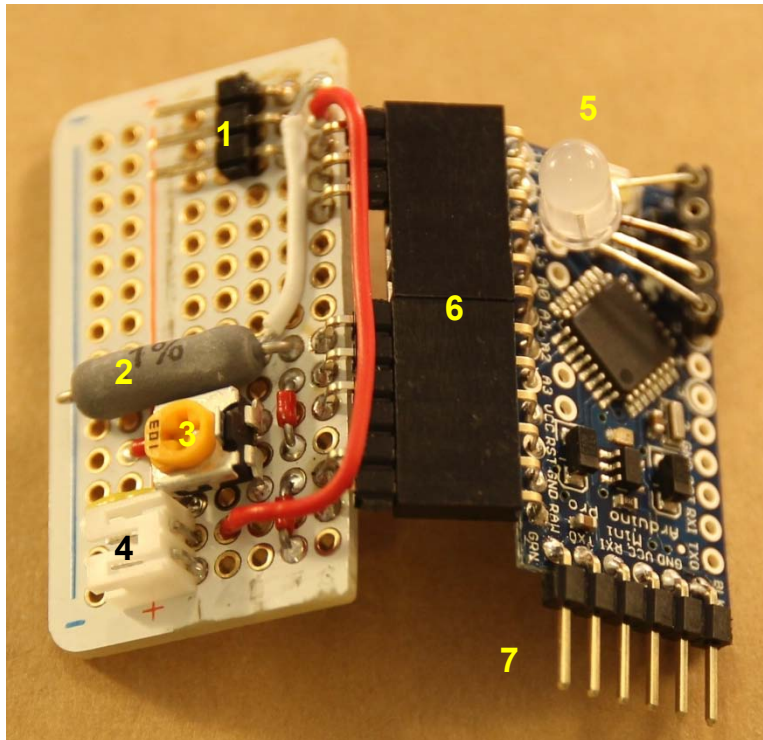


# Buoyancy Engine Controller



The Buoyancy Engine Controller manages the servo motor on the buoyancy engine and directs it when to draw in water and when to expel it. It consists of two main parts: The circuit board on the left and the Arduino Pro Mini microcontroller on the right. These are connected by sets of header pins in the middle.

The main components of the circuit board are:

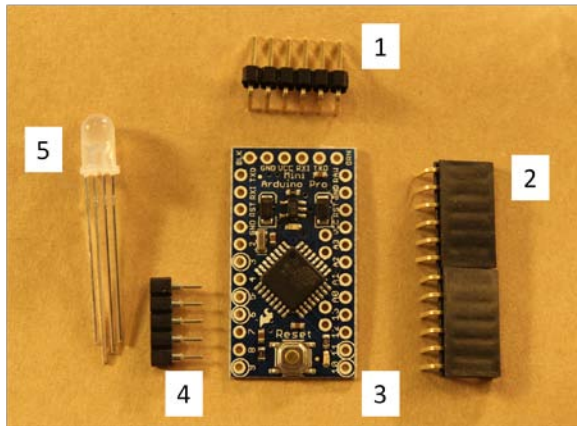
1. THREE-PIN HEADER - Connects to the buoyancy engine servo motor.
2. RESISTOR - Enables microcontroller to detect small changes in voltage and thus stop and reverse the plunger in the buoyancy engine when it runs up against a stop.
3. POTENTIOMETER - Controls the amount of water buoyancy engine draws in.
4. POWER SUPPLY JACK - Plug-in location for the battery power supply.

