
# Automatic Cocktail Dispenser

## Electrical & Computer Engineering

Group 32: Carson Van Pelt, Ben Thuma, Caleb Kong

MAY 3, 2023

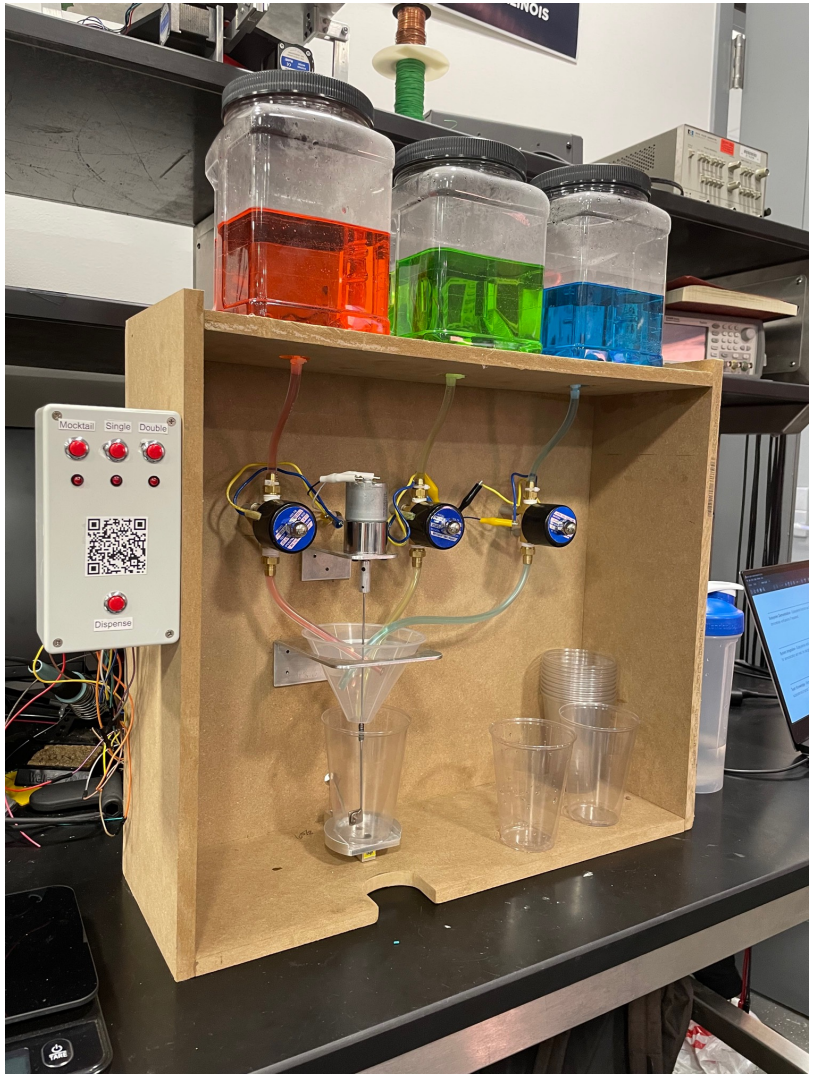

RUSSELL'S
TEMPLETON RYE
BARREL STRENGTH
TEMPLETON RYE
THE GOOD STUFF
MICHTER'S
OLD OVERHOLT
BENCHMARK
HOOSIER BOURBON
BREAKER
CALUMET
WILD TURKEY
WILD TURKEY RYE
WILD TURKEY 101
KENTUCKY SPIRIT
WOODINVILLE
E.W. HARPER
WILD TURKEY Rare Breed
COWBOY
TRAIL'S END
OLD FORESTER
SINGLE BARREL
1792
LARCENY
1870
92 PROOF
TOWN BRANCH
RESILIENT
EHRA BROOKS
99
STRAIGHT RYE WHISKEY
JIM BEAM
SINGLE BARREL
FOUR ROSES

# OBJECTIVE

Goal: Create an automated cocktail dispenser with standardized ingredient portions and different cocktail choices.

