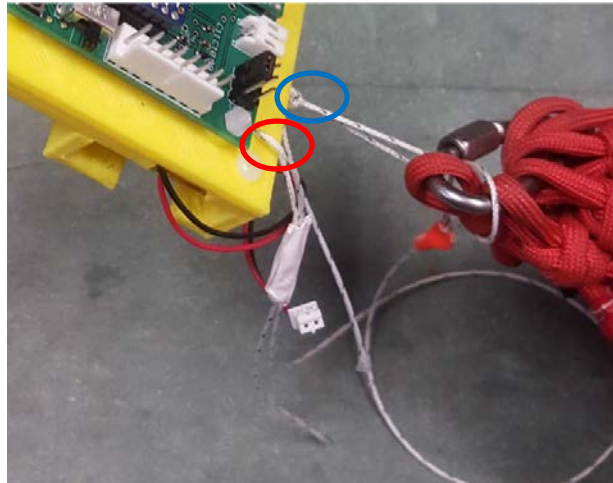
Attaching Cutdown to the Parachute

Remove one of the 3/8 inch nylon screw and nut (doesn't matter which one). This hole will be used to attach the "seatbelt." This line is then connected to the top of the parachute. The "seatbelt" keeps cutdown attached to the payload string after cutdown and the payload string is detached from the balloon.

When sizing the seatbelt, make sure it is long enough to be slack when cutdown rests at the bottom of the lead line



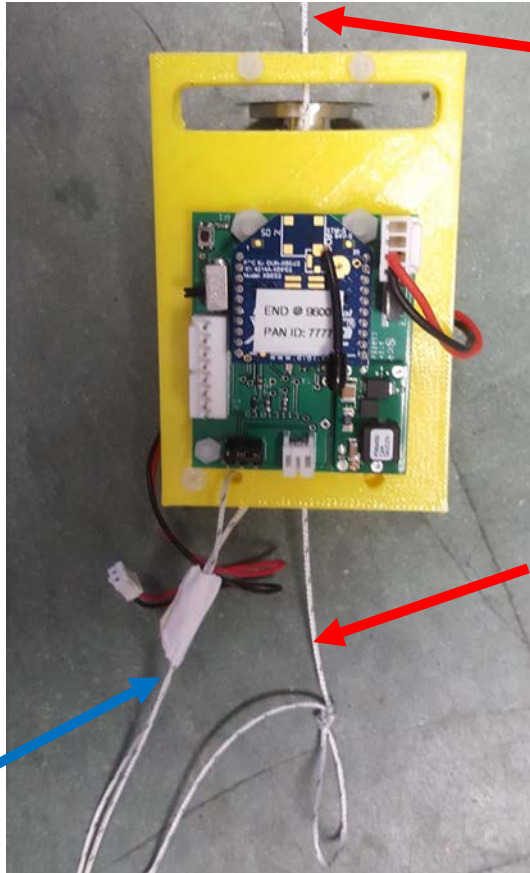
Attaching Cutdown to the Parachute



Seatbelt line placement

When sizing the seatbelt, make sure it is long enough to be slack when **cutdown rests at the bottom of the lead line**

