Buoyancy Engine Assembly
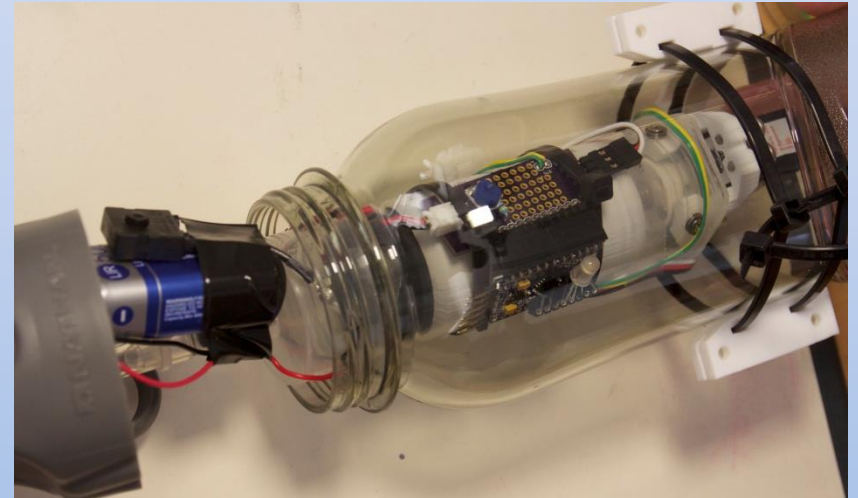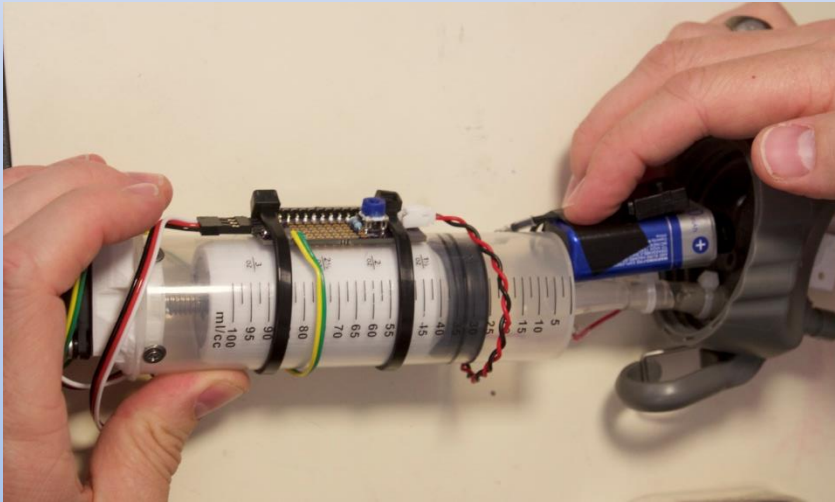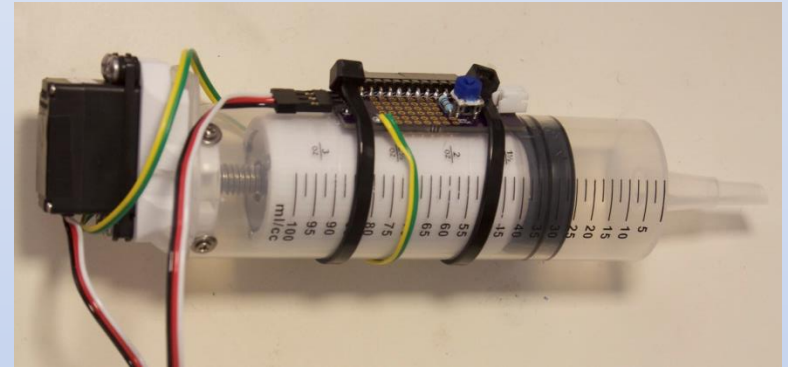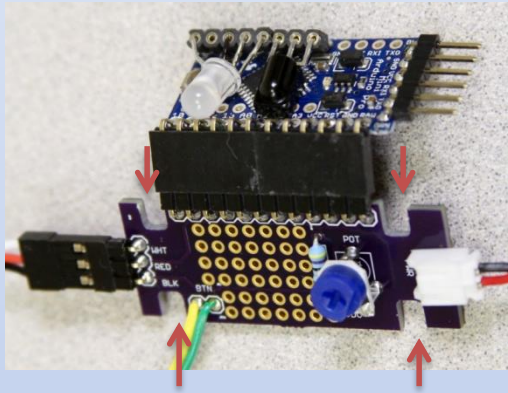
The goal is to assemble a **B**uoyancy Engine - **P**ower Supply - **C**ap (**BPC**) Unit in the following THREE STEPS:

1. Cable tie the buoyancy engine controller to syringe.
2. Connect the cap to buoyancy engine.
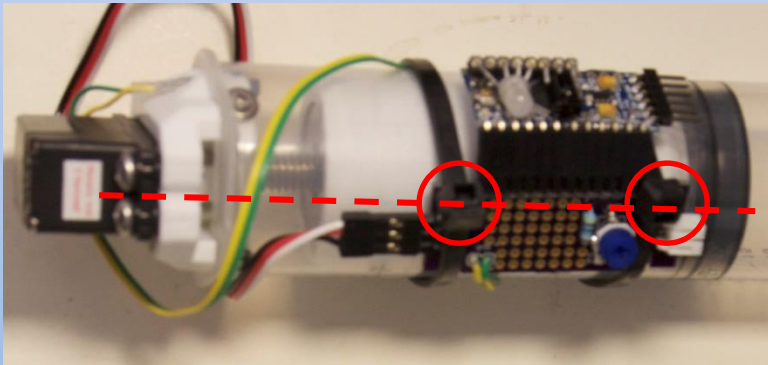3. Attach the power supply to buoyancy engine.

