Robo Submarine

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Introduction:

The SMART program was indeed a profitable experience. The activities ad training provided us with a wealth of information, which will, in the end find its way into our

classrooms. Each day was a challenge. Lectures followed by problem solving the mechatronics laboratory. In the beginning the material and subject matter seemed overwhelming but in time I believe we all realized that we were working on topics that can readily be brought back to our students.

Deciding on a project was a difficult task. Our robot had to possess multi task capabilities, be relevant to classroom instruction and be designed and built within a ten-day period. A limited budget was also another constraining factor in the process.

My partner and I did two days of research and decided to construct a robotic submersible. With a submersible we would be able to demonstrate Archimedes Principle. We also knew that if we were successful in our design and construction, we would be able to build upon the project and in the future, use the submersible for the collection of scientific data.

Theory:

The submerging and surfacing of a submarine is based on the Archimedes' principle.

A buoyant force is exerted on an object submersed in a fluid. The pressure beneath the object is larger than the pressure above. The resultant force on the object is upward, opposing the force of gravity.

The apparent change in (or loss in) weight of an object immersed in a liquid is due to the buoyant force. (The buoyant force on an object in a gas is negligible in most applications.)

When an object is partially or fully submerged, the buoyant force, or apparent loss in weight, is equal to the weight of the fluid displaced. (Archimedes' principle)

The apparent weight equals the actual weight minus the buoyant force. A floating object displaces its own weight of fluid. The buoyant force is equal to the weight of the object. A floating object has an average density, which is less than the density of the fluid in which it is floating.

System:

The ballast tank is to be used to change the overall density of the prototype such that it submerges or surfaces when required.
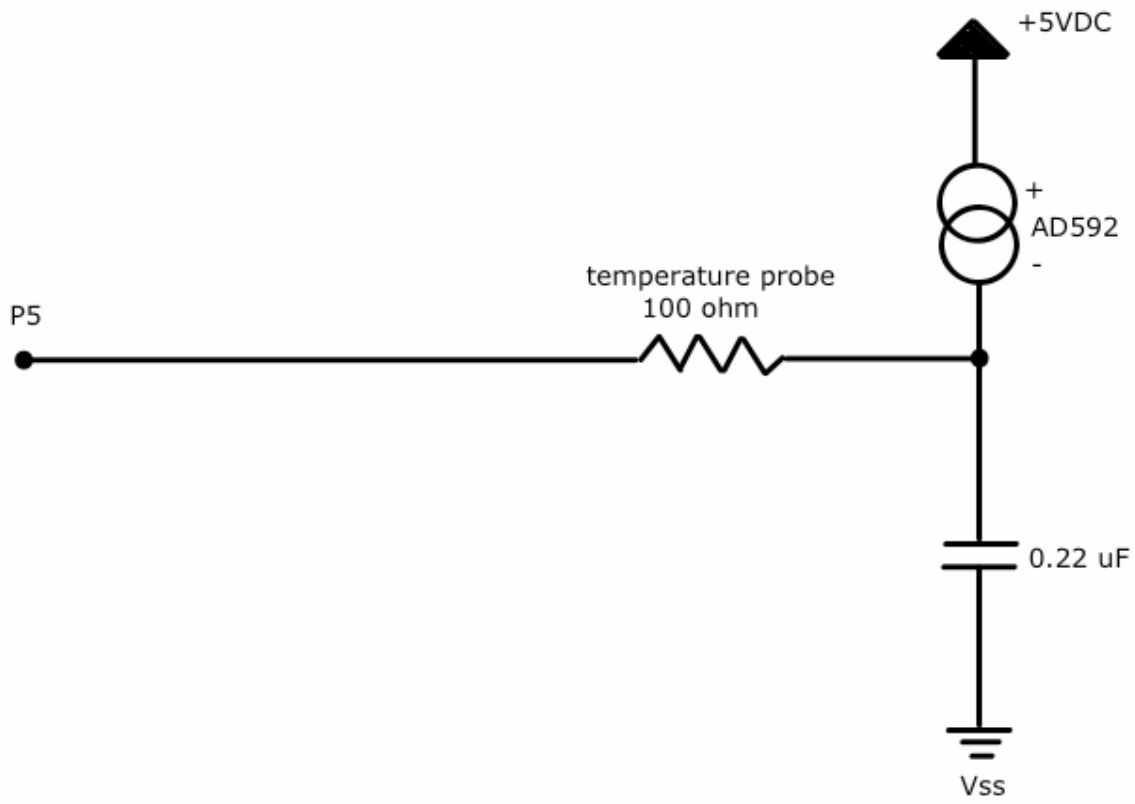
The diving of the submersible is achieved by drawing the water into the ballast tank. Likewise, the water is to be pumped out of the tank for the submersible to surface. A compressed air tank is used for this purpose

