



Vivace Flow Blood Flow Speed Measurement Probe

ENSC 440

Spring 2011

Agenda

Introduction

High Level System Design

Calibration and Testing

Future Work

Timeline and Budget



Introduction

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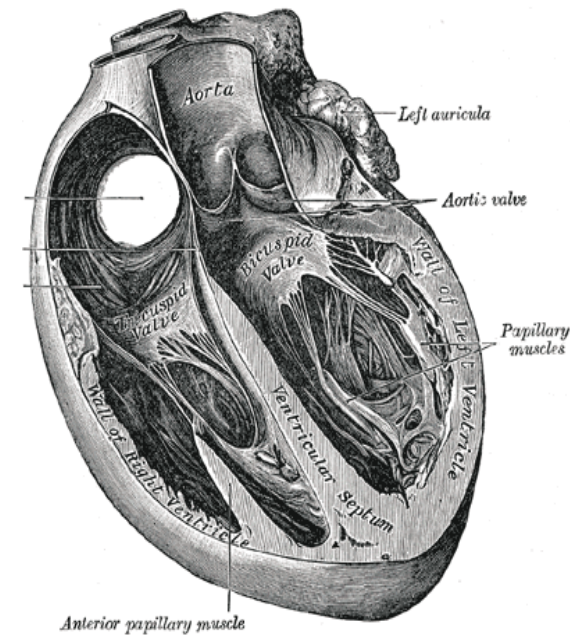
Conclusion

Purpose

- To Measure Instantaneous Blood Flow Speed

Kardium

- Designs solutions for cardiovascular diseases



System Overview

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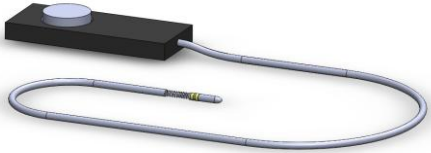
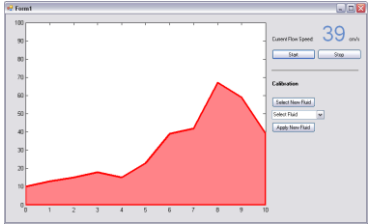
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UniscaSuite™

Allows user to configure settings and commence flow speed measurement

Displays flow speed information to the user in real time and logs all information in a log file

GenioBox™

Tells probe to start collecting data

Processes data received from probe and sends it to the UI

PiccoloProbe™

Collects flow speed information

Sends the information to the GeniusBox

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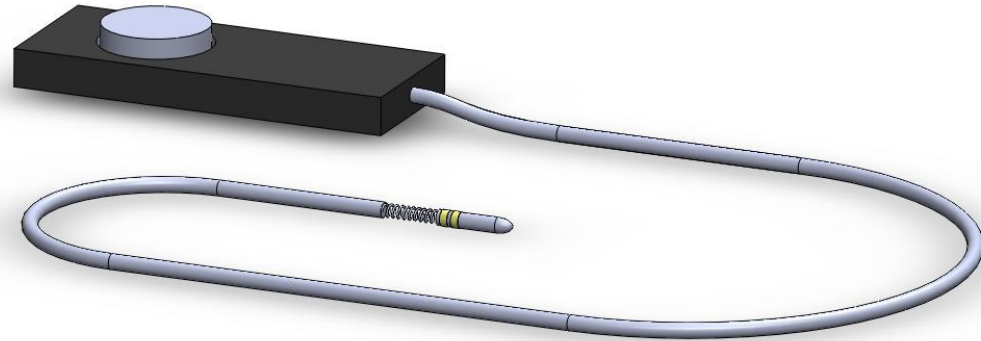
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PiccoloProbe (Mechanical)



PiccoloProbe (Mechanical)

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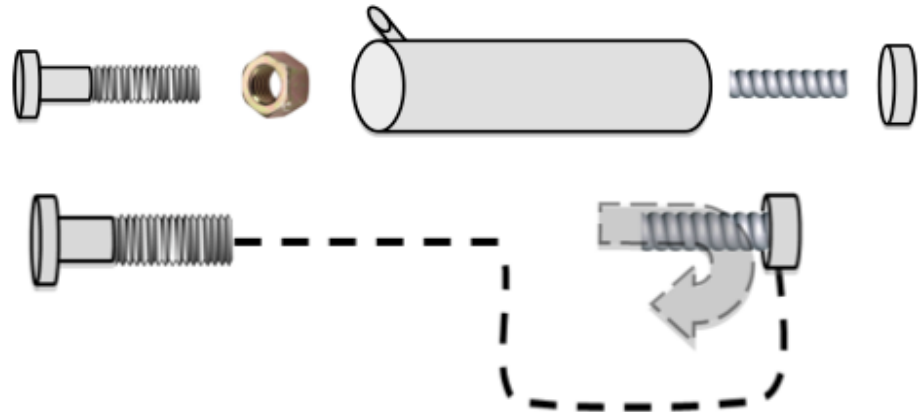
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PiccoloProbe's
Overall
Mechanical
Components
Steering
Summary



PiccoloProbe (Mechanical)

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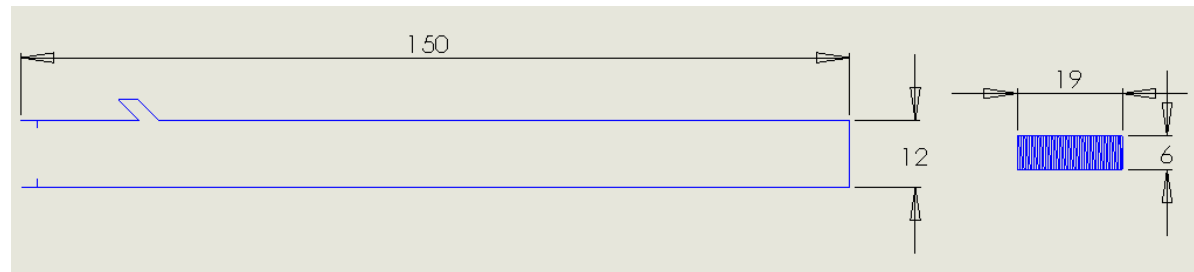
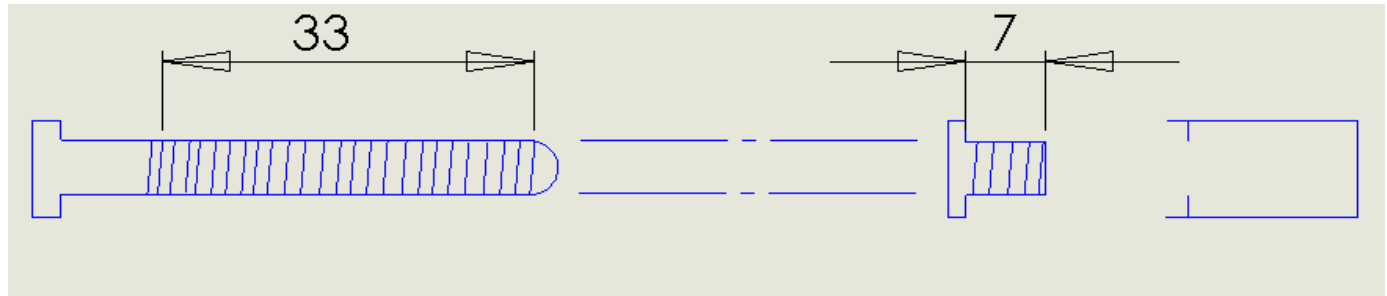
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Units: mm