STEP ONE - Cable tie Controller to Syringe
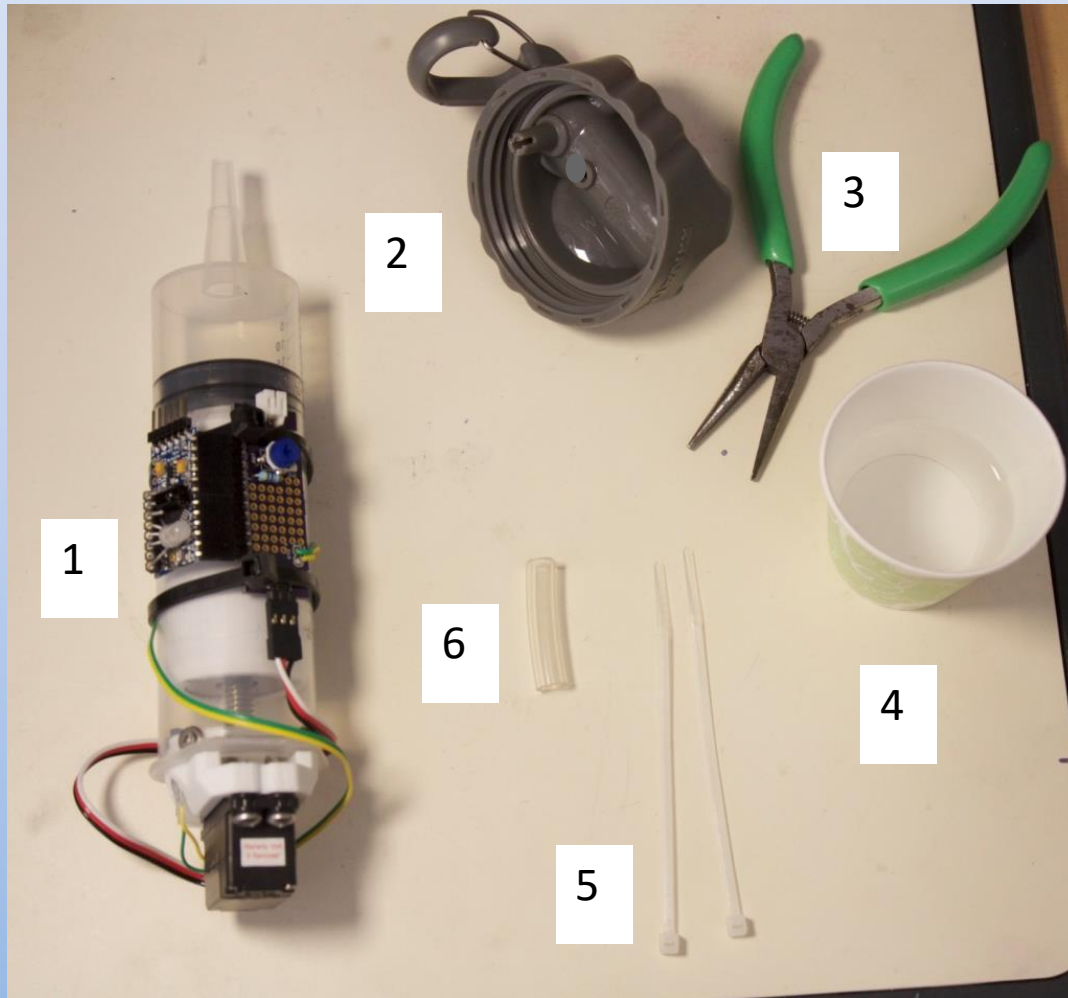
Cable Tie Cut-Outs →

Use large cable ties to secure controller to syringe. Ties will fit in the cut-outs on the circuit board. Align the controller with the high side of the servo as shown above.

Note the alignment of the controller with the servo

Use pliers to tighten cable ties snuggly. Cable tie heads (circled) should be positioned as shown. The tie furthest from the servo fits under the Arduino.
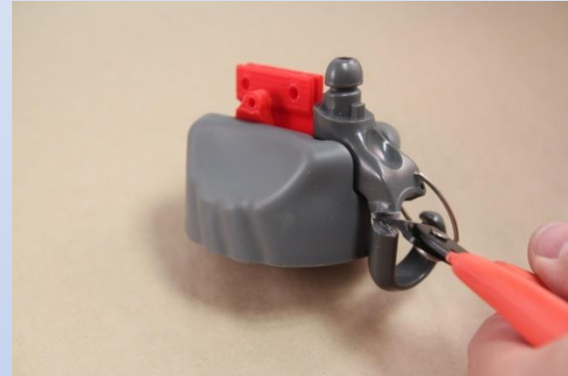
STEP TWO – Connect Cap to BE

MATERIALS

1. Buoyancy Engine (BE)
2. Cap & Rudder Mount
3. Needle Nose Pliers
4. Cup of Water
5. Small Cable Ties
6. Plastic Tubing

Remove the Plastic J-Hook
*Safety goggles are a must for this operation.