The main parts of the Arduino Pro Mini microcontroller are:

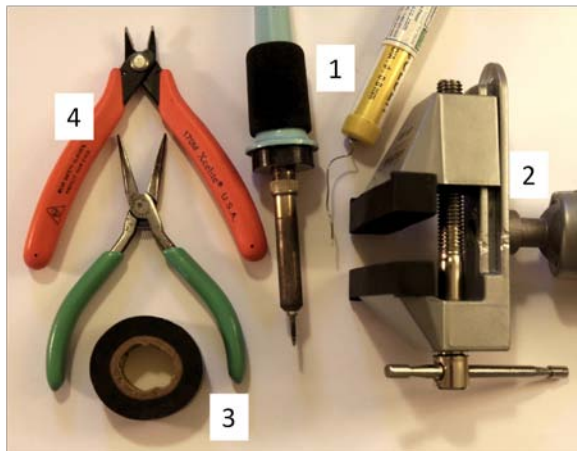
5. RGB LED – Indicates glider's descent or ascent by color changes.
6. HEADER PINS along length - Connect the Pro Mini to the circuit board.
7. HEADER PINS along width - Enable connection to FTDI breakout board for programming.

To create the Buoyancy Engine Controller, follow the Circuit Board Build and Arduino Pro Mini Build instructions then join these two components together as illustrated in the directions.

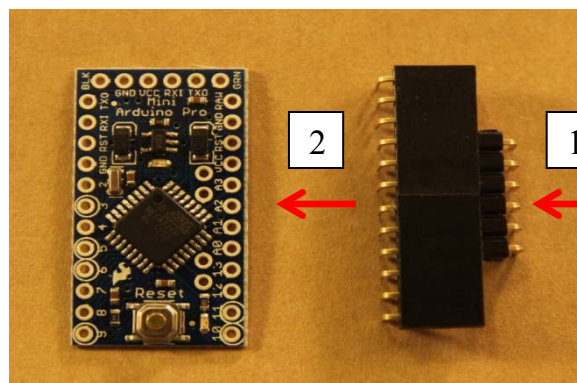
# Arduino Pro Mini Build



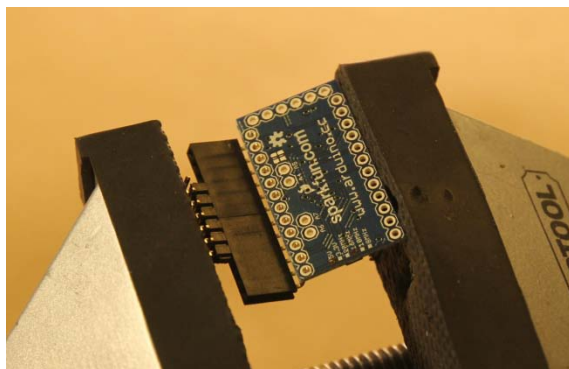
1. The Arduino build kit includes one set of male right angle header pins (1), two sets of female right angle header pins (2), an Arduino Pro Mini board (3), a set of socket pins (4), and an RGB (tri-color) LED (5).



2. Tools and supplies needed are soldering iron with solder (1), small vice (2), electrical tape (3), and wire clippers and needle nose pliers.



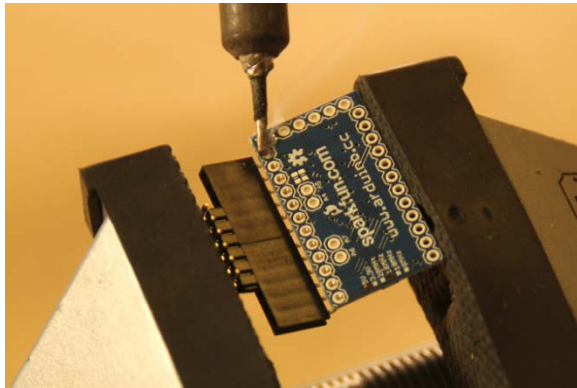
3. Use male header pins to connect and stabilize the two sets of female header pins (1). Fit female header pins into pin holes on Pro Mini with a one-to-one alignment as shown (2).



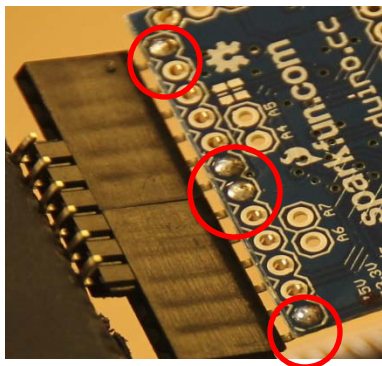
4. Flip Pro Mini board over while maintaining the connections between the pins and board. Secure in vise.



