

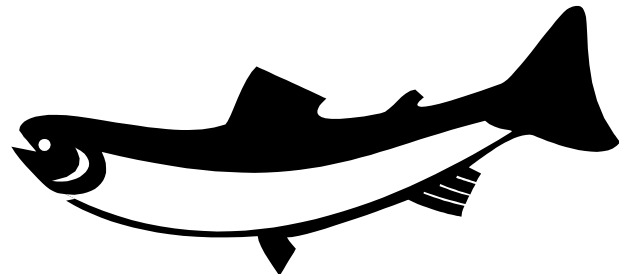
FLY-ROD ACCESSORY PACK

PRESENTED AS A HONORS PROGRAM SENIOR PROJECT

A Senior Design Project by Rob Streeter and Kurtis Buck

Overview

- General Project Description
- Sub-system Highlights
- Total Cost Breakdown
- Q / A



General Description

- Heated guides
- Fish metrics
- Air temperature
- Intuitive display

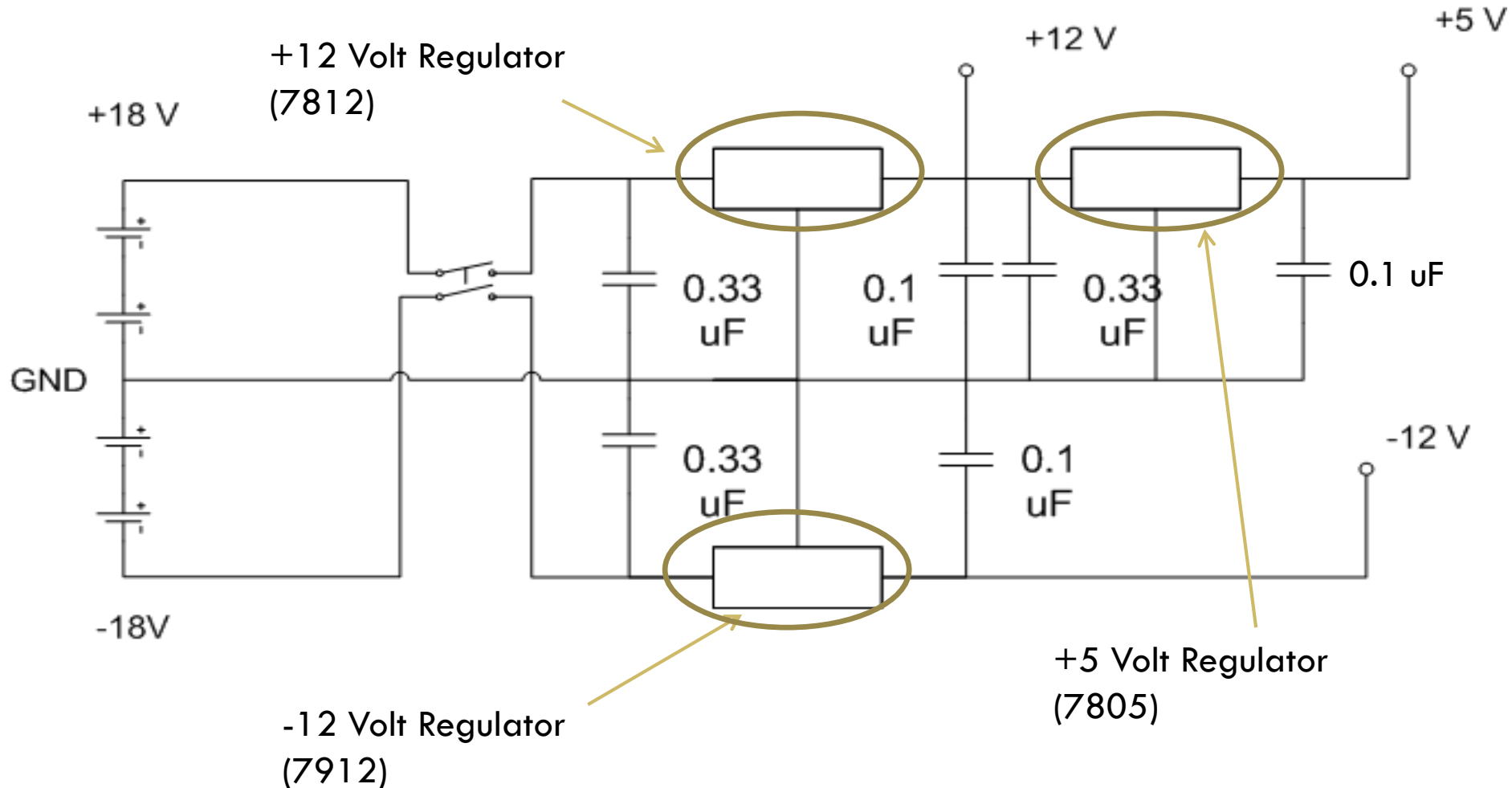
Design Specifications

- Heated guides
- Temperature sensing (within ± 1 °F)
 - Range is different from original specs, now 0-110° F
- Fish weight (within 0.25 lbs)
- Fish length (within 0.5 inches)
- Low battery indicator (105% minimum required voltage; 12.8 Volts)
 - The last four are displayed on an LED display
 - Temperature displays in 5° increments

Sub-system Highlights - Power

- 3 regulated voltage levels
 - +5 V DC (7805 regulator)