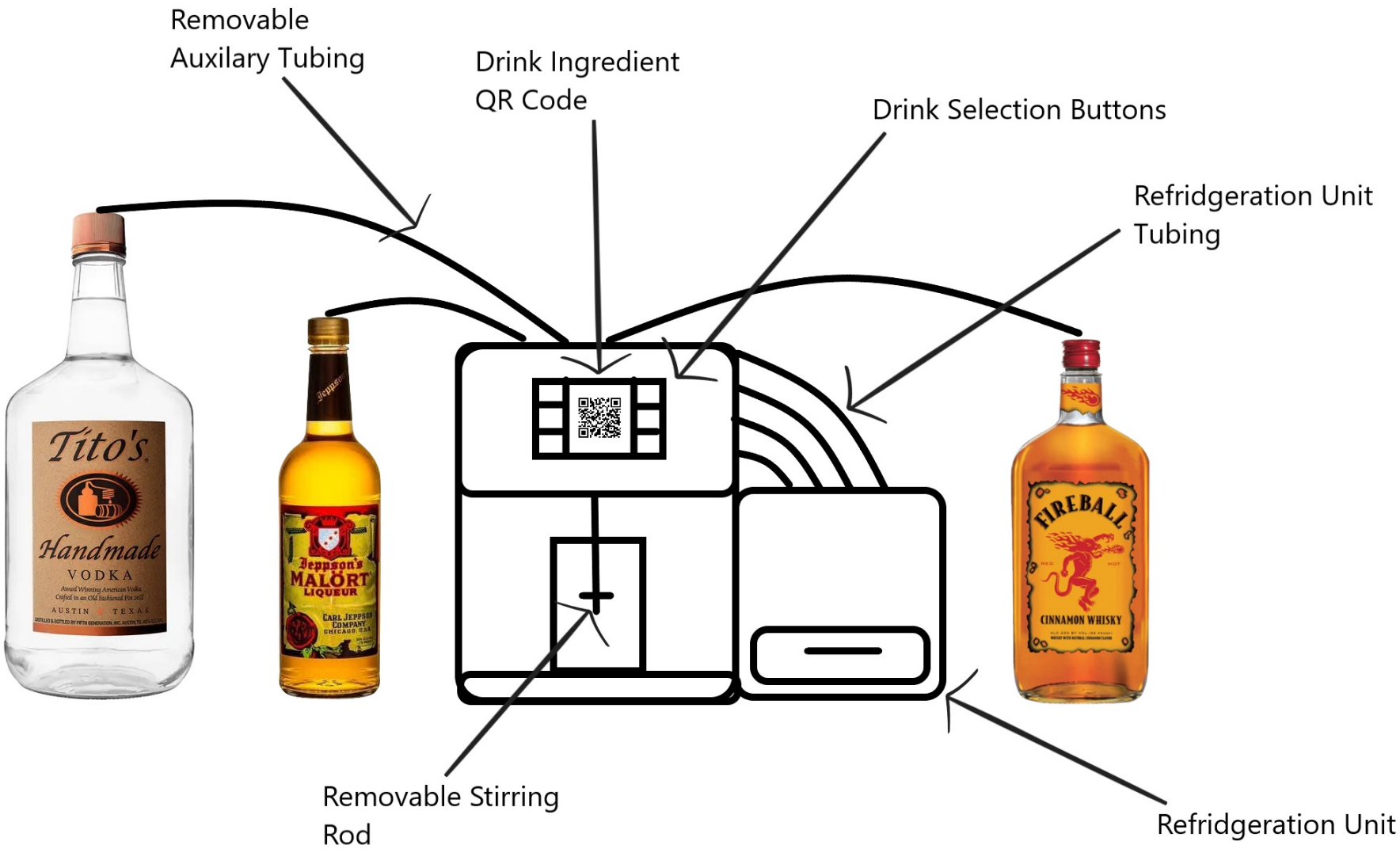
# Functional Requirements

1. Dispense the user's chosen drink with no selection error.
2. Dispense the correct quantity of each ingredient for each respective cocktail with ~10% accuracy (i.e. mass of the finished cocktail is 205g).
3. Mix the drinks uniformly after a successful dispense.