Use flush cutters to cut plastic J-hook at its base and remove.

It might take more than one "bite".
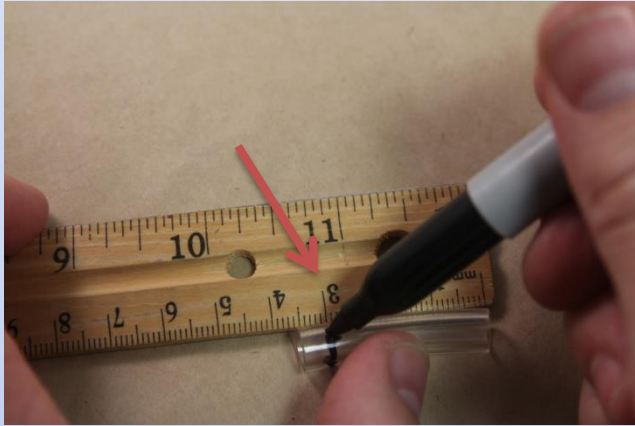
Remove the Wire Clip

Use needle-nose pliers to dislodge and detach the wire clip .

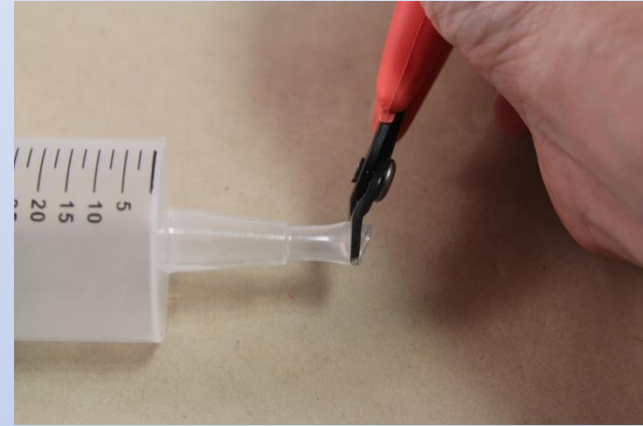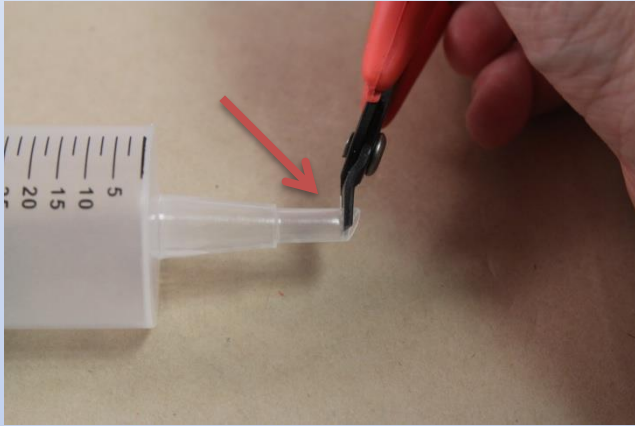Discard wire clip and J-hook.

Trim Plastic Tubing

Measure and mark length of tubing at **3 cm**. Trim tubing to 3 cm.
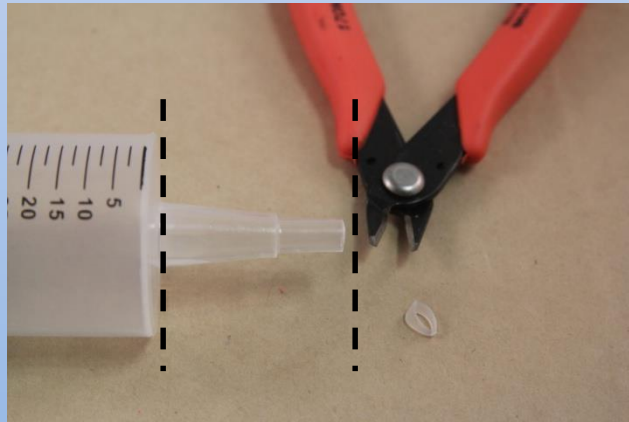
Re-measure to confirm length.

Trim the Tip of the Buoyancy Engine Syringe

Trim off just the slanted tip of the syringe nozzle
so that it's parallel to the end of the syringe barrel.

Connect Plastic Tubing to Cap

 → →

Wet the tubing. Slide it on to the cap nozzle until it hits the base flange.

Proper Tubing Connection

Prepare Small Cable Tie

Secure Tubing with Small Cable Tie

Position the cable tie with the head away from the cap threads.
Tighten the cable with needle nose pliers by grasping the cable close to the head and twisting.
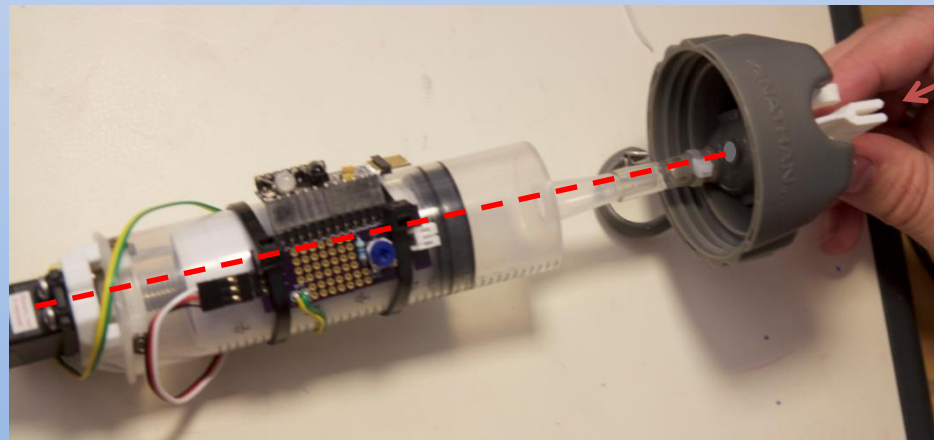

Clip the cable tie with flush cutters.