 - +12 V DC (7812)
 - -12 V DC (7912)
- Voltage provided by four 9V batteries, center tapped to provide positive and negative voltage levels.
- Design taken from datasheets for the regulators

Sub-system Highlights – Power Circuit Schematic



Sub-system Highlights – Heated Guides

□ Many Attempts

- Frostex Heat Tape

- Minco

- Transistors

 - 2SD313

 - 2N5682

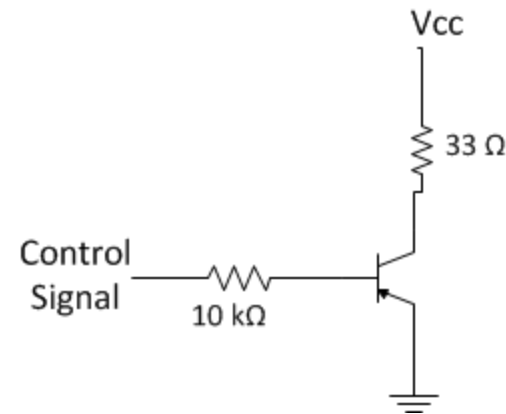
 - 2N3617

- Found the 2SD313 to be the best choice

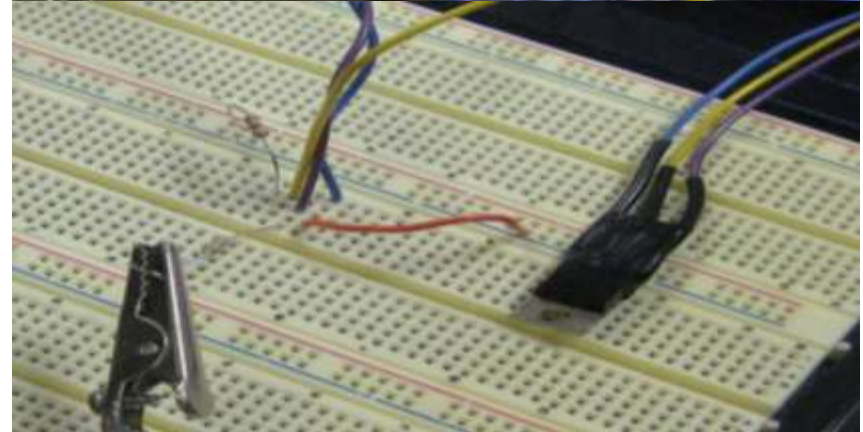
Sub-system Highlights – Heated Guides

Circuit Schematic and Testing

- Initial testing of 2SD313
 - ▣ 10 minutes ON, 52°F temperature gain
 - ▣ Used 30V and 1A during this period
 - ▣ $P_D = 6.94 \text{ W}$, $P_{D_{\max}} = 22.97 \text{ W}$
- All measurements have shown to be well within safe ranges given in data sheets



