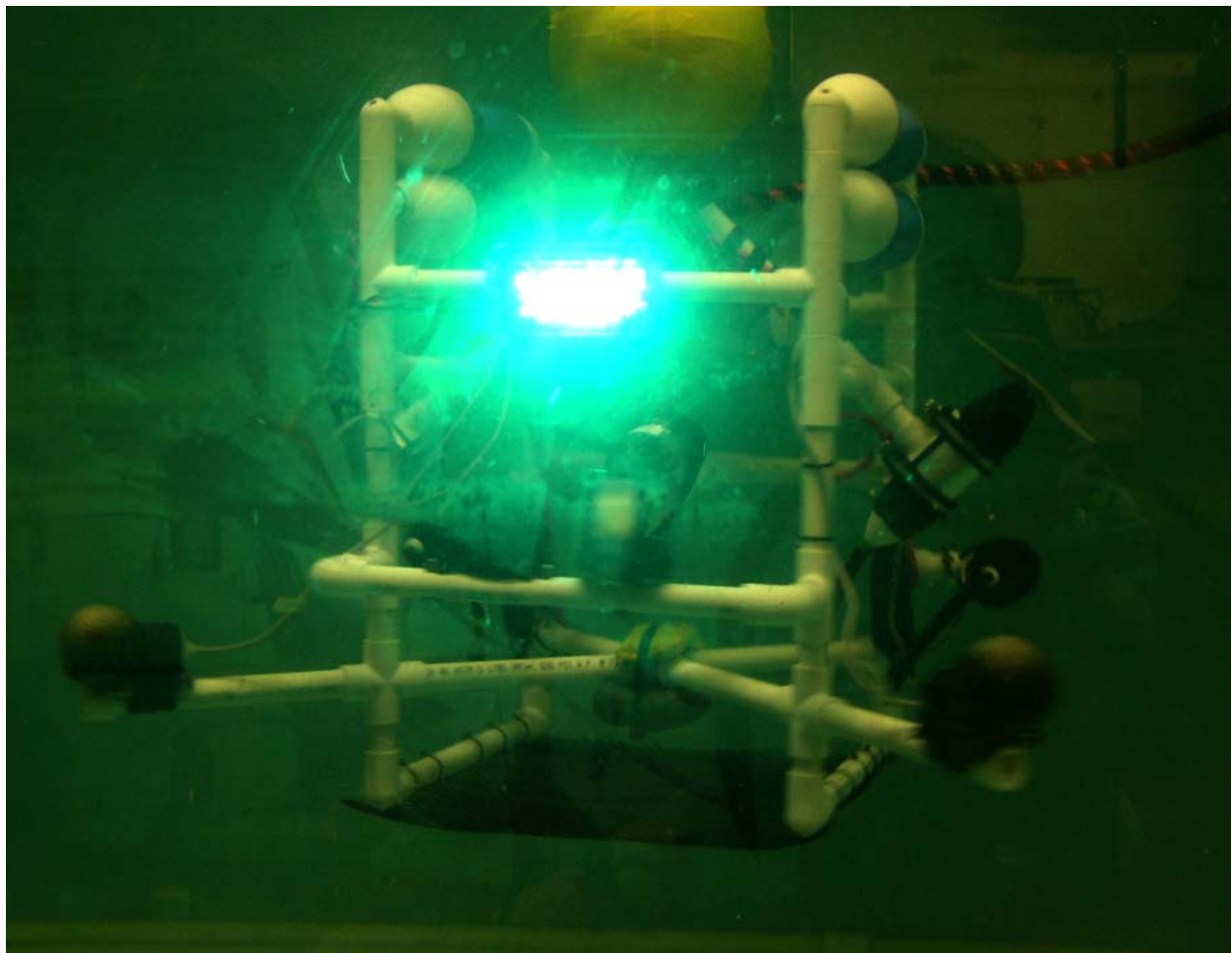




Advanced Sea Perch Lighting Bank *Construction Manual*



Lighting Bank Construction

A bank of lights on your ROV can be very useful for operating in dark conditions, as well as for illuminating any gauges that you may have mounted on your ROV. A simple bank of waterproof lights can be constructed using some Light Emitting Diodes (LEDs), resistors, wire, a proto-board, epoxy, and some solder. Below we will describe how we built a simple bank of LED lights for the Advanced Sea Perch, which ran off a 24 volt supply. The concepts presented can be easily modified for your own ROV.

Step 1: Assemble LED bank

On a piece of proto-board (blank circuit board about 6 inches long by 3 inches wide), we mounted forty two LEDs, and connected them into six rows of 7 LEDs. The LEDs we used were Nichia type NSPE590S, Bluish-Green, focused beam LEDs. These run at 3.6v, 0.06A. The blue-green color is most efficient since it is absorbed least by water. The LEDs in each of the rows were wired in parallel, and the rows were then connected in series, as shown in the wiring diagram. This brings the lighting bank's required voltage close to the 24v supply voltage. Remember that LEDs have a positive and a negative terminal, and will not work if they are reversed.