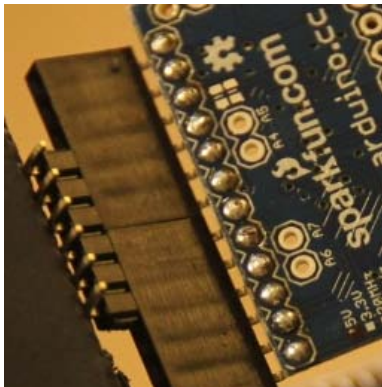
5. Female header pins will appear at an angle in relationship to the plane of the Pro Mini. (This angle here helps the Pro Mini conform to the shape of the buoyancy engine and fit in the confined space of the glider bottle more easily.)



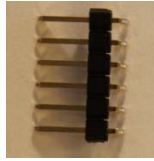
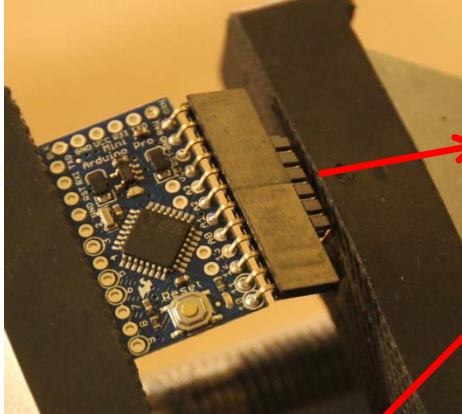
6. Solder connections...



7. First solder the ends and two middle pins to secure the two female header pin sets on both sides...

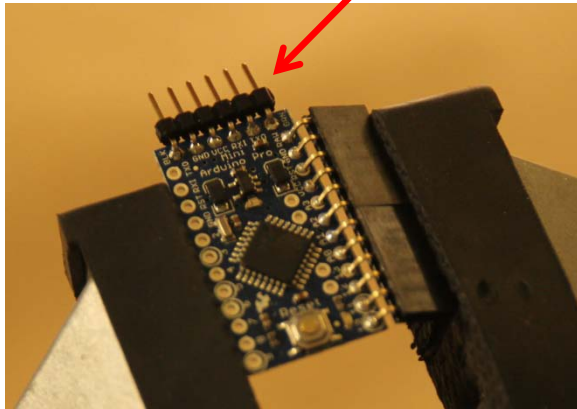


8. Then finish soldering the other joints.

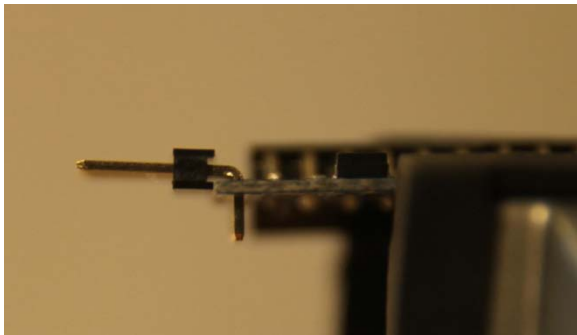


9. Flip over Pro Mini board with header pins and check solder joints.

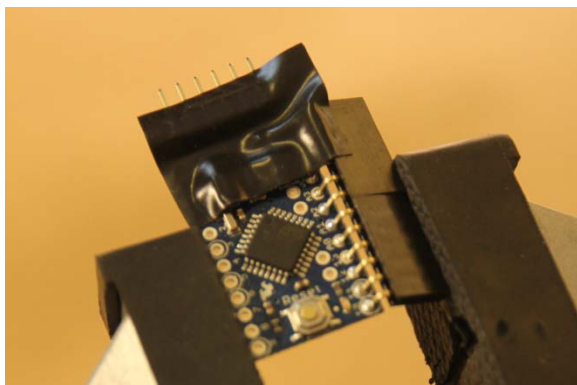
Remove male header pins that were used to stabilize the now soldered female header pins.