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The diving of the submersible is achieved by drawing the water into the ballast tank. Likewise, the water is to be pumped out of the tank for the submersible to surface. A water pump motor is required to handle these processes.
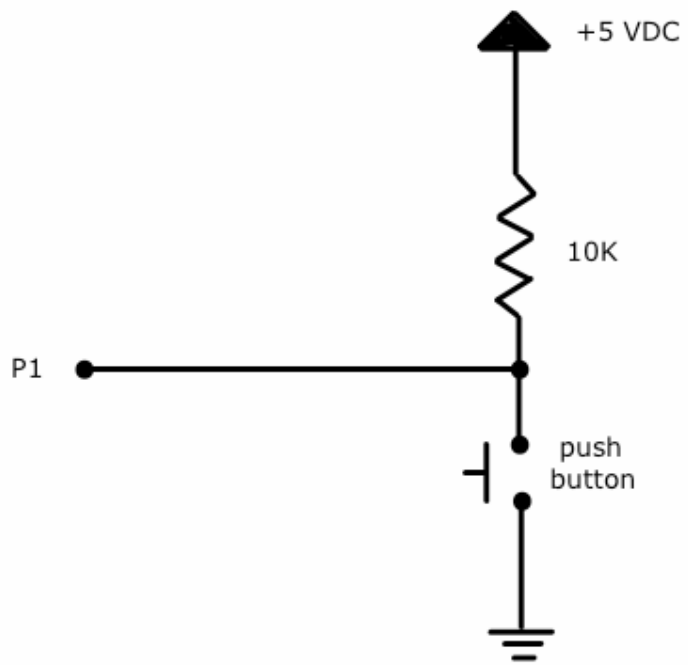
The ballast tank is to be tightly secured to the bottom of the hull of the submersible so that they will not break loose from the main body in the course of surfacing and submerging. Silicone is to be used to seal up the openings so that water will not seep into the computer control area.
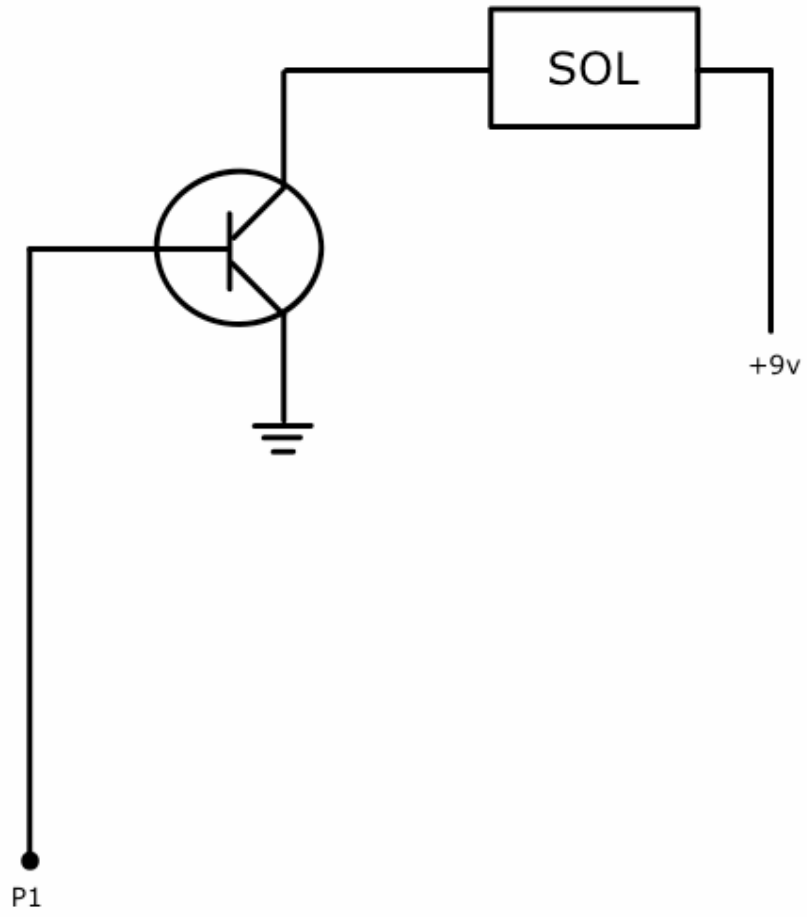
The submersible will contain sensors that will allow the collection of data. We wanted to include probes, which would allow the sampling of Dissolved Oxygen (DO), Temperature, pH, and Pressure. At this point we only included a temperature probe. We were constrained in our choice of probes due to the fact that many of those compatible with the BS-2 system were cost prohibitive.