Ensure Correct Cap Alignment

Wet the other end of the tubing. Align the cap and rudder mount with the controller and high side of the servo. (See photo below.)

Rudder Mount

Servo – Controller – Cap/Rudder Mount should all line up as shown.

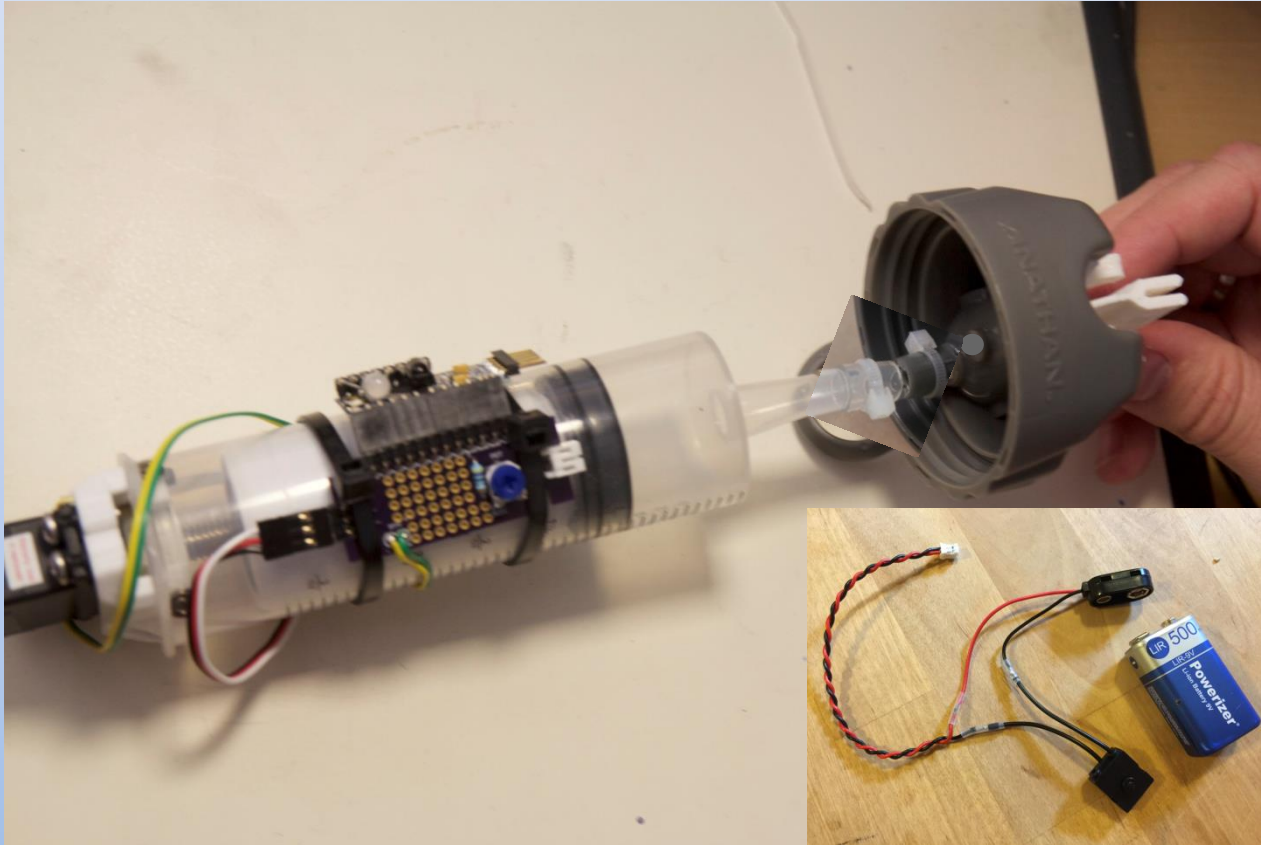# Slide Tubing onto Syringe and Secure

Push the cap with tubing onto syringe as far as possible. The ends of the cap and syringe nozzles should almost be touching.
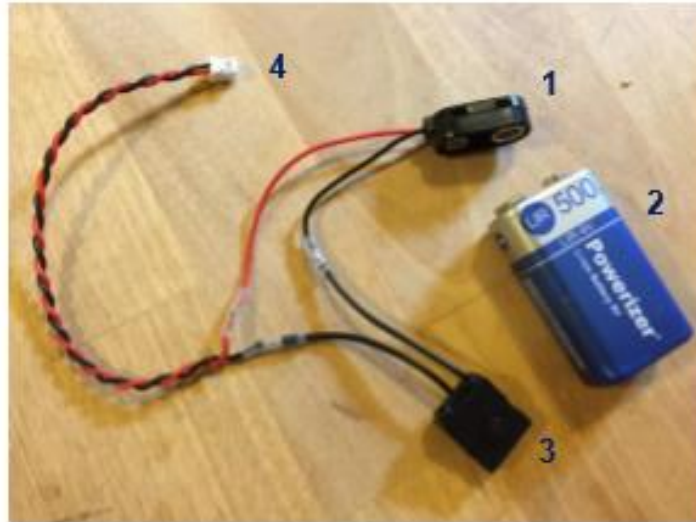

Attach a small cable tie with the head away from the cap threads as before. Tighten cable with pliers and trim excess.