Sub-system Highlights – Heated Guides Experiment

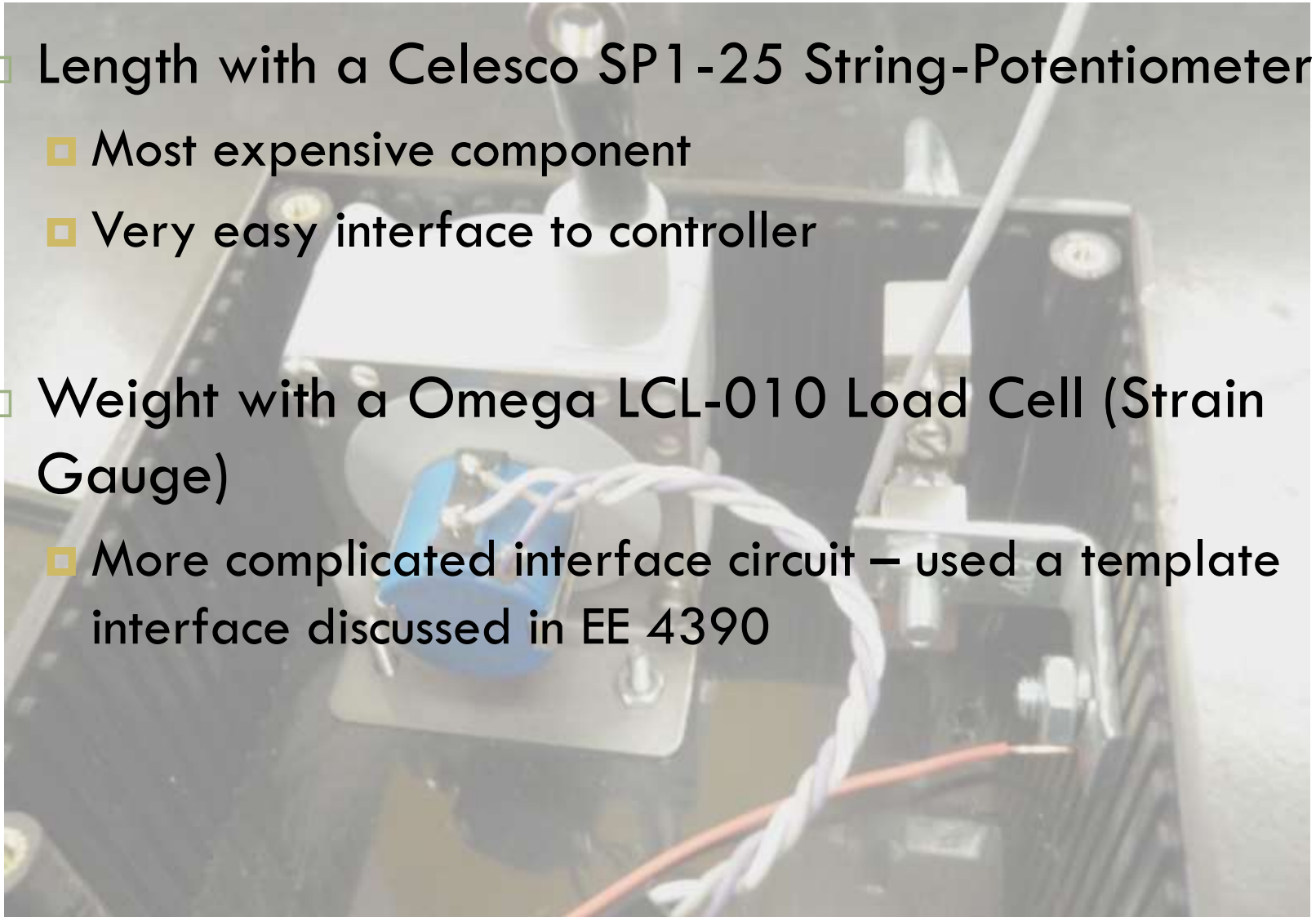


Sub-system Highlight - Microcontroller

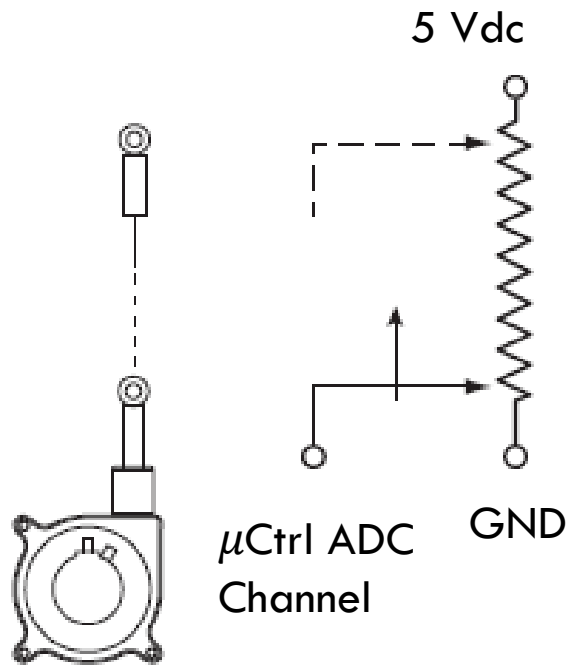
- ATtiny861 chip
 - ▣ Upgrade from the ATtiny261 we originally used
 - ▣ Power-efficient
 - ▣ Small (20 pin DIP package)
 - ▣ Included all necessary features
 - 8kB Flash memory
 - 6 channel, 8-bit ADC
 - Numerous general I/O pins

Sub-system Highlights – Fish Metrics

- Length with a Celesco SP1-25 String-Potentiometer
 - ▣ Most expensive component
 - ▣ Very easy interface to controller
- Weight with a Omega LCL-010 Load Cell (Strain Gauge)
 - ▣ More complicated interface circuit – used a template interface discussed in EE 4390