PiccoloProbe (Mechanical)

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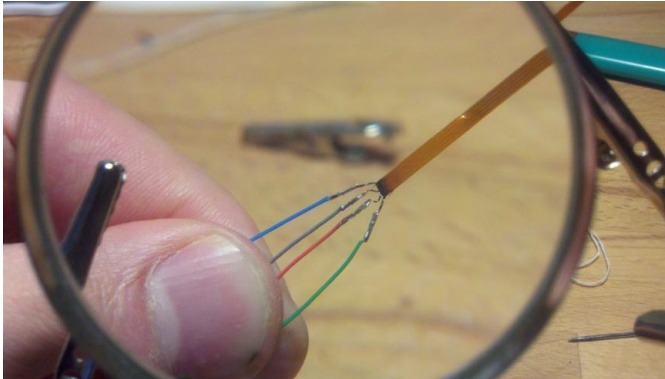
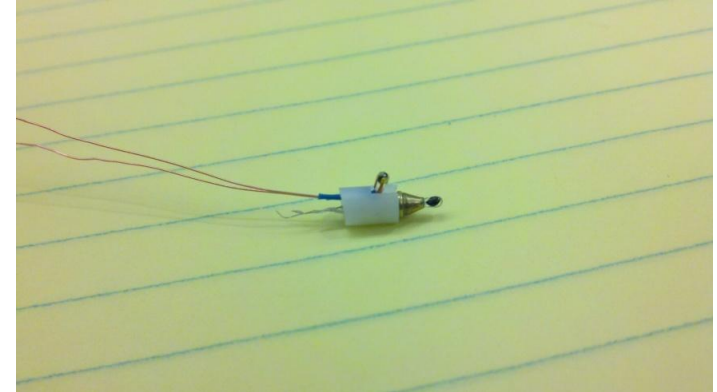
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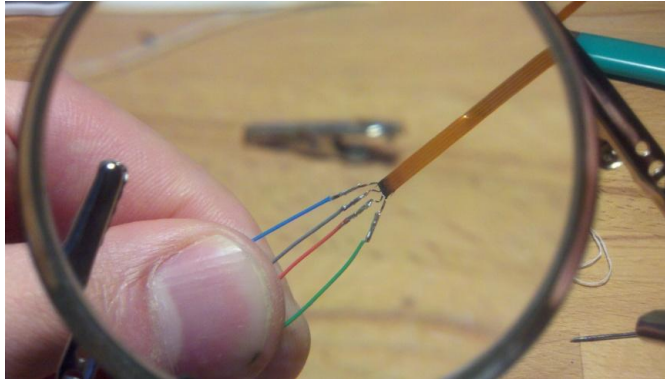
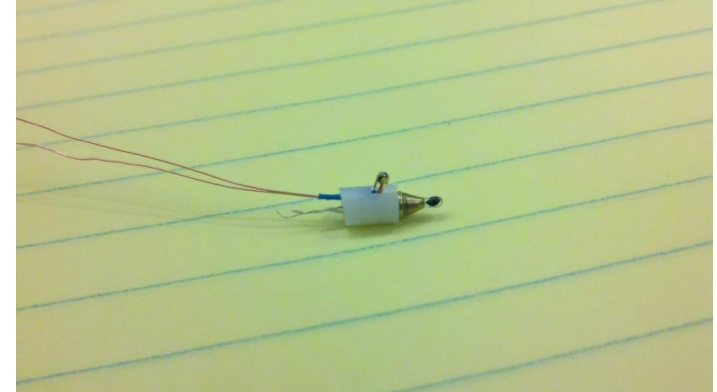
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PiccoloProbe (Mechanical)

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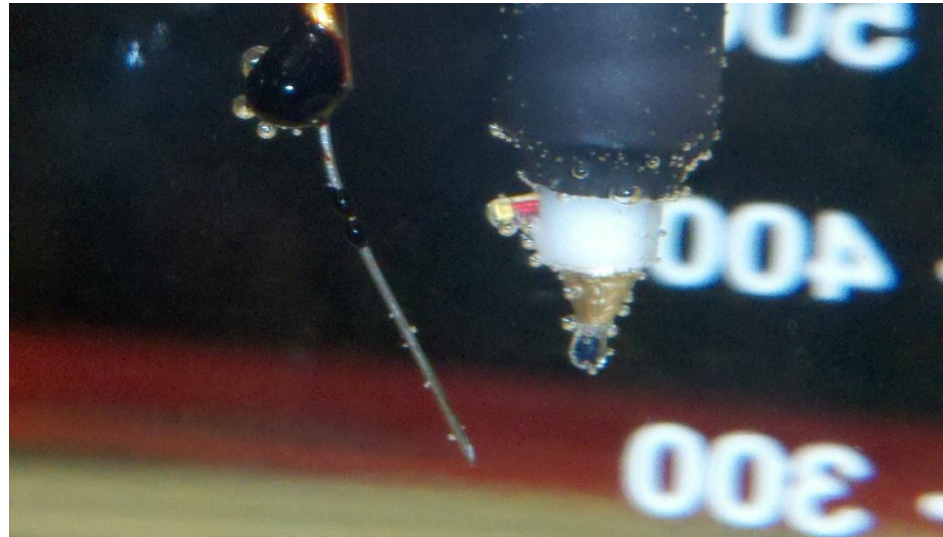
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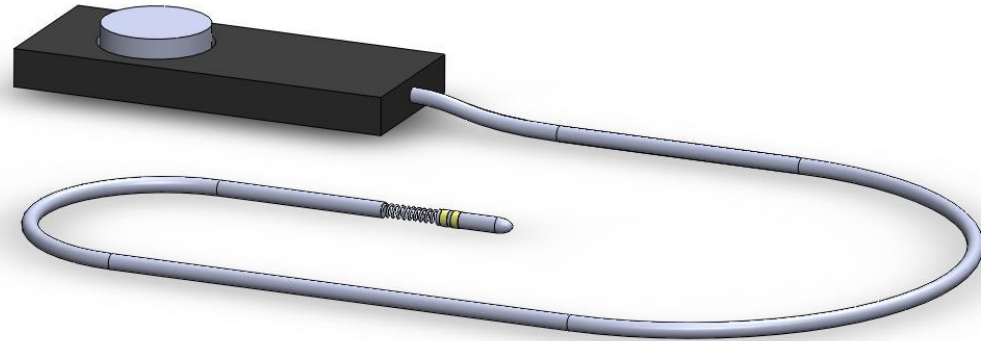
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PiccoloProbe (Electronic)