STEP THREE – Attach Power Supply to BE

Buoyancy Engine(BE)/Cap and Power Supply Circuit with 9v Battery

Power Supply

The power supply provides 8.4 volts of direct current to the buoyancy engine controller where the voltage is reduced to approximately 7 volts by a resistor. The power supply includes a snap connector, a 9 volt rechargeable Lithium battery, and a pushbutton switch which is the ON/OFF control for the circuit.

The power supply also includes a plug that connects to the buoyancy engine controller by sliding into the power supply jack on controller's circuit board.
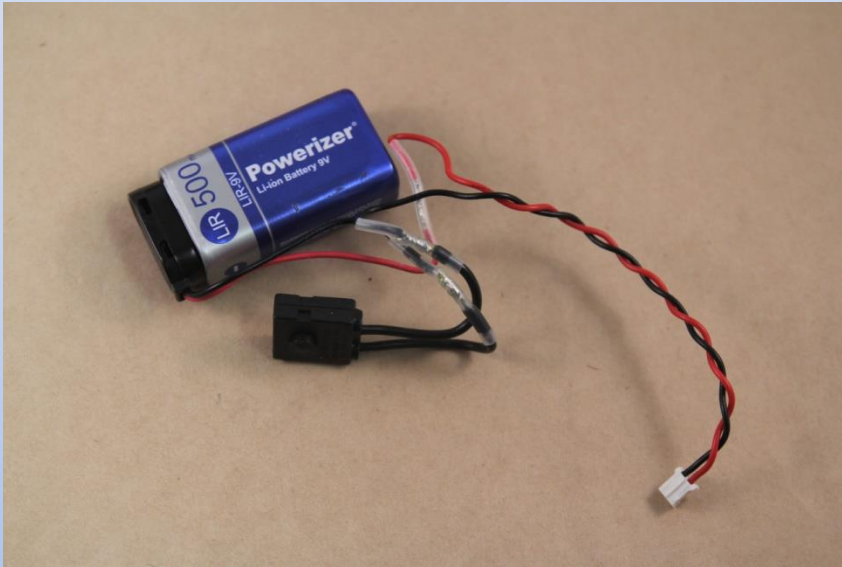
The main components of the power supply are:

1. BATTERY SNAP CONNECTOR – Connects battery to power supply circuit.
2. LITHIUM BATTERY – Provides 8.4 volts of rechargeable power.
3. PUSHBUTTON SWITCH – The ON/OFF control for the circuit.
4. POWER SUPPLY PLUG – Provides power to the buoyancy engine controller by plugging into the power supply jack.
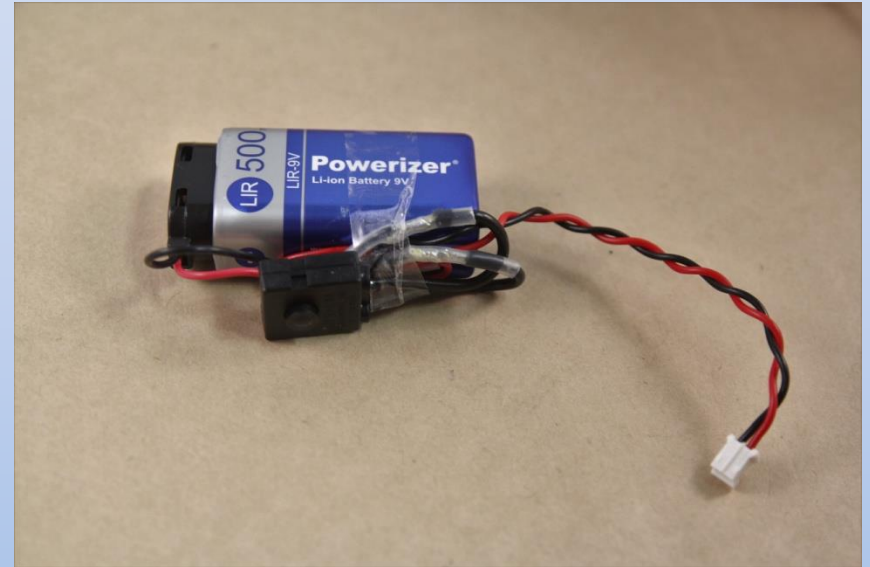
Buoyancy Engine Controller