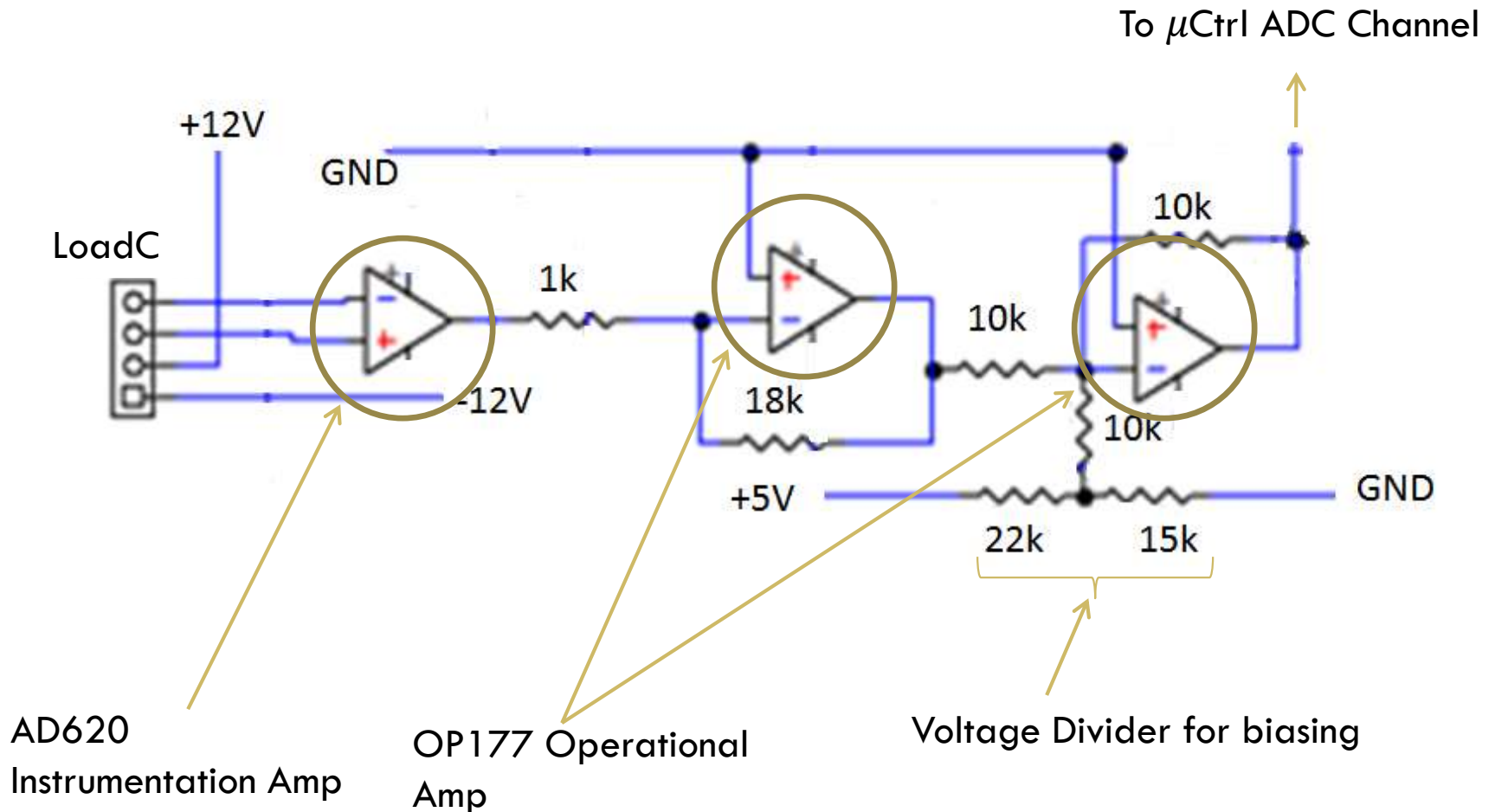


Sub-system Highlights – Fish Metrics Circuit Schematics (String Pot)



- Image taken from datasheets