10. These will be soldered to the end of the Pro Mini board adjacent to the female header pins.

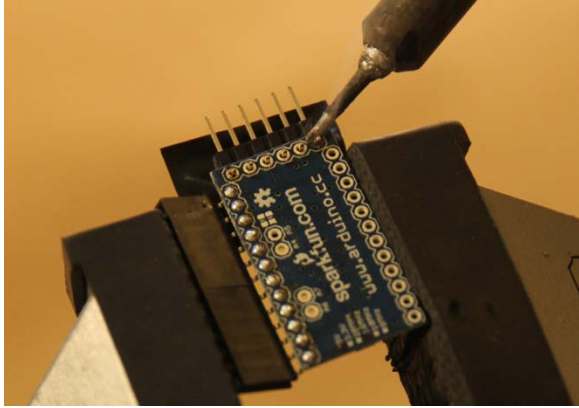


11. The longer pins should not angled, but remain in a plane parallel to the Pro Mini Board as viewed from the side.

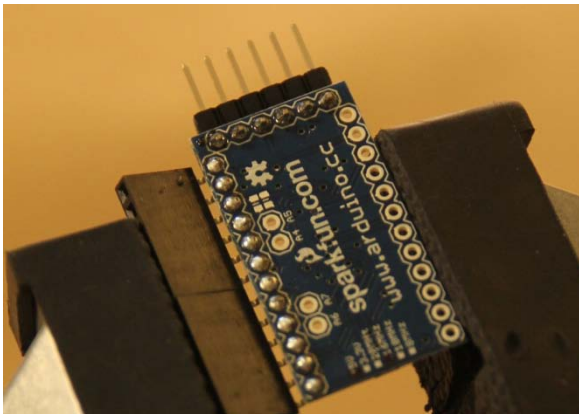


12. Tape male header pins in the position described above.

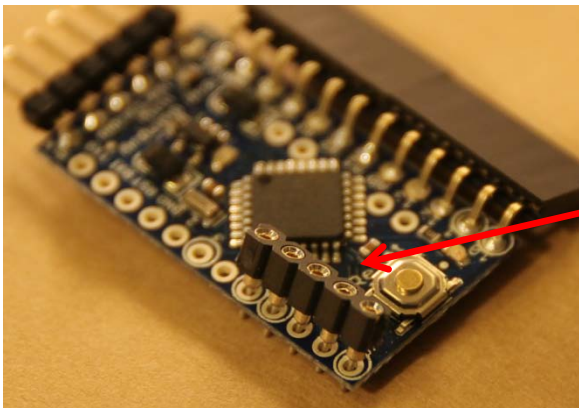




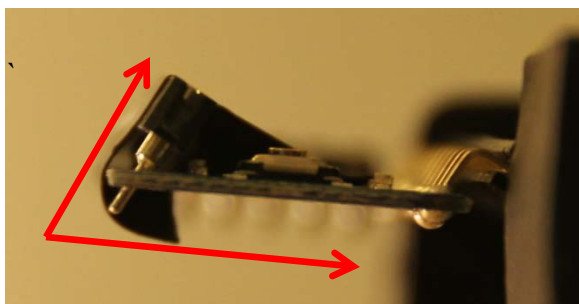
13. Flip board over and solder pins in place.