PiccoloProbe (Electronic)

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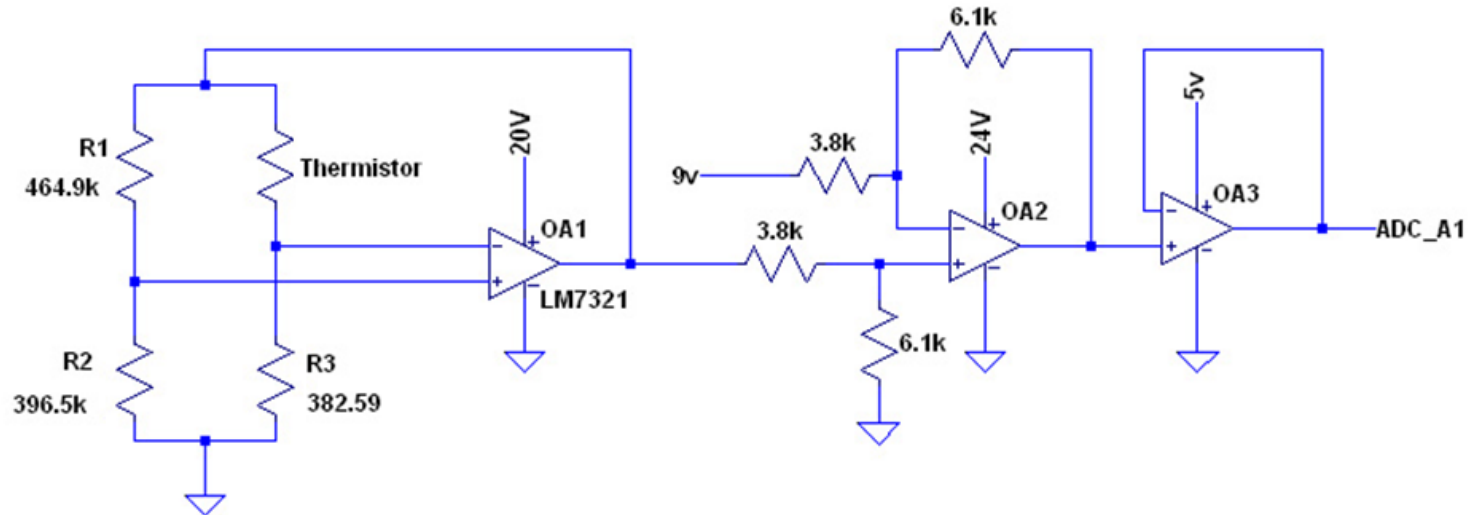
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PiccoloProbe (Electronic)

Characteristics of the Flow Sensing Thermistor

- Honeywell Glass bead NTC thermistor
- Low dissipation constant (0.1mW/°C)
- Time constant in air: 0.5s
- Small size: 1.14 mm diameter
- Relatively large β value (relationship between resistance and temperature)
- Drawback: $\pm 20\%$ tolerance which made calibration of thermistor vital

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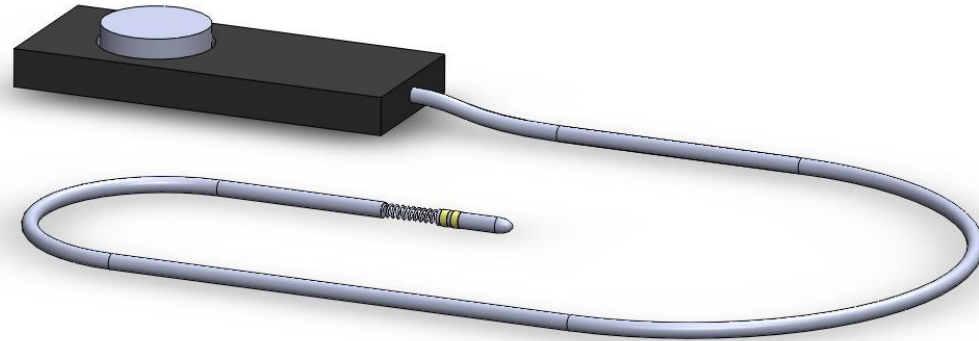
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GenioBox



GenioBox

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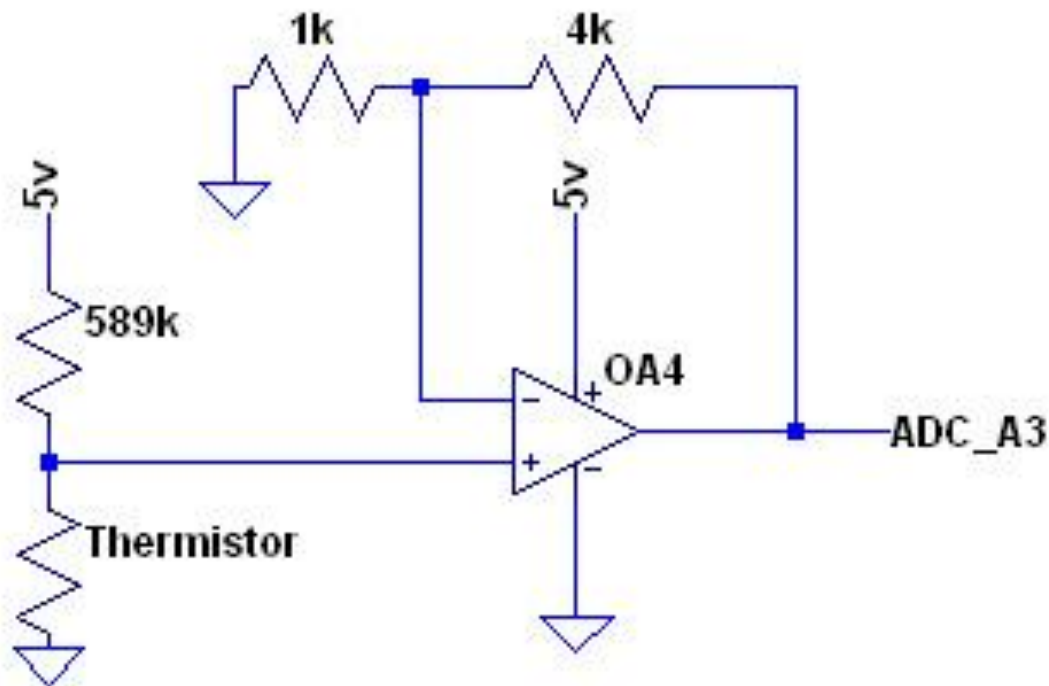
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- Epcos glass encapsulated temperature measuring thermistor
- $0.4\text{mW}/^\circ\text{C}$ dissipation constant