- Voltage divider design

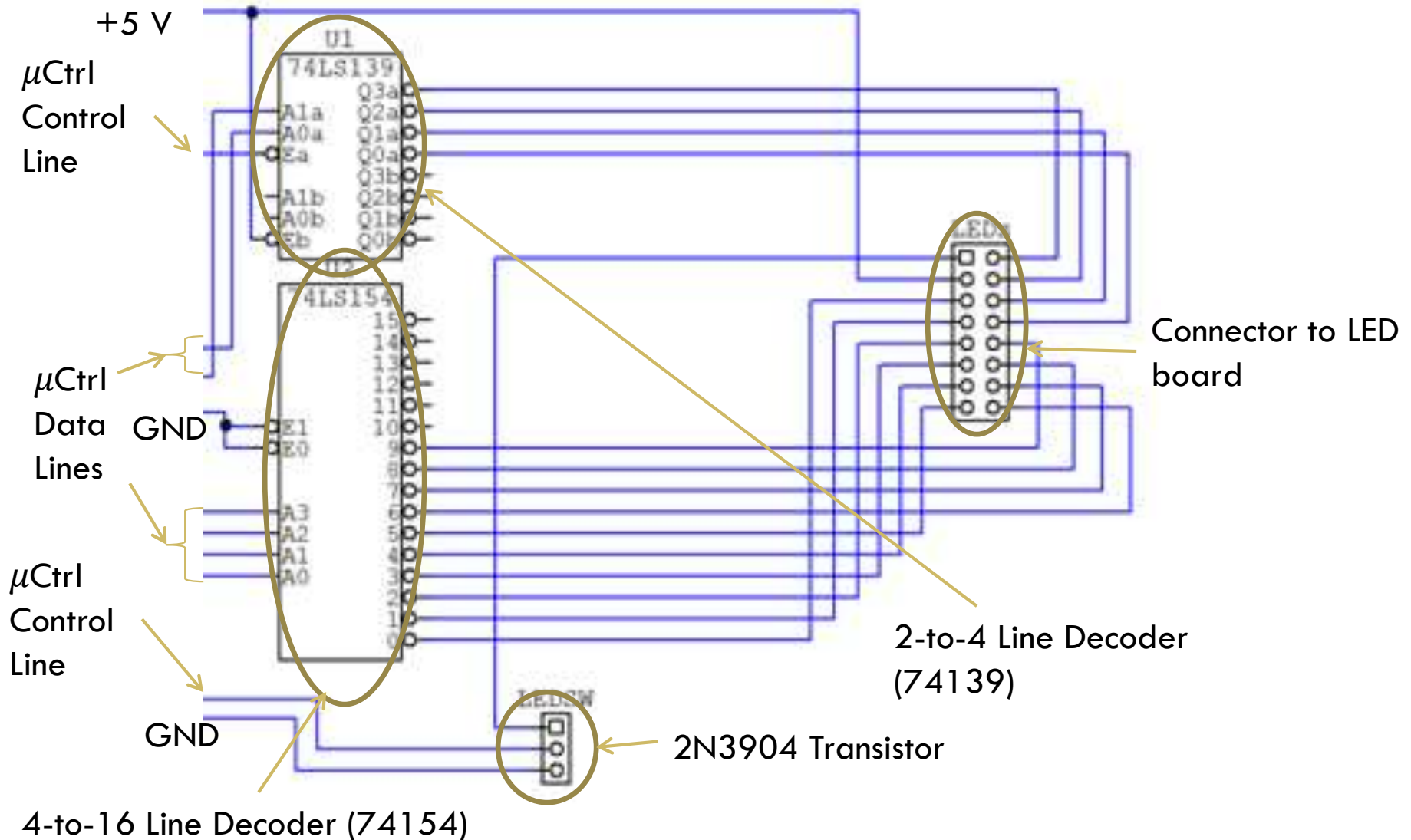
Sub-system Highlights – Fish Metrics Circuit Schematics (Load Cell)