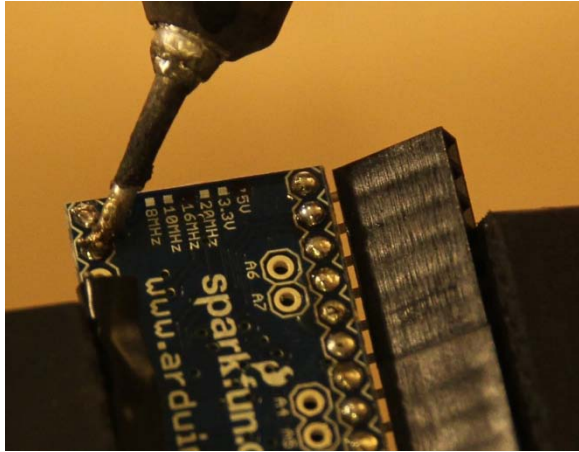
14. Check all solder joints.



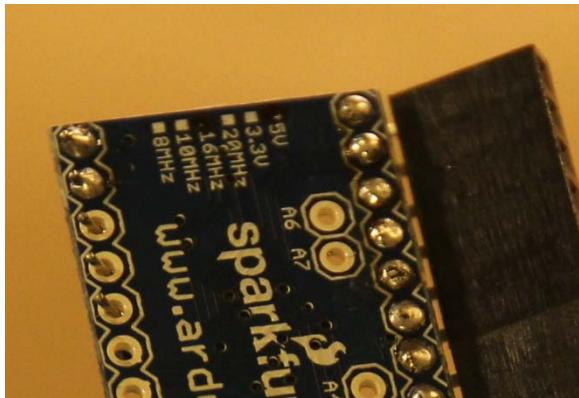
15. Remove board from vise and position socket pin set on Pro Mini as shown.



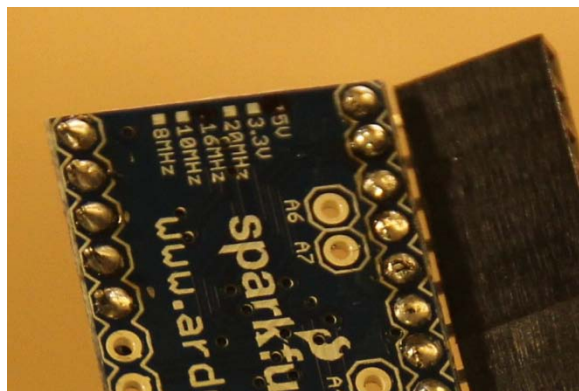
16. Tape socket pins at an inward (acute) angle in relationship to the Pro Mini board to secure for soldering.



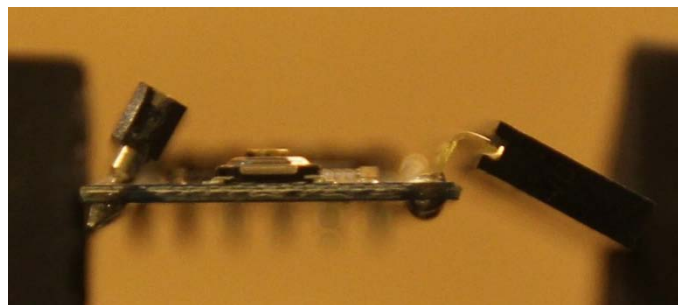
17. Place board in vise and solder two end socket pin joints.



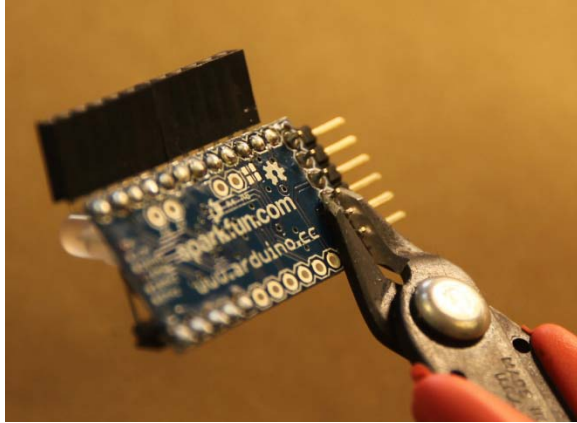
18. Remove tape and solder remain three pins.