GenioBox

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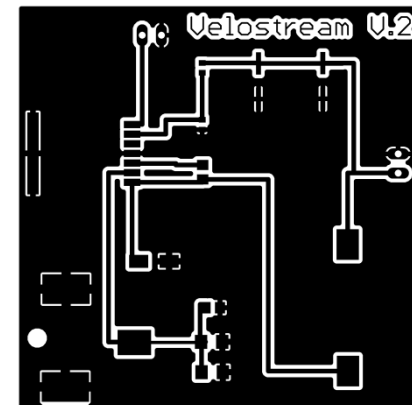
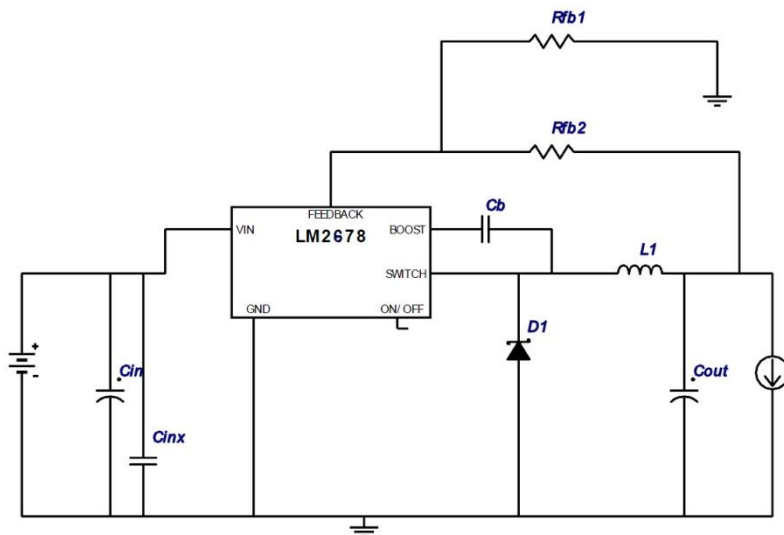
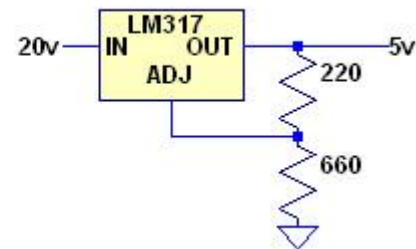
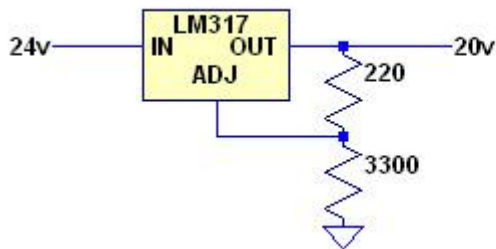
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GenioBox

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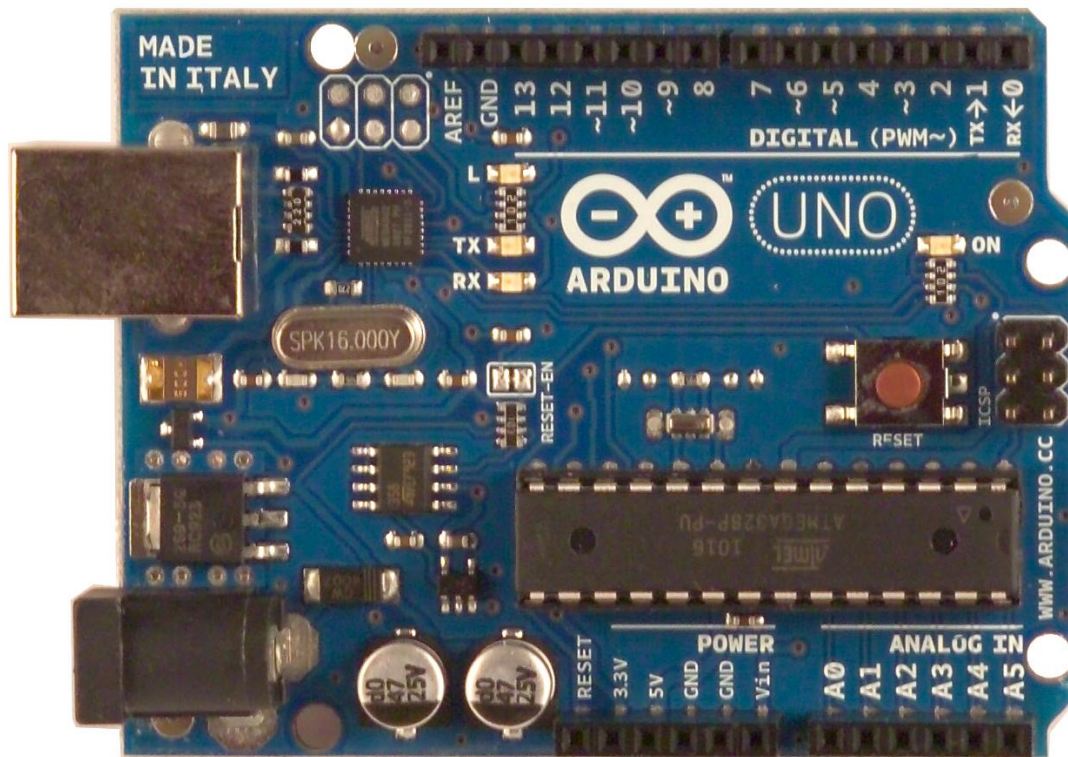
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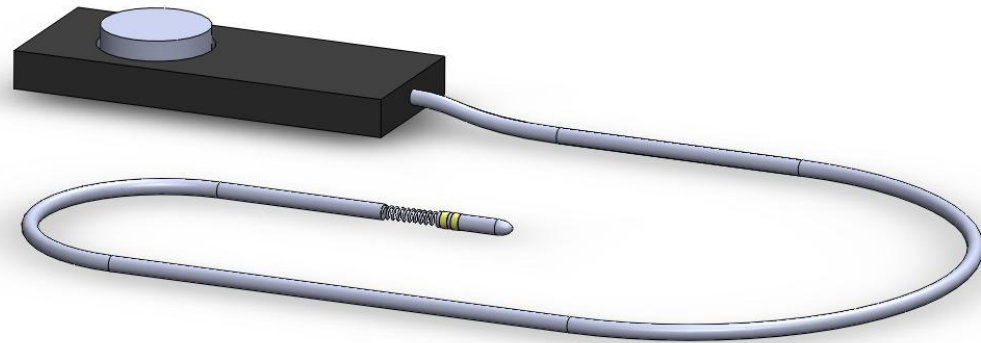
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UniscaSuite