Power Supply Jack

Prepare Battery

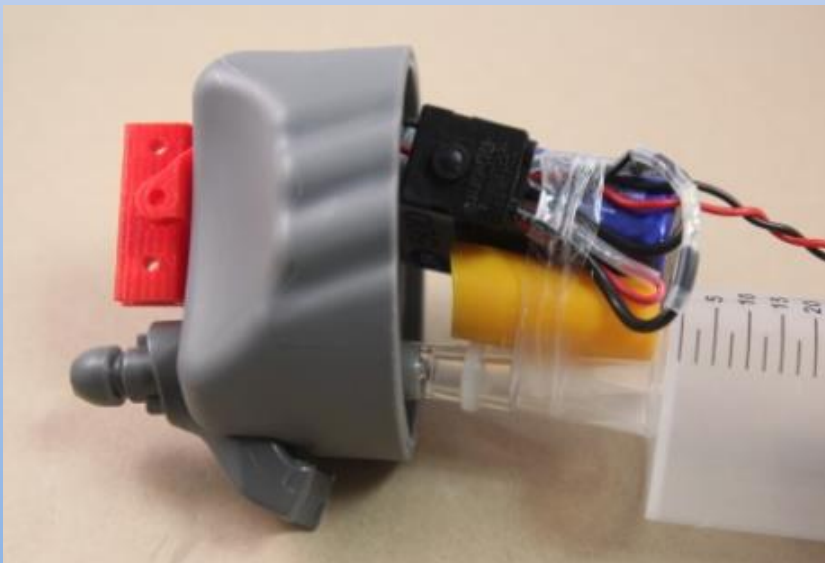Attach the 9v snap-connector and power supply circuit to the battery.

Fold excess wires and use transparent or electrical tape to attach the pushbutton switch to the side of battery.
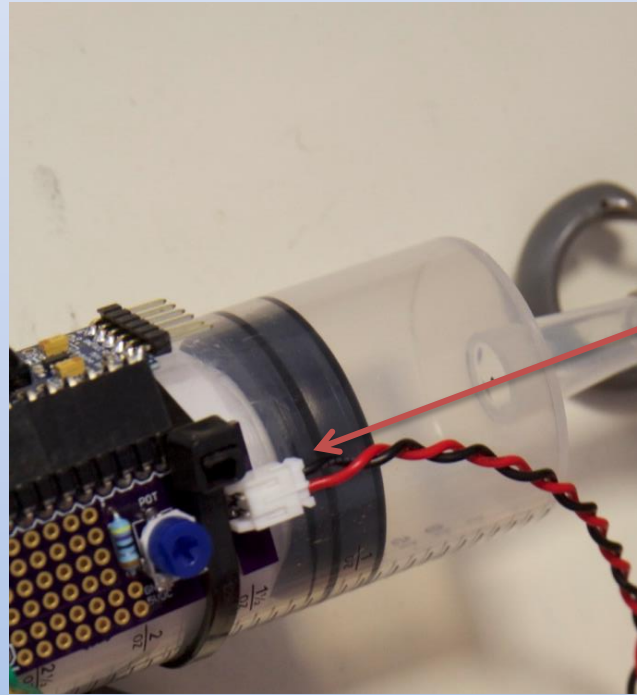
Battery Placement

The battery needs to sit all the way against the top of your cap. You may need to tilt the battery to sit above the vent hole.

One trick to do this is to use the yellow rubber mouthpiece as a spacer. Tape the mouthpiece and battery to the syringe as shown.
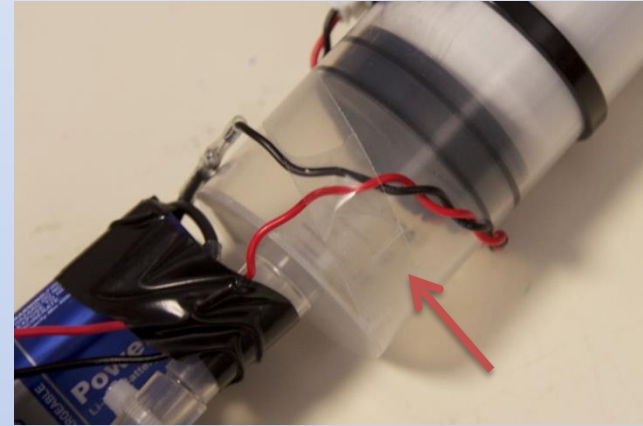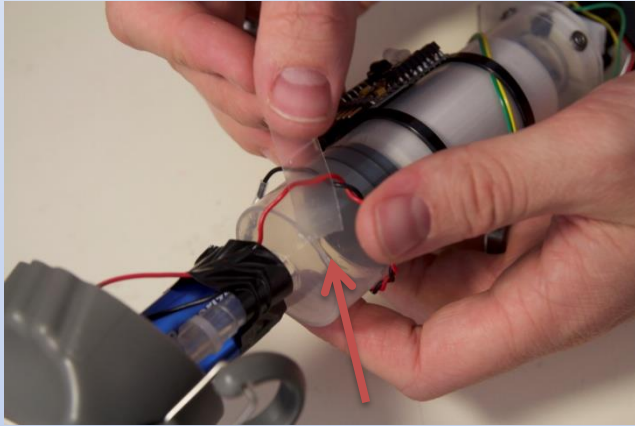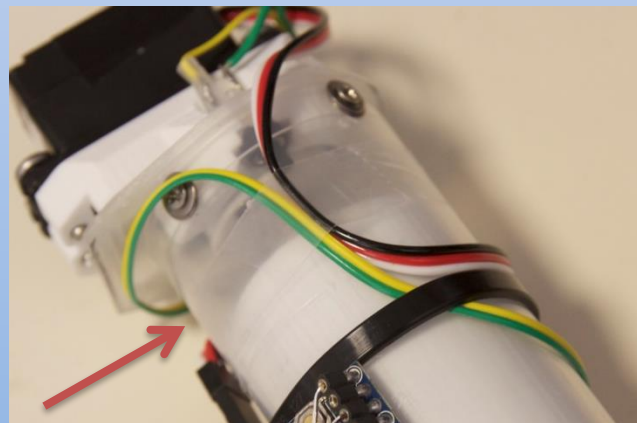
Plug Power Supply into Circuit Board

Make sure the power supply is plugged into the circuit board.