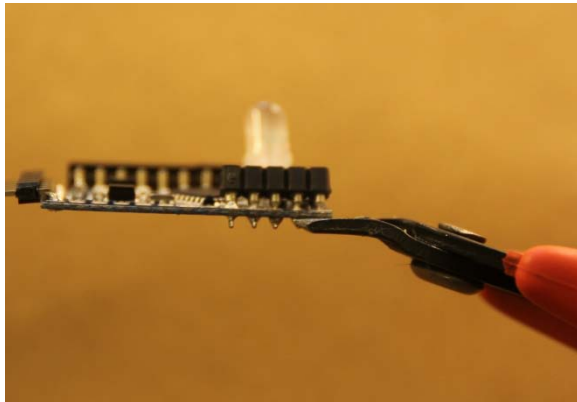
19. Check all solder joints.



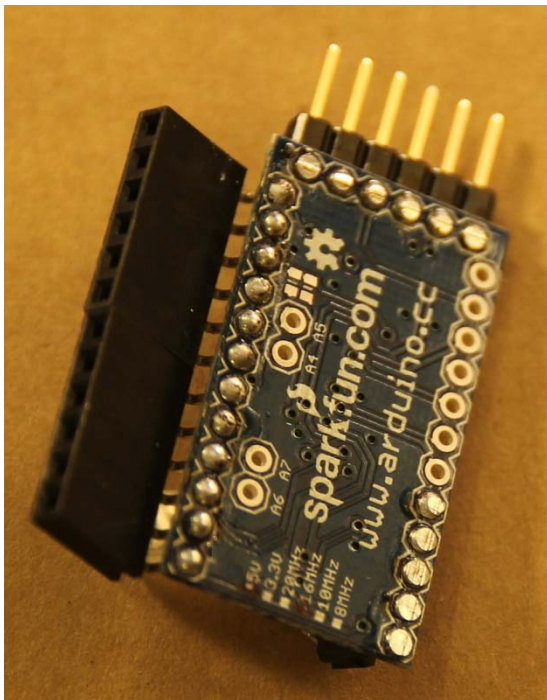
Correct Angles of Socket Pins and Female Header Pins



20. Remove any excess pin material from male header pin solder joints.



21. Remove any excess pin material from socket pin joints.



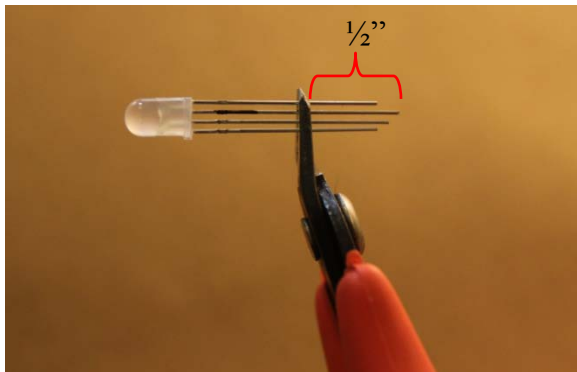
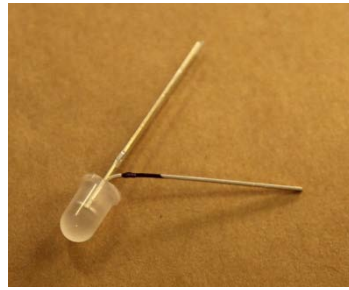
A Trimmed Up and Well Soldered Board



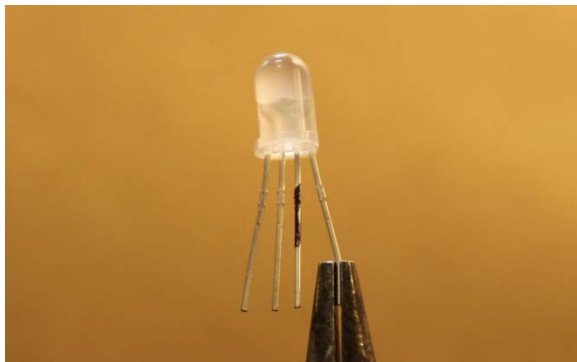
22. Locate RGB (tri-color) LED and identify the longest pin.