UniscaSuite

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- Uses C# and the .NET Framework
- Uses Windows Forms to create the User interface
- Uses the .NET IO suite for COM port and logging



UniscaSuite

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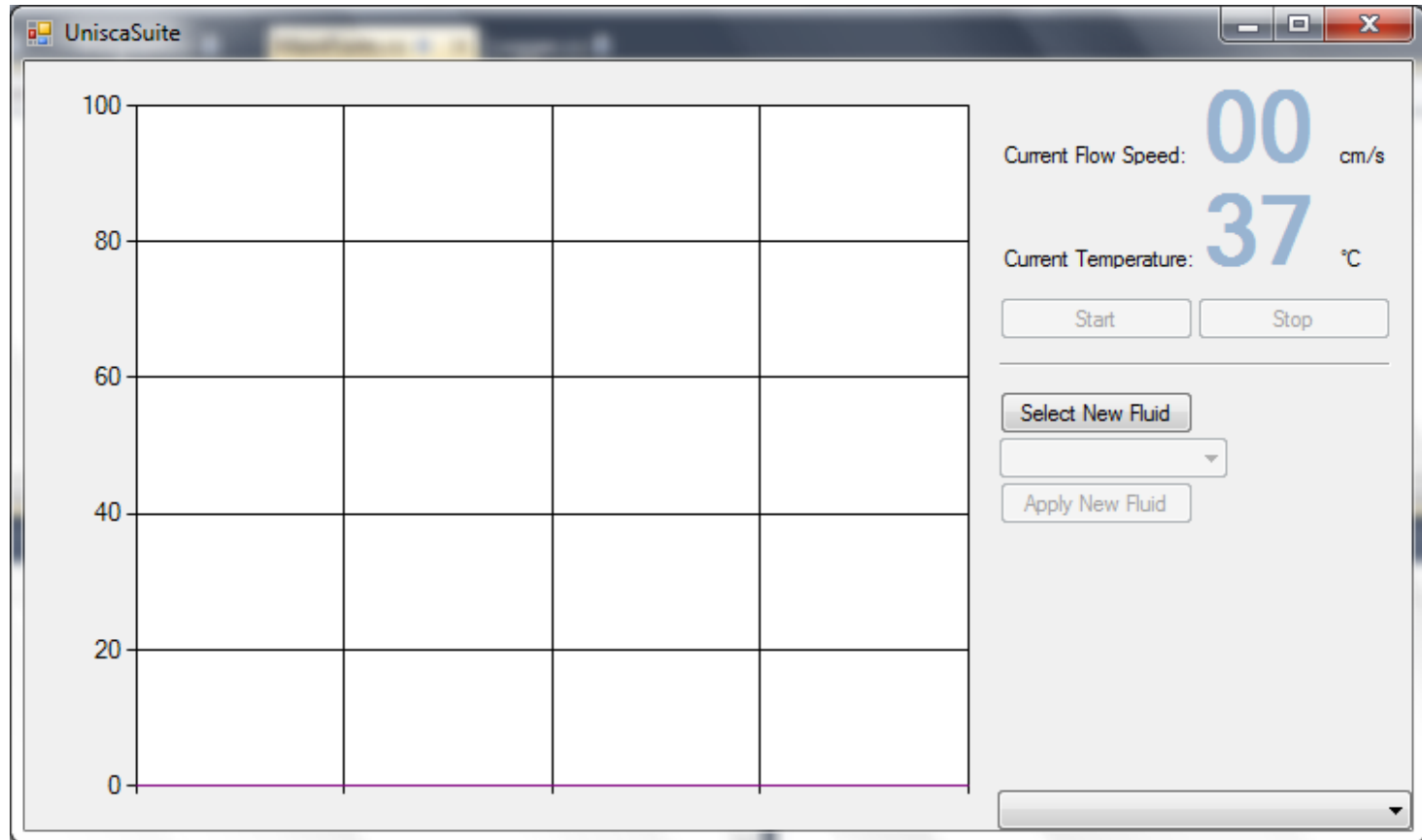
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UniscaSuite

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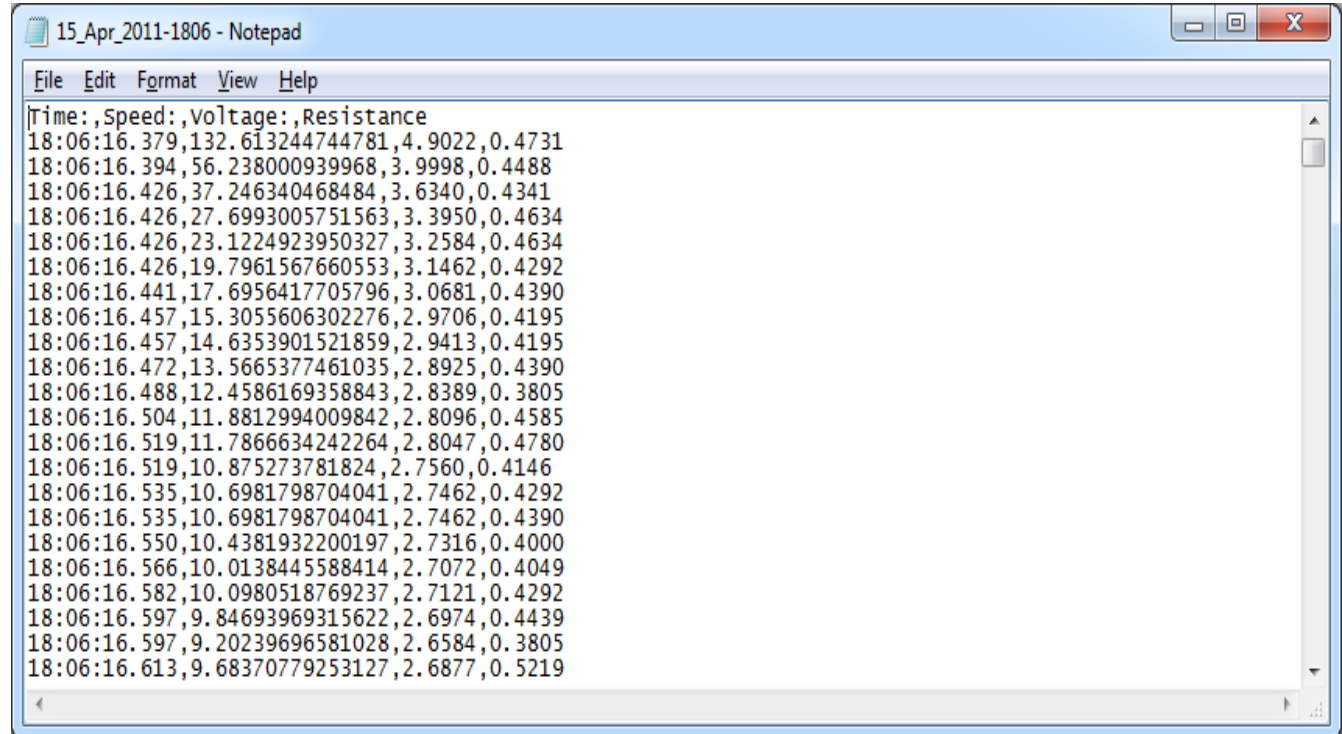
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```
15_Apr_2011-1806 - Notepad
File Edit Format View Help
Time:,Speed:,Voltage:,Resistance
18:06:16.379,132.613244744781,4.9022,0.4731
18:06:16.394,56.238000939968,3.9998,0.4488
18:06:16.426,37.246340468484,3.6340,0.4341
18:06:16.426,27.6993005751563,3.3950,0.4634
18:06:16.426,23.1224923950327,3.2584,0.4634
18:06:16.426,19.7961567660553,3.1462,0.4292
18:06:16.441,17.6956417705796,3.0681,0.4390
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UniscaSuite