Step 2: Add power reduction resistors

Space should be left on the proto-board for a set of resistors to protect the LEDs from being over-powered. For our 24 volt system, we wanted about 10 Ohms of resistance, to bring the voltage down to that required by the LED banks and to protect the LEDs from excessive current. A single 10 Ohm resistor, while providing the proper voltage drop, would not absorb enough power. Therefore we used seven 70 Ohm resistors in parallel to create a more robust 10 Ohm resistor. This was wired onto the proto-board on the positive side of the LEDs.

Step 3: Add a power cord and controls

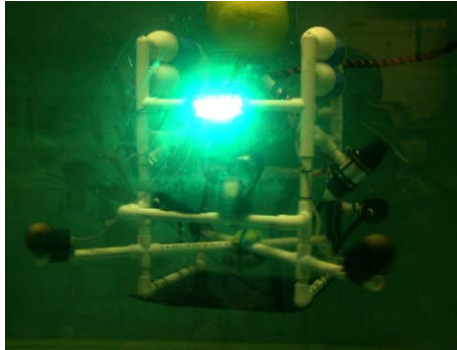
We connected an extra pair of wires in our tether to the bank of LEDs, as their power source. These wires went to a control box at the other end (top side) of the tether cable, where we had a three way (SPDT) switch that could supply the LEDs with either 24 volts for full brightness, or through a 15 Ohm bank of resistors yielding 20 volts for dimmer light.

Step 4: Pot the LED Bank

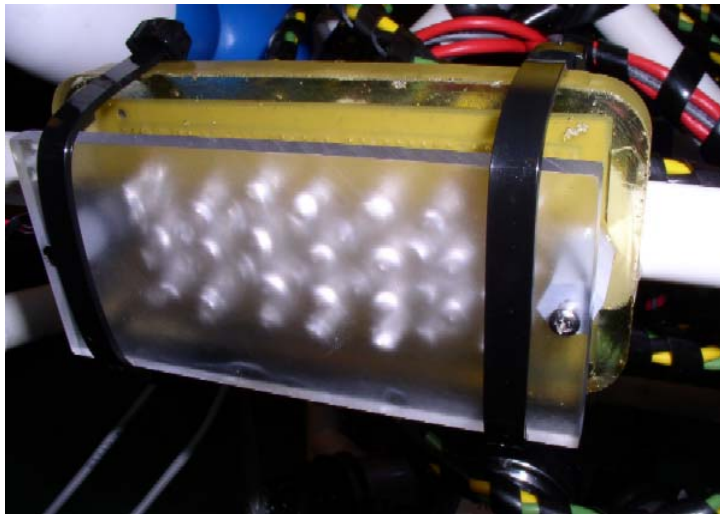
We placed the lighting bank assembly in a shallow container just larger than the proto-board, with the LEDs facing up, and propped a little off the bottom of the container. We filled the container just over the proto-board with liquid epoxy, making sure that the power cable was well embedded and all parts well covered to ensure water-tightness. The LEDs were not covered with epoxy, as they are individually water proof, and will benefit from the heat dissipation action of the water. An alternative method is to paint several layers of epoxy onto the board.

Step 5: Mount the Lighting Bank

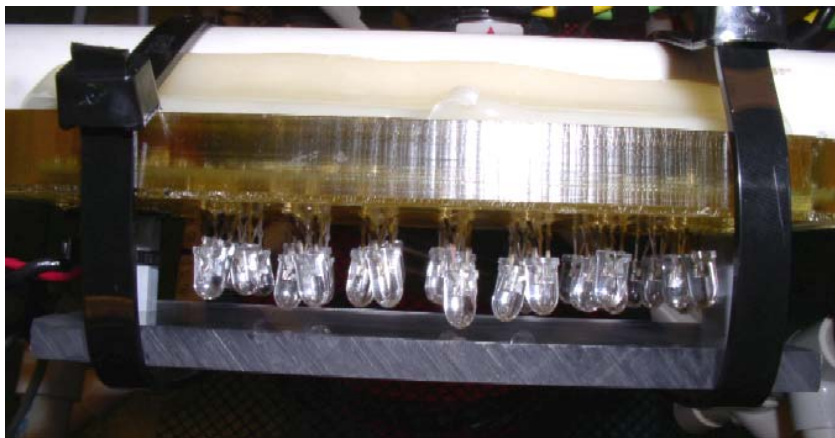
We mounted the lighting bank on our ROV, well above and a little behind our instruments. In this way, it illuminates the field of view of our camera well, and sheds a little light on the instruments. We mounted a lightly sanded piece of clear plastic (lexan) in front of the LEDs to diffuse the light. A piece of milk jug would probably work just as well.



Advanced Sea Perch with lights on bright.




LED Lighting bank, seen through protective front cover.



LEDs embedded and proto-board embedded in epoxy.

Lighting Bank Wiring Layout

Single LED:  Single Resistor: 