We feel that the temperature probe we constructed brought proof of concept to our project.
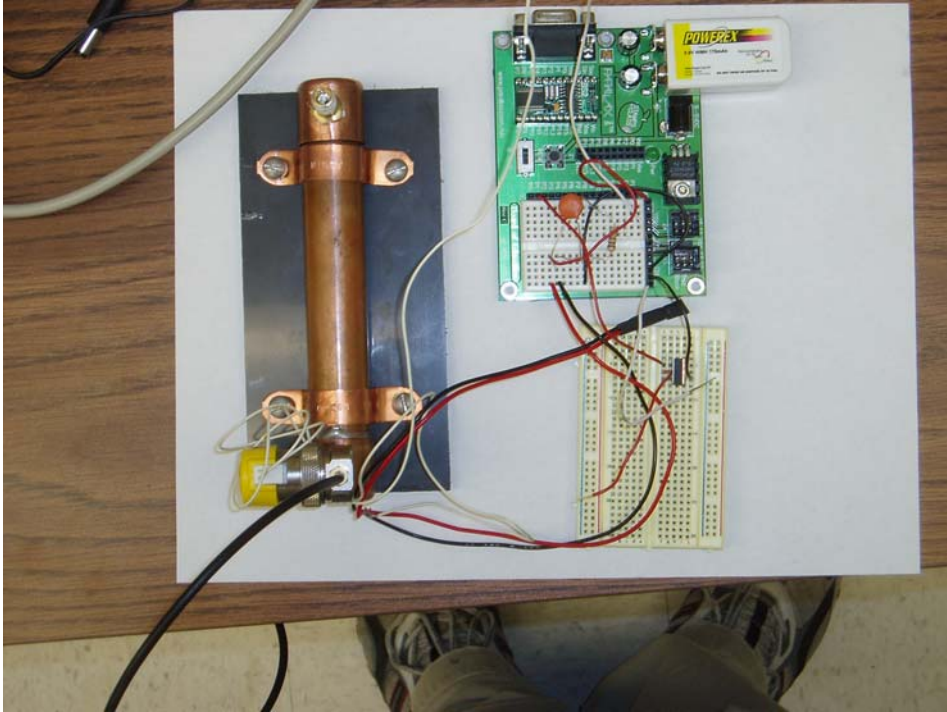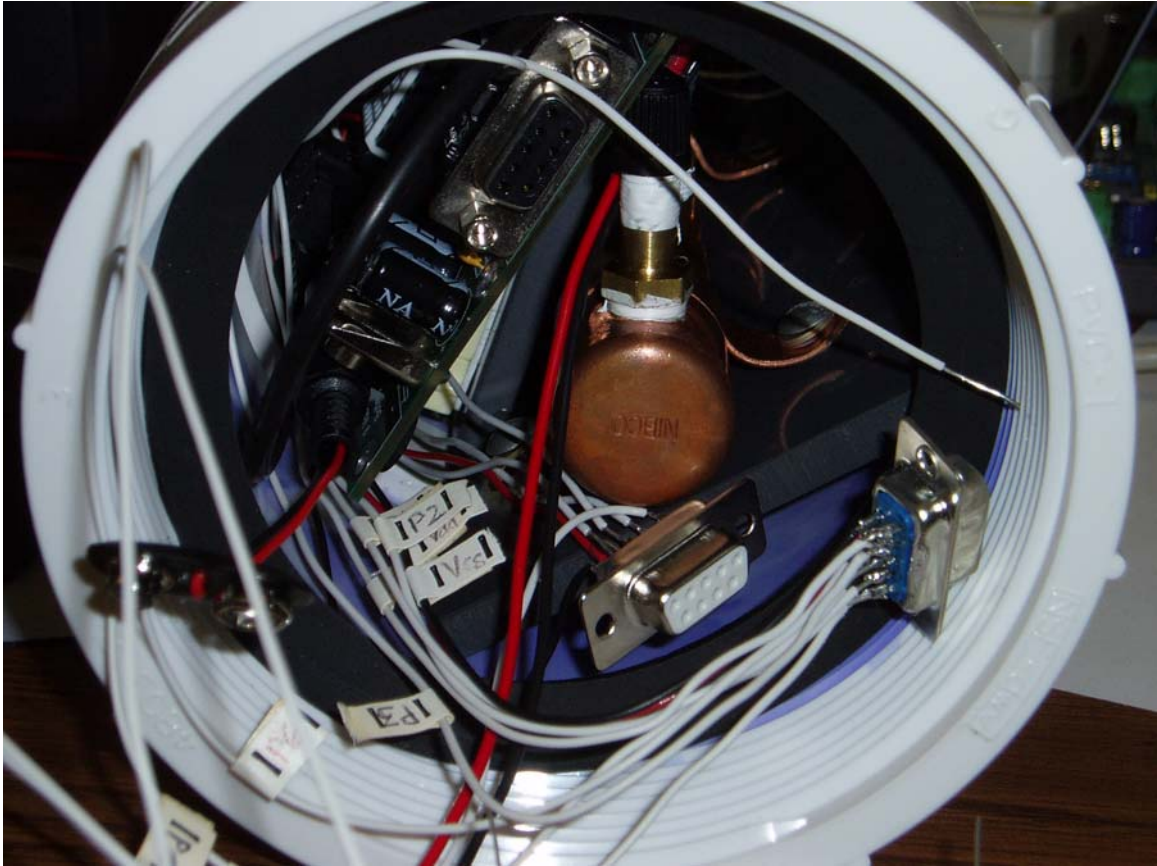**Circuitry:**