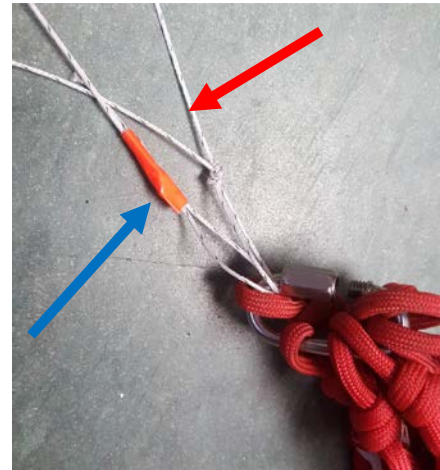
Attaching Cutdown to the Parachute



To Balloon

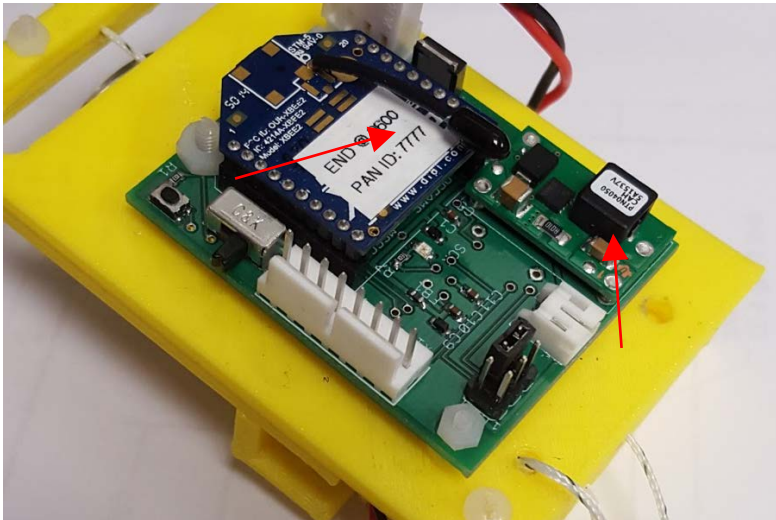
Attach both the **seatbelt** and **leadline** to parachute apex

To parachute



Resetting the Timer

- The cutdown system has a backup timer to initiate cutdown after TIME.
- This timer must be reset before a flight.
- There are two steps in place to prevent the timer from accidentally being reset during during flight: a **jumper peg** and **reset switch**
- For the following steps make sure the battery is plugged in.

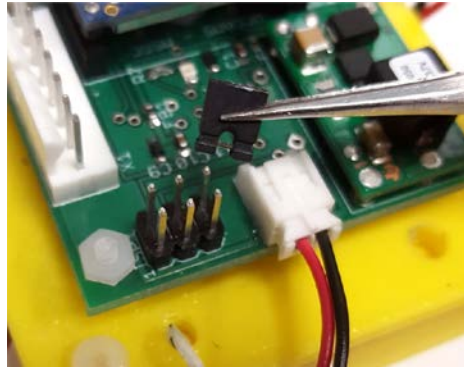
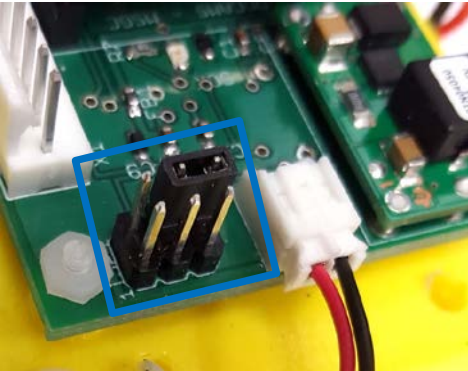


NOTE: The cutdown will **not** reset if the battery is unplugged. Instead the timer will pause and continue where it left off when power is restored.

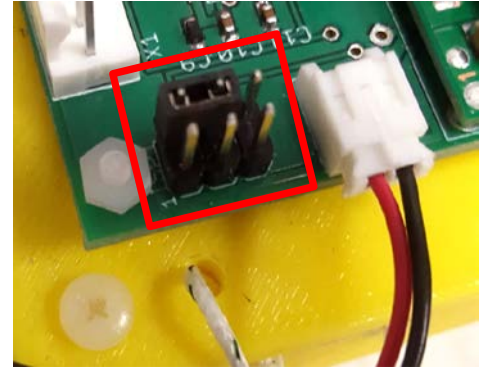
Resetting the Timer

First we must move the jumper to the reset position. The best way to do this without dropping it is by using a pair of tweezers.