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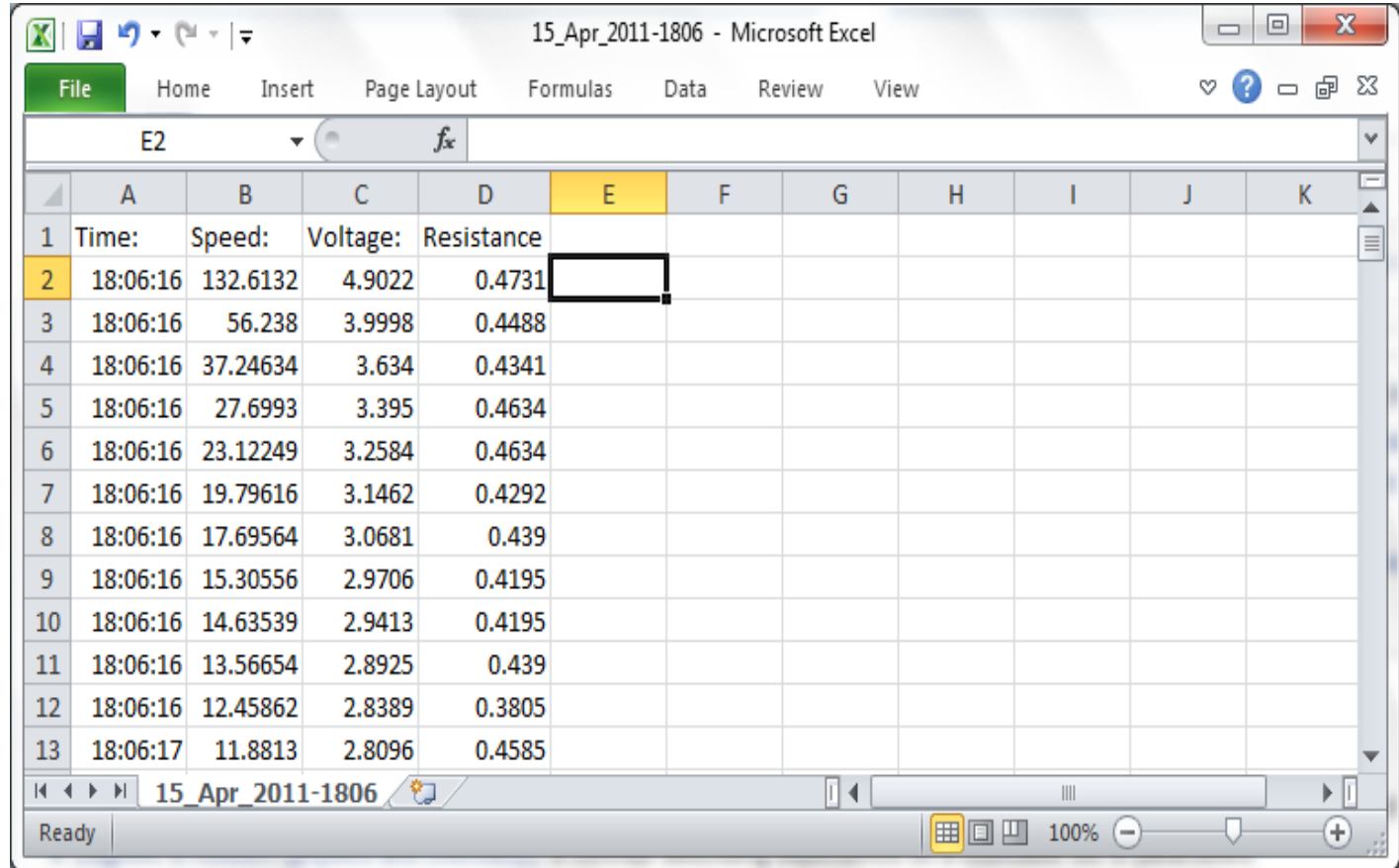
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15_Apr_2011-1806 - Microsoft Excel

	A	B	C	D	E	F	G	H	I	J	K
1	Time:	Speed:	Voltage:	Resistance							
2	18:06:16	132.6132	4.9022	0.4731							
3	18:06:16	56.238	3.9998	0.4488							
4	18:06:16	37.24634	3.634	0.4341							
5	18:06:16	27.6993	3.395	0.4634							
6	18:06:16	23.12249	3.2584	0.4634							
7	18:06:16	19.79616	3.1462	0.4292							
8	18:06:16	17.69564	3.0681	0.439							
9	18:06:16	15.30556	2.9706	0.4195							
10	18:06:16	14.63539	2.9413	0.4195							
11	18:06:16	13.56654	2.8925	0.439							
12	18:06:16	12.45862	2.8389	0.3805							
13	18:06:17	11.8813	2.8096	0.4585							



UniscaSuite

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- Used Nullsoft Scriptable Installer System (NSIS) to create installer
- Uses scripts to generate installers
- Installs *UniscaSuite* and .NET if needed
- Includes uninstaller