Plug power supply into the circuit board as shown above.
If the Arduino lights up, press the power supply's
pushbutton switch to turn it off.
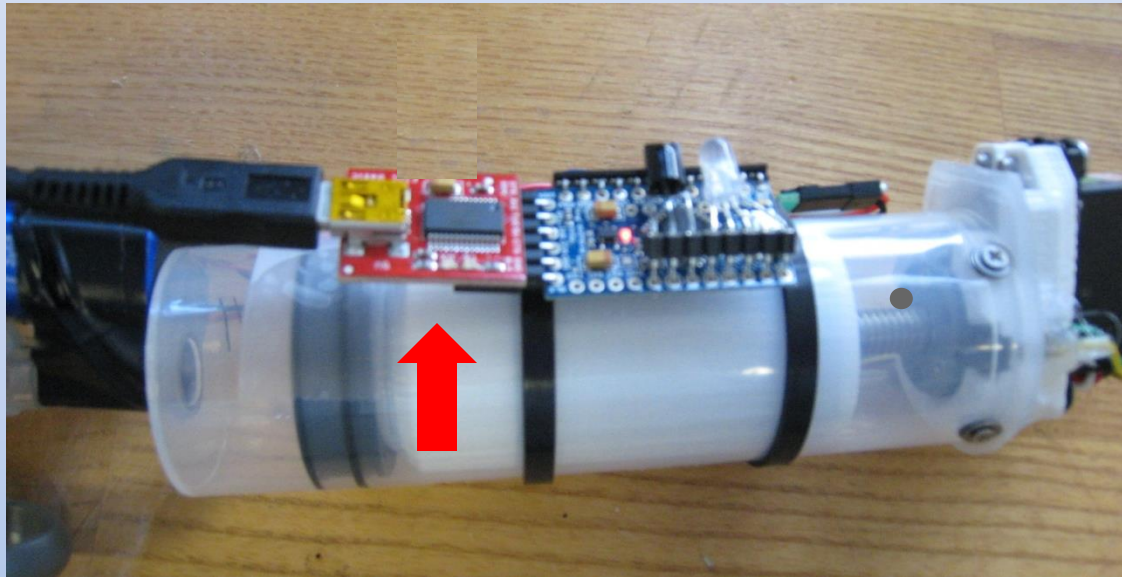
Secure Loose Wires

Use clear tape to secure any loose wires to the syringe. Clear tape helps to allow you to see the position of the plunger during operation.

Congratulations! The complete Buoyancy Engine (BE) Assembly is ready to test.
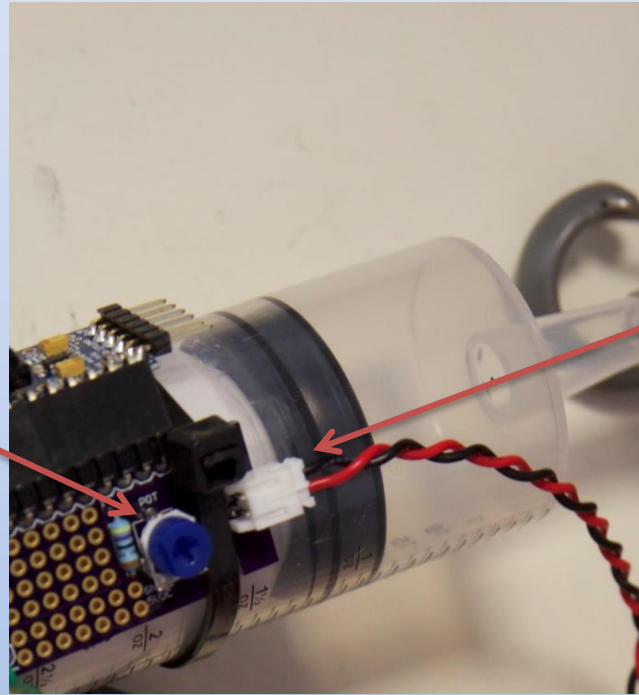
Download the Firmware

Use the FTDI USB serial adaptor found with the Arduino Pro Mini parts to connect your computer to the Arduino. Then follow the instructions (www.seaglide.org/firmware) to load the SeaGlide program onto your Arduino Pro Mini.