+5VDC

+
AD592
-

temperature probe
100 ohm

P5

0.22 uF

Vss

+5 VDC

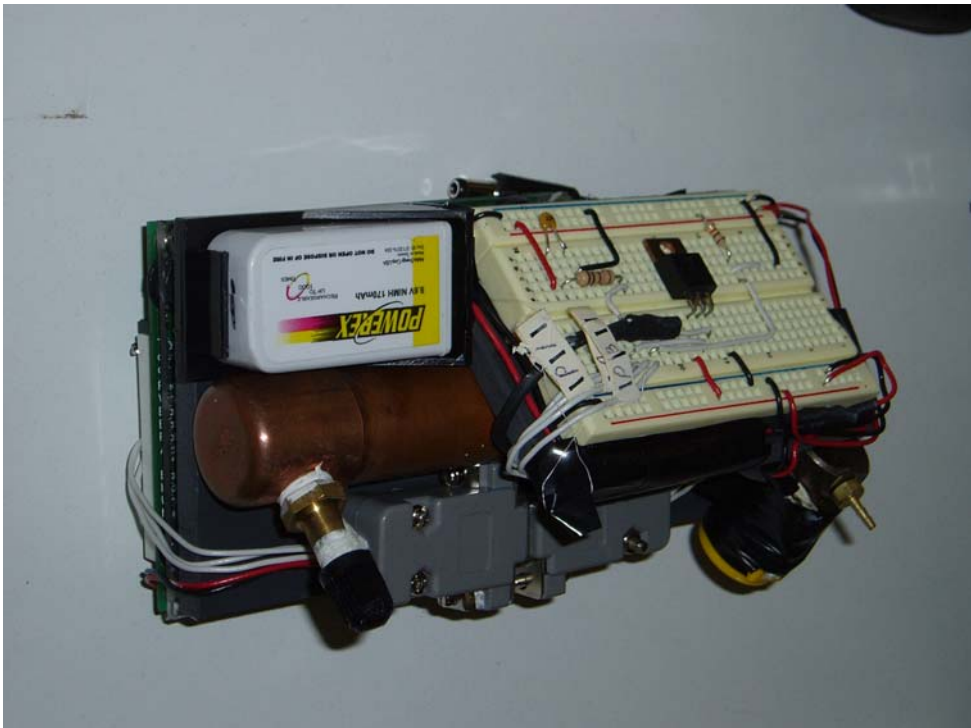10K

P1

push
button
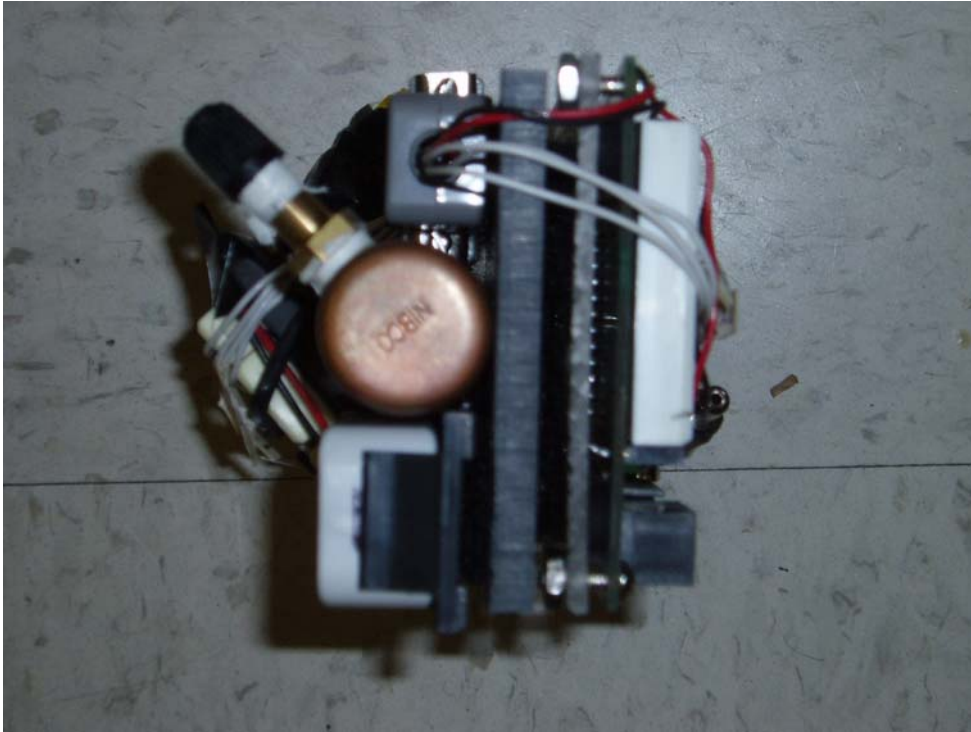
SOL

+9v

P1

Compressed Air Tank

Circuitry with compressed Air Tank

Fitting it all in.

IC, Bread Board and Compressed Air, Tank All in One

Consultants:

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References:

For parts and materials   Digi-Key
                             McMaster-Carr
                             Neweark Electronics

Electricity & Electronics   Randy Stone
                                   Holt, Rinehart & Winston

Internet Sources   www.scilinks.org

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