UniscaSuite

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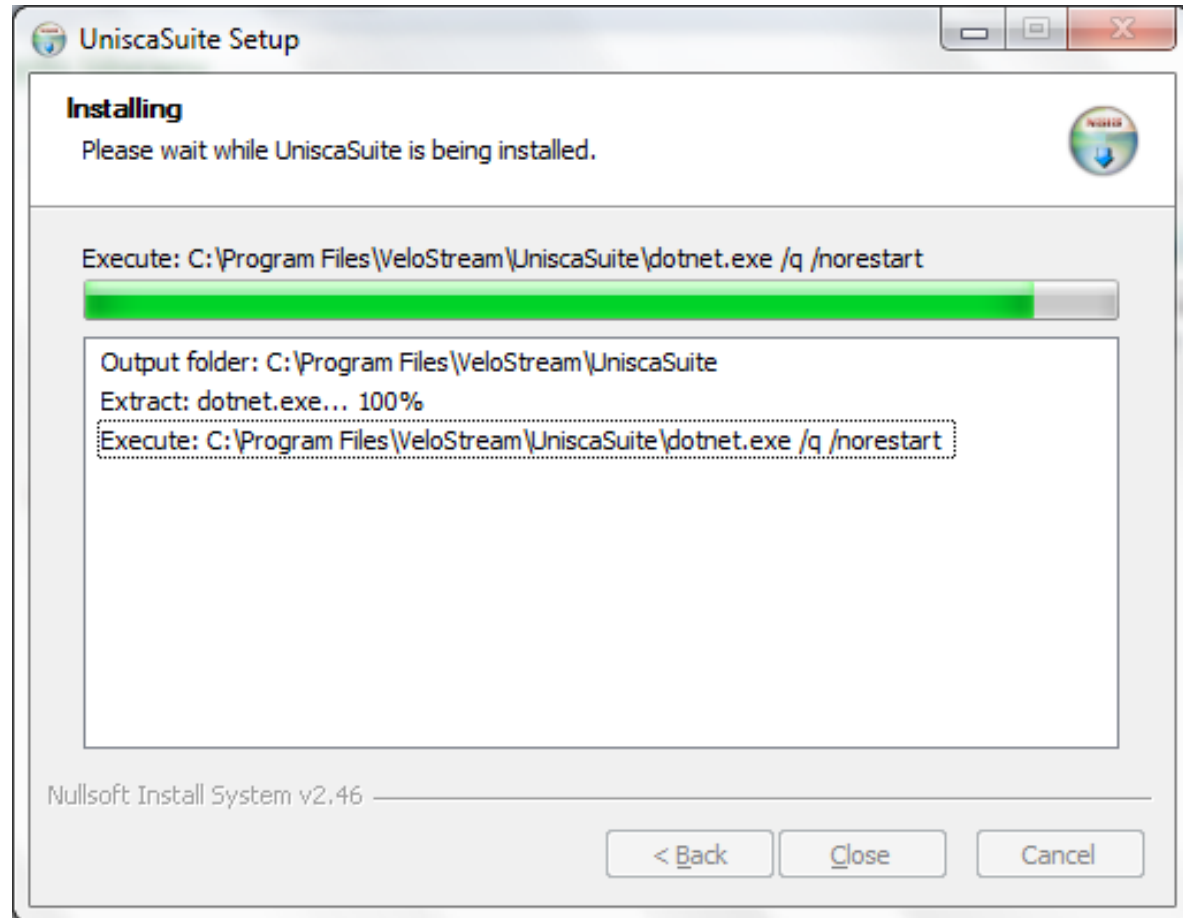
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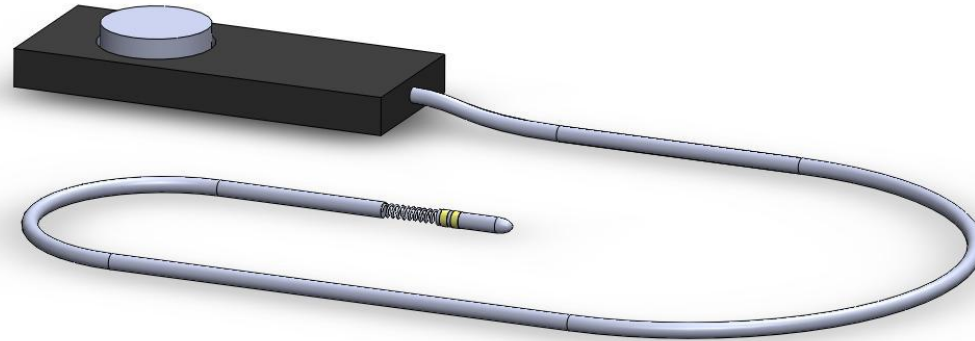
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Calibration

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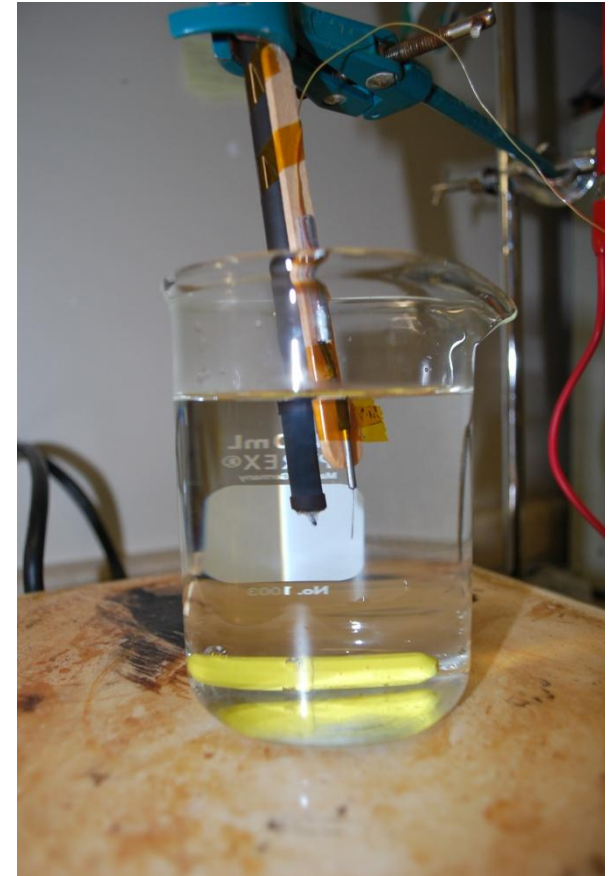
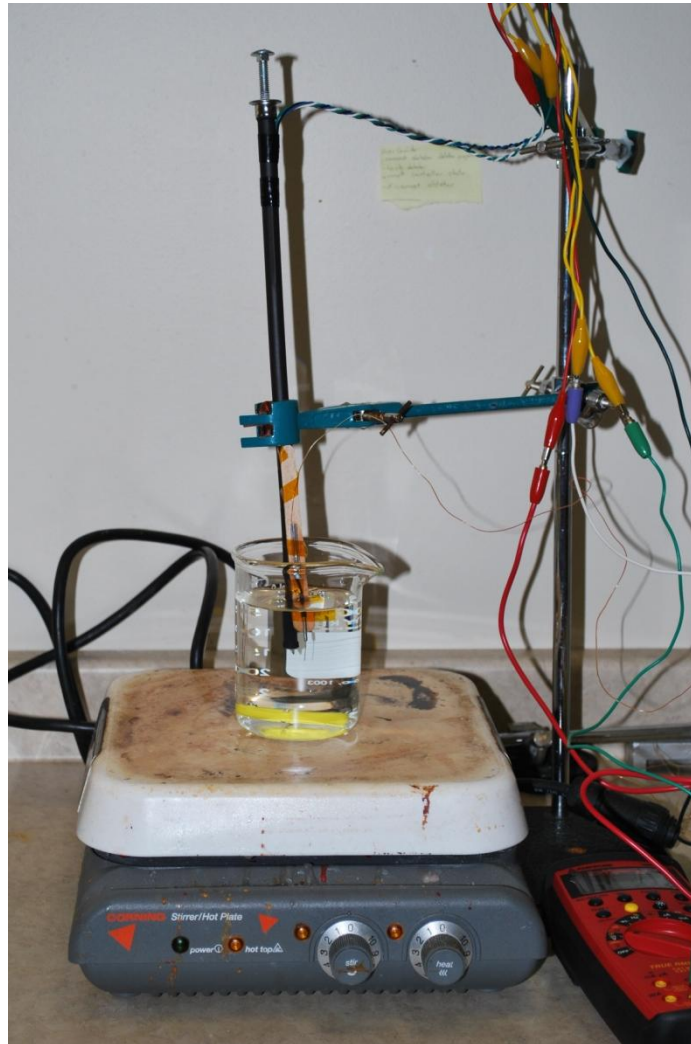
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*velo*stream