23. Bend this pin away from the others and mark it with a black sharpie.

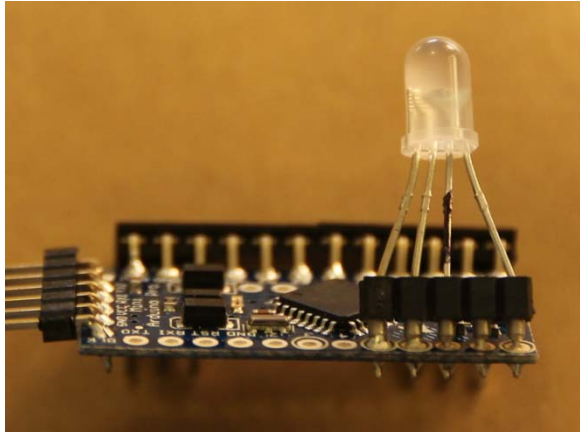


24. Shorten pins approximately 1/2" as measured from the longest pin.

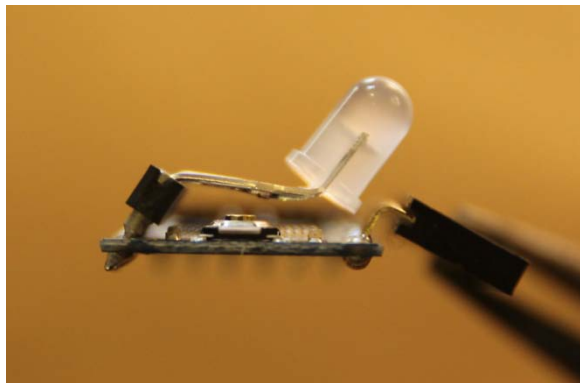


25. Separate pins and use needle nose pliers to bend the outer most wire (adjacent to marked pin) as shown.

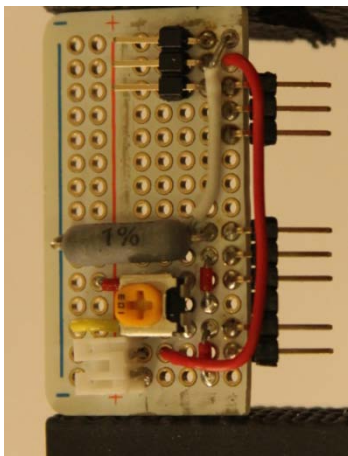




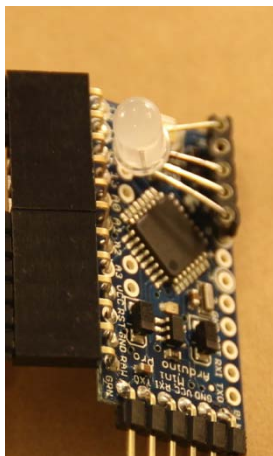
26. Fit RGB LED into sockets of socket pins as shown.



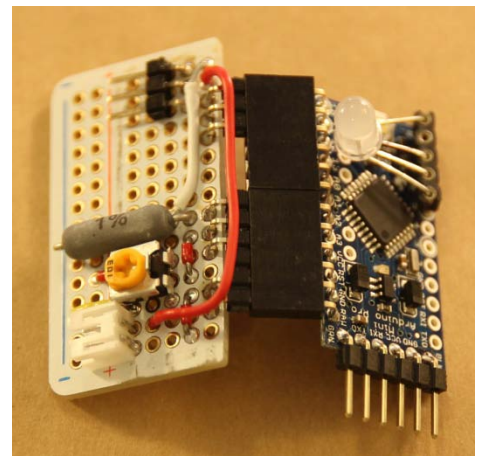
27. Bend RGB LED so its pins are nearly parallel to Pro Mini board.