Normal Position



Reset Position

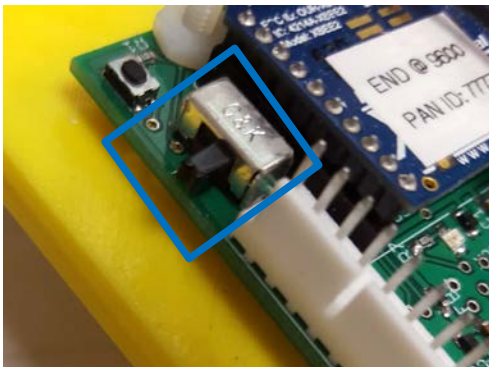


Resetting the Timer

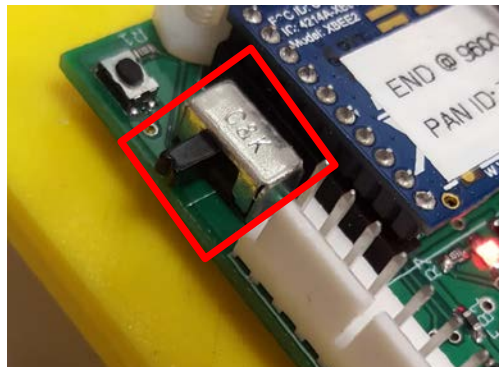
Now flip the switch to reset the timer. The OCCAMS board will beep rapidly. After a few seconds flip the switch off and replace the jumper to its normal position.

After resetting the timer, cutdown is ready for launch. If any other operations regarding cutdown still need to be completed at this point, unplug the battery so the timer does not run out.

Reset Position



Off Position

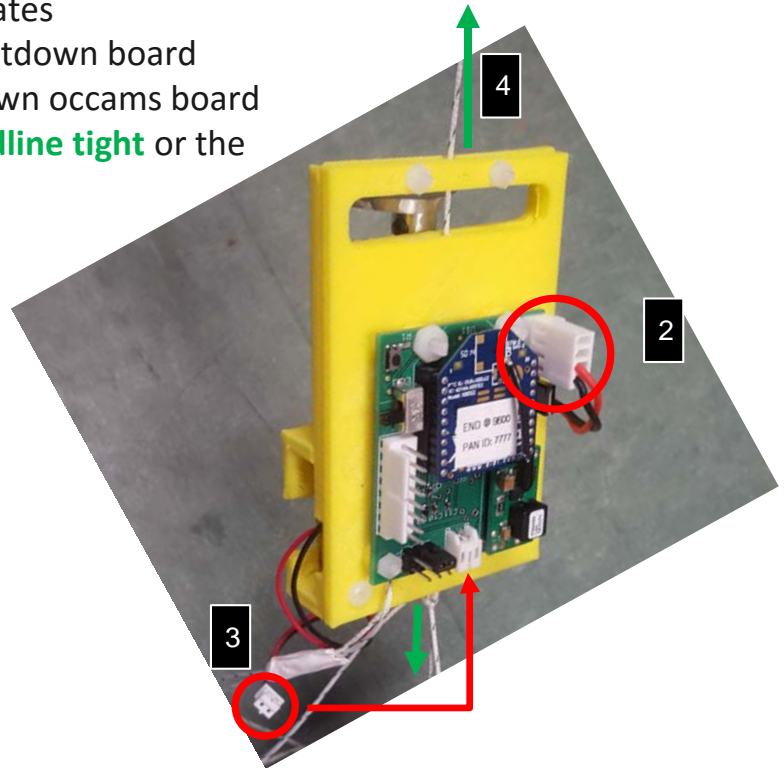


Reset Position

Testing Operations

Testing Procedure

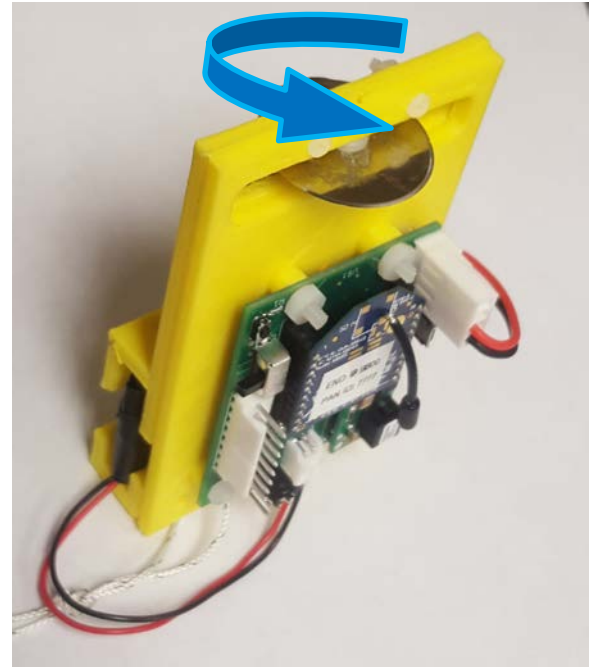
1. Insert the test leadline between cutdown system plates and reattach plates
2. **Plug in the dc motor** to the cutdown board
3. **Plug in battery** into the cutdown occams board
4. **Hold each end of the test leadline tight** or the blade may not cut