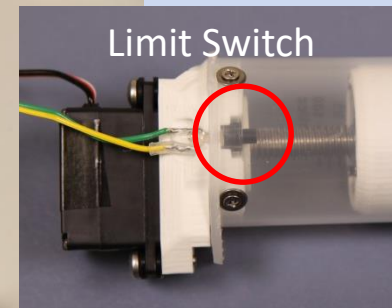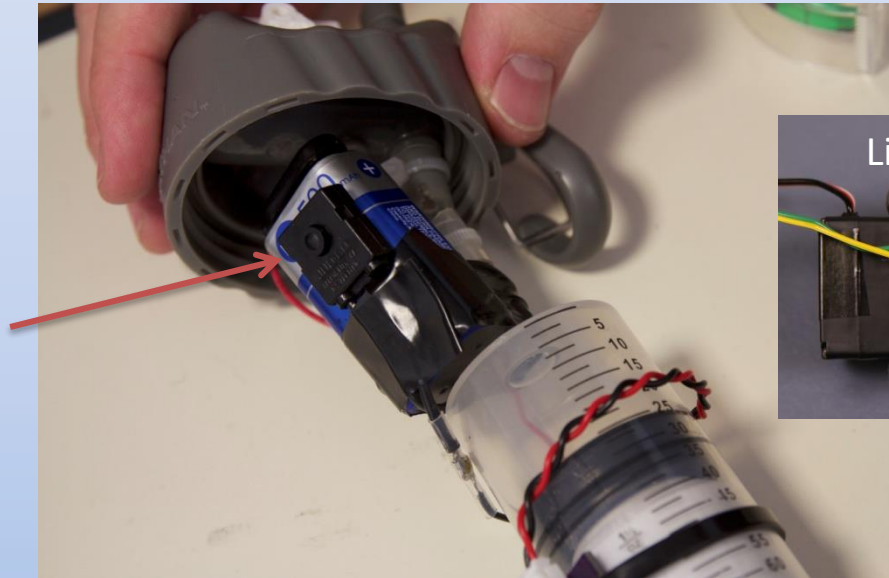# Adjust the Potentiometer

Potentiometer

Make sure the power supply is plugged into the circuit board.

For testing, turn the potentiometer (POT) counterclockwise until it stops. This will shorten the time between water intake (dive) and expel (rise) cycles. The POT can be turned clockwise to increase the pause time between cycles which translate in to deeper glider dives.

Test Buoyancy Engine (BE)

Pushbutton
Power Switch

Limit Switch

READ

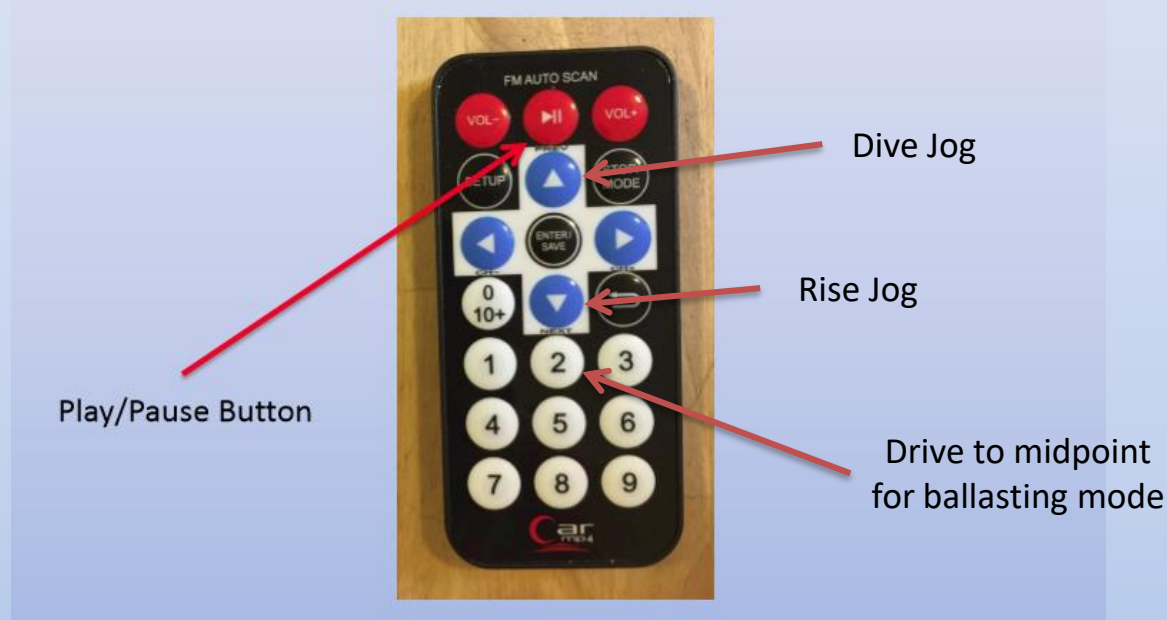Press the power switch, but **be prepared to stop the motor** if it struggles and/or stalls. The BE should immediately start in the water-intake-dive-cycle with the plunger being drawn towards the servo. It should hit the limit switch, stop, and then change direction (expel-water-phase). As it nears the end of the syringe, the plunger should stop again and then change direction to start a new cycle.

Trouble Shooting & Adjustments

❑ Make sure the 9v battery is fully charged.

❑ Check wiring and solder joints.

❑ The pushbutton-limit-switch must protrude far enough out that the plunger hits it.

❑ The distance the plunger travels during the expel or rise cycle can be adjusted in programming. See "riseDriveTime" in SeaGlideV1_0.

❑ With a fully charged battery, riseDriveTime can be adjusted in one second increments or smaller such that the plunger nearly touches the end of the syringe.

Test BE with IR Remote

Dive Jog

Rise Jog

Play/Pause Button

Drive to midpoint for ballasting mode

- Ensure that clear plastic battery guard is removed from the remote.
- Start the Buoyancy Engine (BE).
- Push the Play/Pause button to start and stop the BE.

When Paused:

- Push the up or down arrow to jog the plunger to one side or the other.
- Push #2 to center the plunger for ballasting. See "Ballast and Flight Principles" Instructions