Sub-system Highlights – LED Display

- 2 rain-gauge style displays
 - ▣ Increases the range of values for display
 - ▣ Avoids cold-weather issues with LCD displays
 - ▣ Easy to visualize, digitally controlled circuit
- Low-voltage indicator light
 - ▣ Transistor switch controlled

Sub-system Highlights – LED Display Circuit Schematic



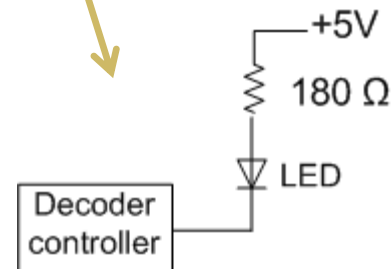
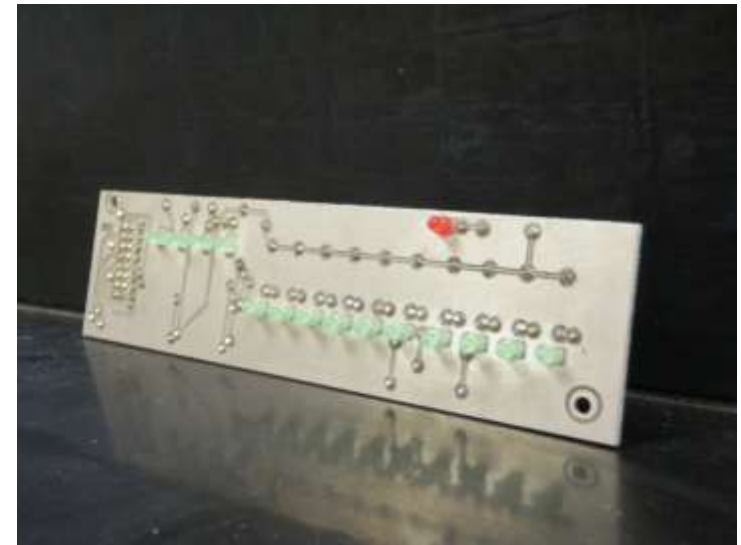
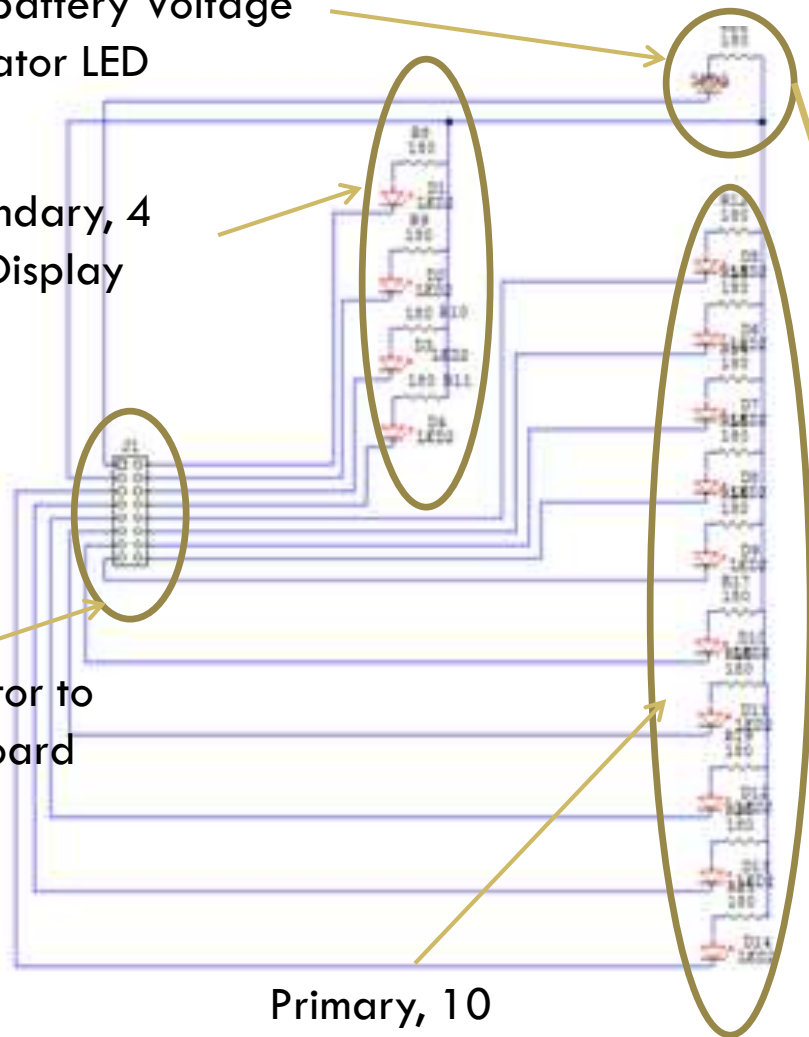
Sub-system Highlights – LED Display Circuit Schematic (page 2)