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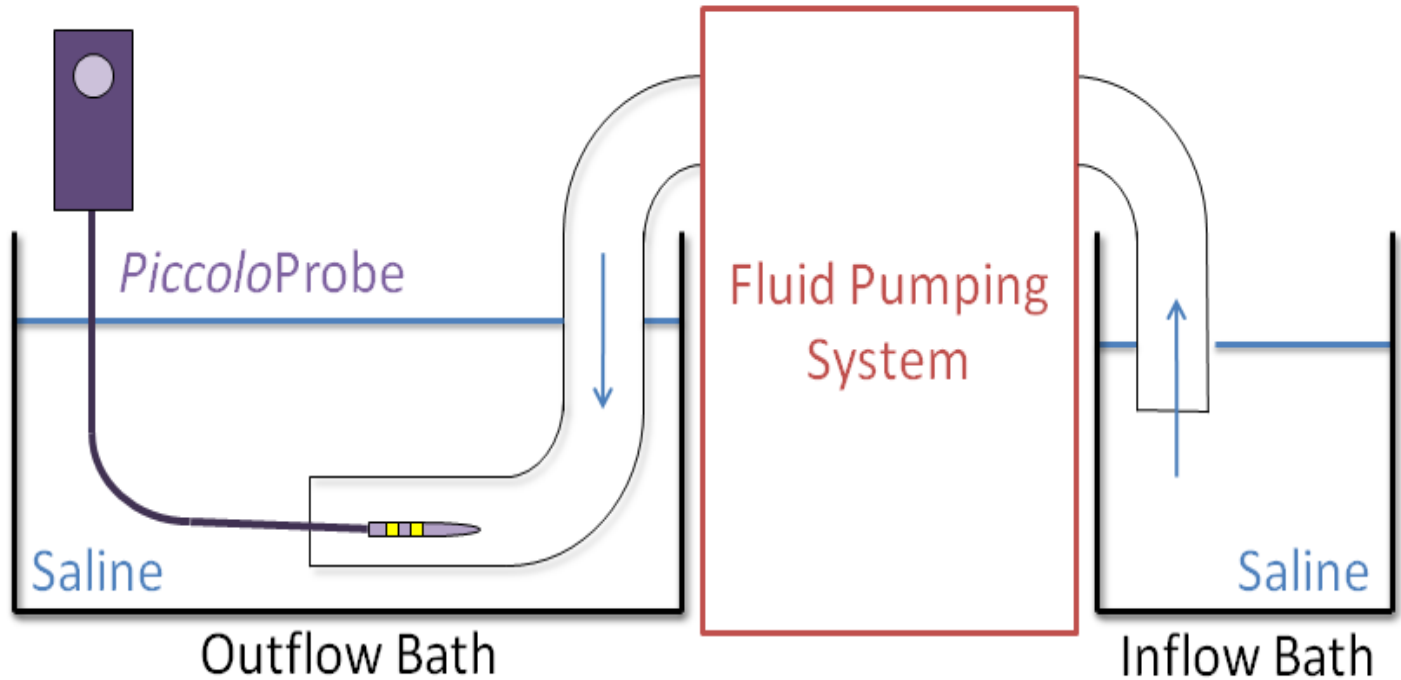
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Calibration and Testing

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Future Work

Improvements:

- Use of DAC card instead of microcontroller to improve accuracy and reduce noise
- Optimize components (i.e., better op-amps, more flexible tip of probe)

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Item		Budgeted Cost	Required Cost
Electronics Components	Microcontroller, Power Supplies, PCB Components	\$200.00	\$289.35
	Analog Circuitry and Sensors	\$250.00	\$359.01
Mechanical Components	Probe Materials	\$150.00	\$52.00
Testing Device	Flow Machine, Flowmeter	\$200.00	\$0.00
Shipping		\$100.00	\$38.49
Contingency		\$100.00	\$0.00
Sum:		\$1000.00	\$737.86



Timeline and Budget

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Stage		Proposed Date	Actual Date
1	Order Parts	Feb. 7	Apr. 10
	Flow Method Design	Feb. 3	Feb. 10
2	Body Prototyping	Feb. 14	Feb. 10
	Flow Pump Design	Feb. 21	Not Necessary
	Flow Sensing Assembly	Feb. 21	Mar. 7
3	Feedback Loop Integration	Mar. 7	Mar. 15
	Body Assembly	Mar. 7	Mar. 10
	Logging Software Integration	Mar. 21	Apr. 1
4	Building of Test Pump	Mar. 28	Not Necessary
	Formal Testing	Mar. 31	Apr. 15
5	Presentation of Device to Contractors	Apr. 12	Ongoing



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- Successful in building of a flow speed probe with response time of 0.5s
- Future work necessary to achieve some of the more difficult requirements set by Kardium
- Under budget



Thank You!!!

Questions?