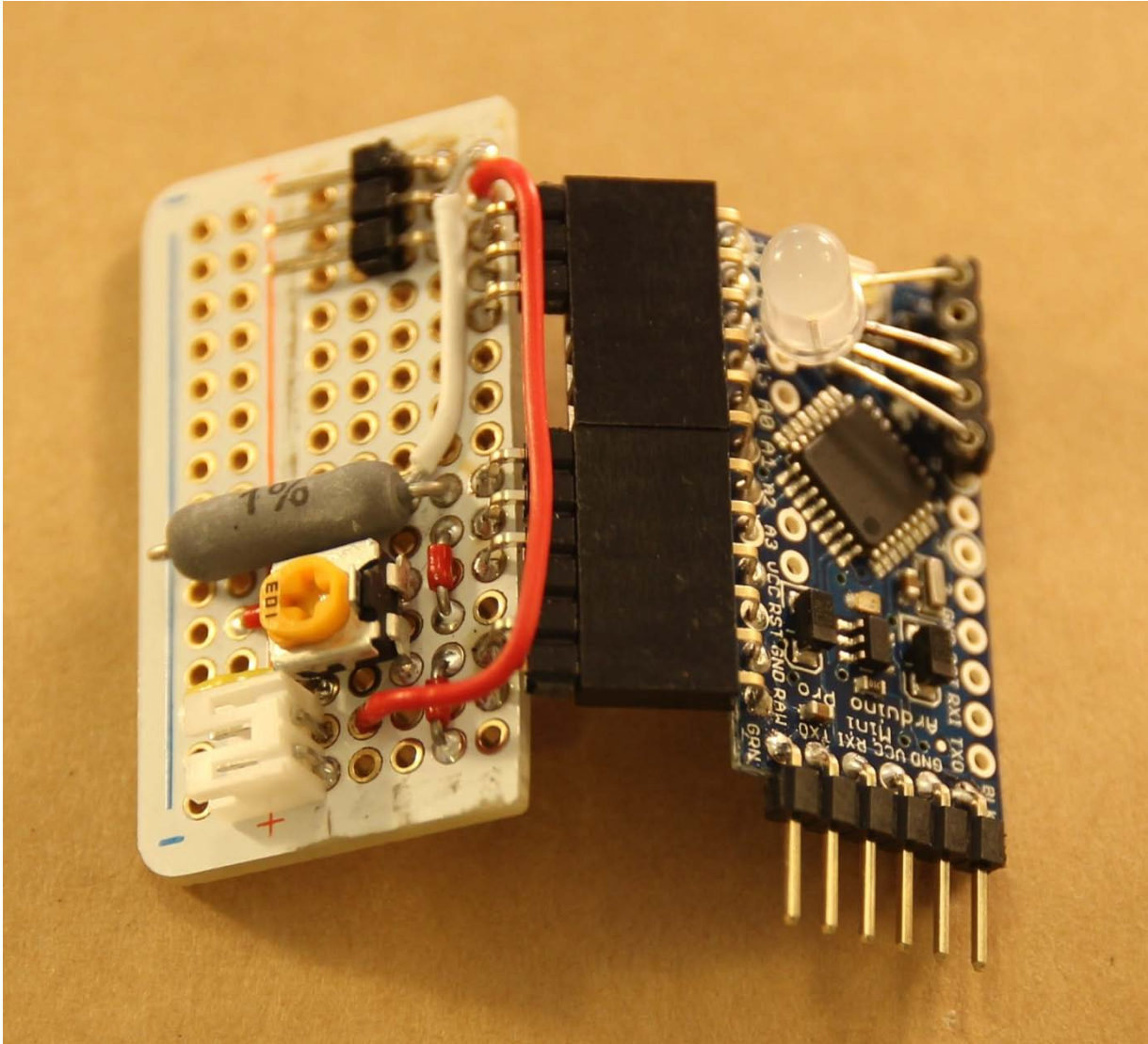
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28. Connect circuit board to female header on pro mini board to complete the buoyancy engine controller.



Buoyancy Engine Controller