Low battery Voltage
Indicator LED

Secondary, 4
LED Display

Connector to
main board

Primary, 10
LED Display

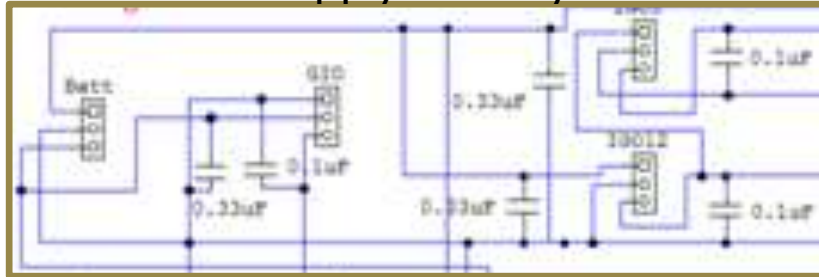


LED board
pictured
measures
5.5"x1.5"

Entire System Circuit Schematic

(Except LED Board)

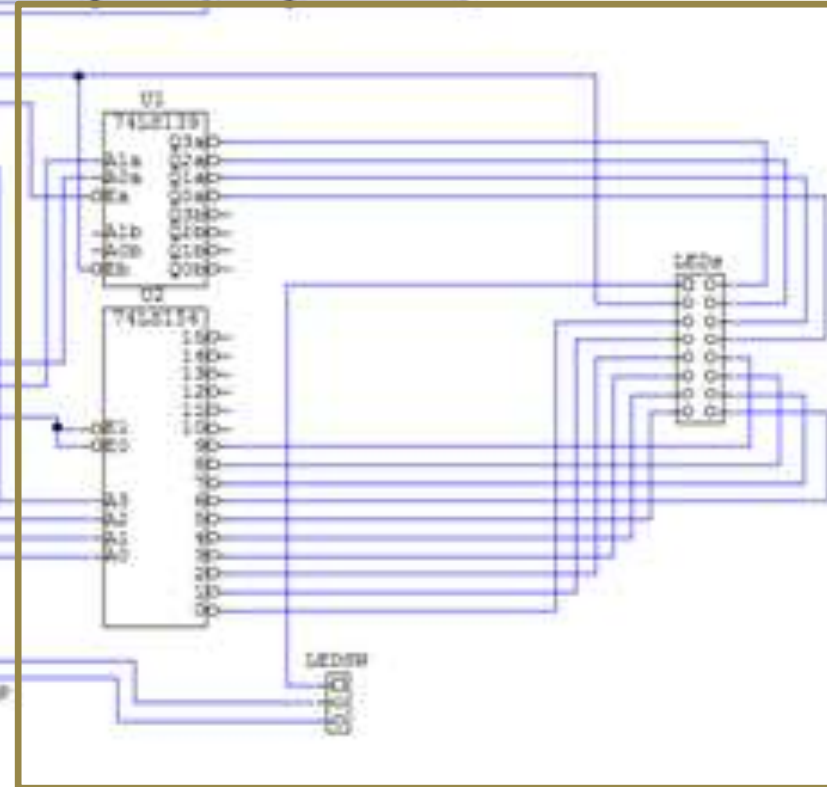
Power Supply Circuitry



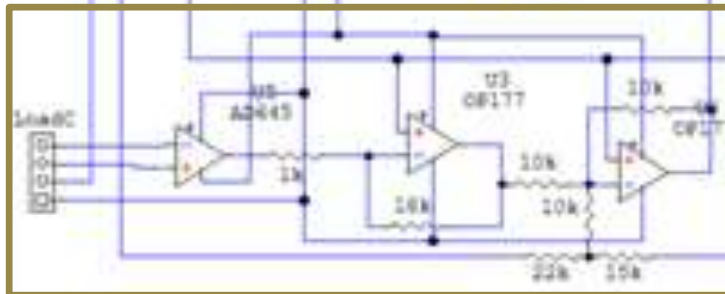
ATtiny861



LED Display Circuitry



Load Cell Circuitry



Design Specifics – Part Costs

Component	Cost
Microcontrollers	4 @ \$3.00 each = \$12.00
Heating Element(s)	3 different possibilities totaling \$11.88
String Potentiometer	2 @ \$138.00 each = \$278.00
Load Cell + mounting hardware	\$85.00
Batteries	\$16.88
Other Components (provided by the ECE Department shop)	~\$45.00
Total project cost (minus fly rod and shipping)	\$448.76