Testing Operations

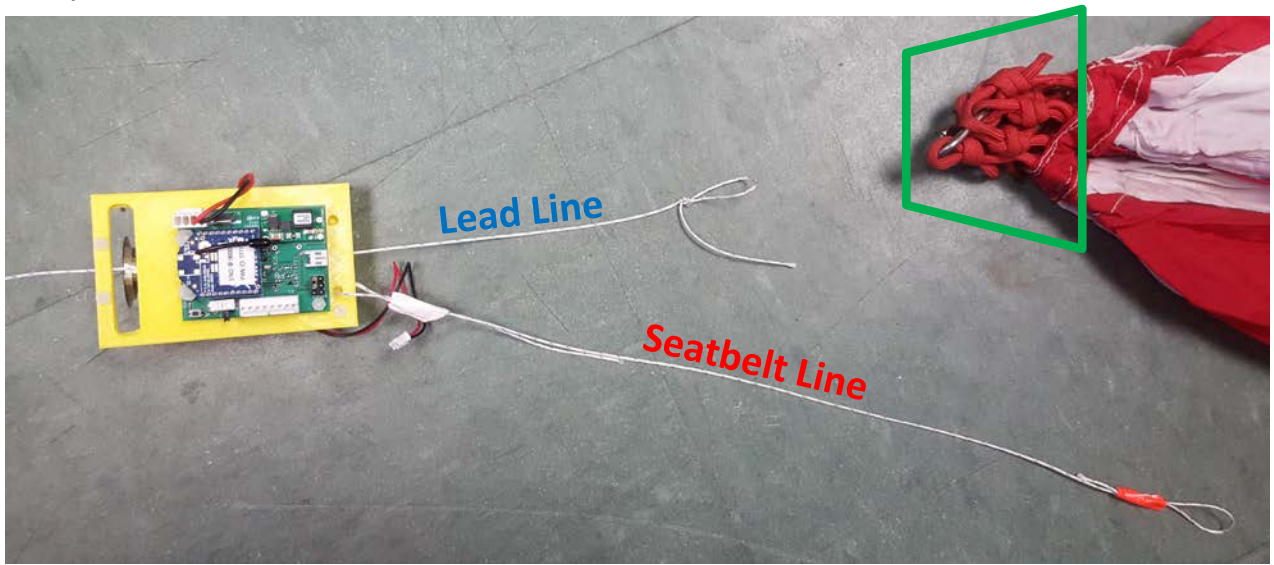
Testing Procedure

- Send the **shutdown command** via email through the iridium modem
- When the shutdown receives the command the motor will spin, cutting the test line.
- Send the **reset command** via email through the iridium modem. If reset isn't sent the shutdown command will stay active.
- Repeat above procedure as many times as necessary to insure shutdown functionality
- Make sure the reset command is sent, and then reset the shutdown timer.
- Unplug the battery



Flight Day Operations

- Make sure the cutdown has its **seatbelt line** attached
- Insert the **lead line** between the cutdown plates, making sure the blade does not interfere with the line and that the cutdown may slide freely up and down the line.
- Reattach plates and heck that all hardware is properly tightened
- Attach the lead line and seatbelt to the **parachute apex**
- Plug in the 850 A/hr battery and place it in its slot. If the motor spins at this point that means the reset command was not sent



Flight Day Operations

Just before launch

- Reset the cutdown timer if this was not done previously.
- Apply foam casing and velcro strap



During Flight

- When it is time for the flight to be terminated, send the cutdown command via email. If this command for some reason does not work, the cutdown will automatically fire when the timer has run out.
- Retrieve cutdown with payload
- Optional: do a happy dance