\$310.76 with only one string-pot

Major Issues

- Heating Elements

- Tried several options before finding one that had potential
- Cost-limited by one company (minimum order price of \$250.00)

Major Issues

- Moving to a PCB from the breadboard
 - ▣ Design was fully-functional on a breadboard
 - ▣ Mistakes in PCB design
 - More difficult to fix than on a breadboard
 - ▣ More difficult to test than a breadboard circuit

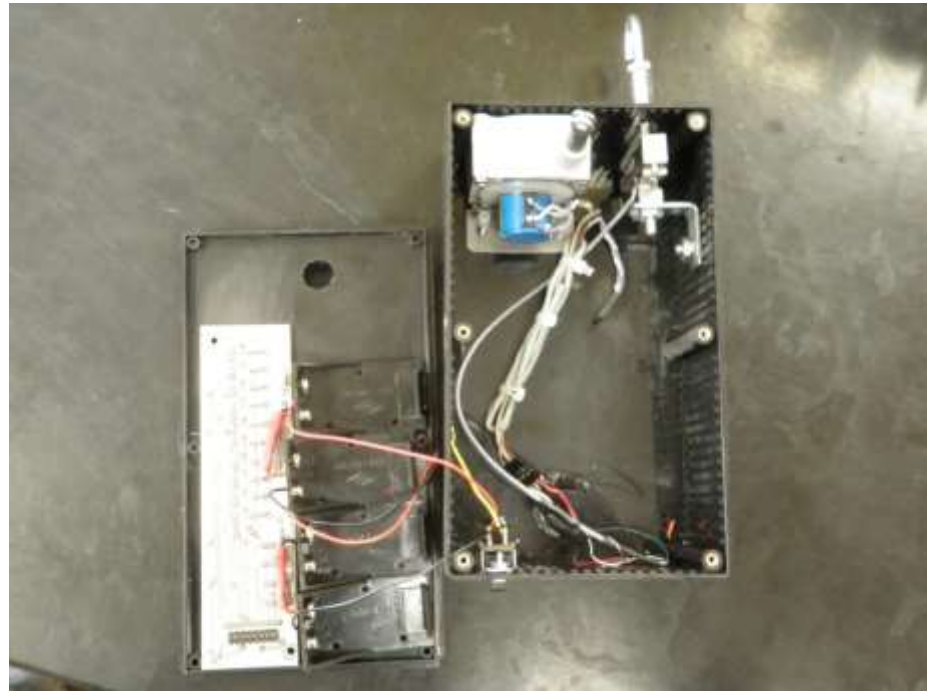
Future Work

- Streamline guide heating
- Data storage
- Eliminate external wiring between hip-pack and rod
- Weather-proof the hip-pack

- Separate heat from fish metrics for two separate products

Acknowledgements

- Orvis
- Dr. Whitman
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Questions?