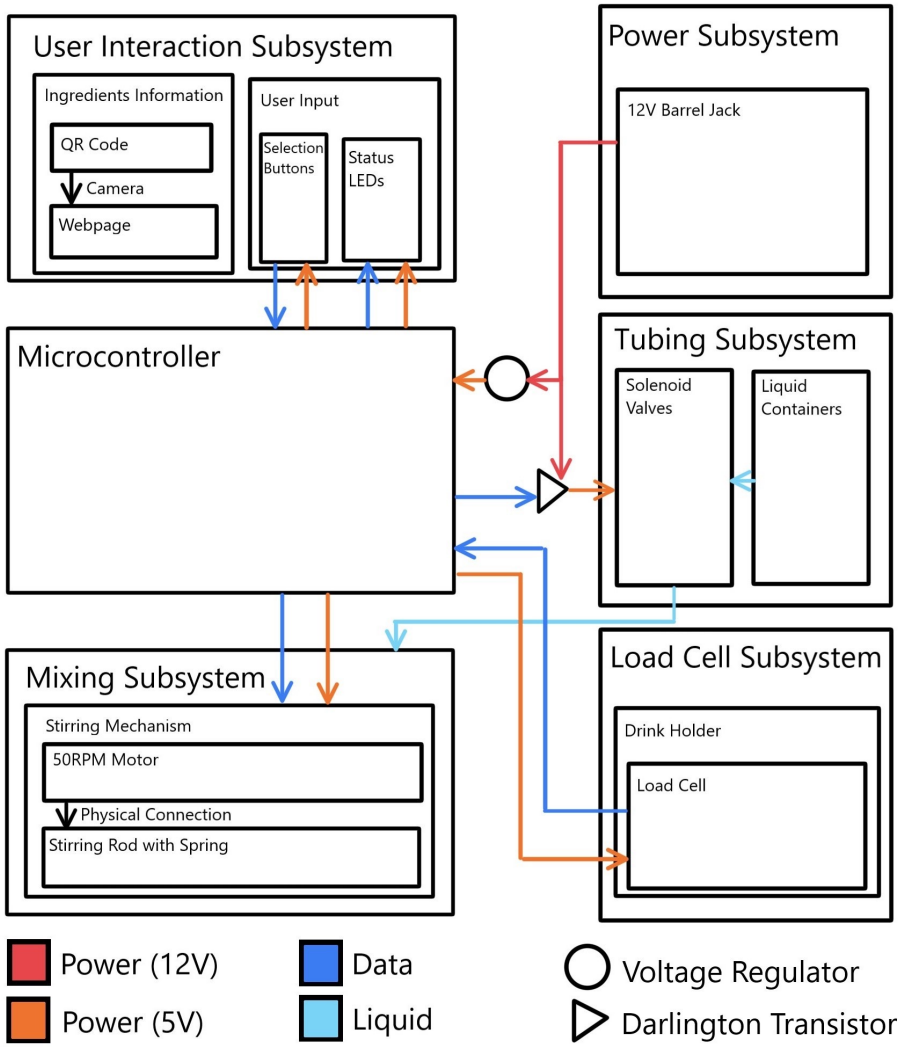


# Original Design + Changes

# Original Idea



# Block Diagram



# User Interaction Subsystem


## Buttons:

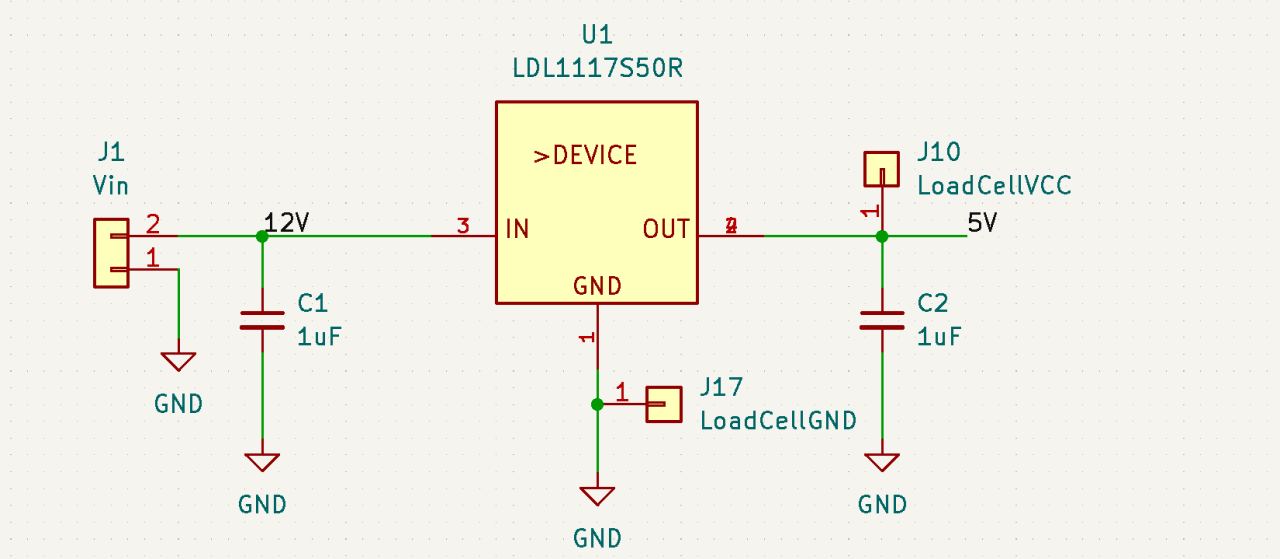
- 10kOhm resistor to reduce current
- 1µF debouncing capacitor

## LEDs:

- 1kOhm resistor to reduce current
- Current Rating: 35mA
- Voltage Rating: 2V

## LDL1117S50R

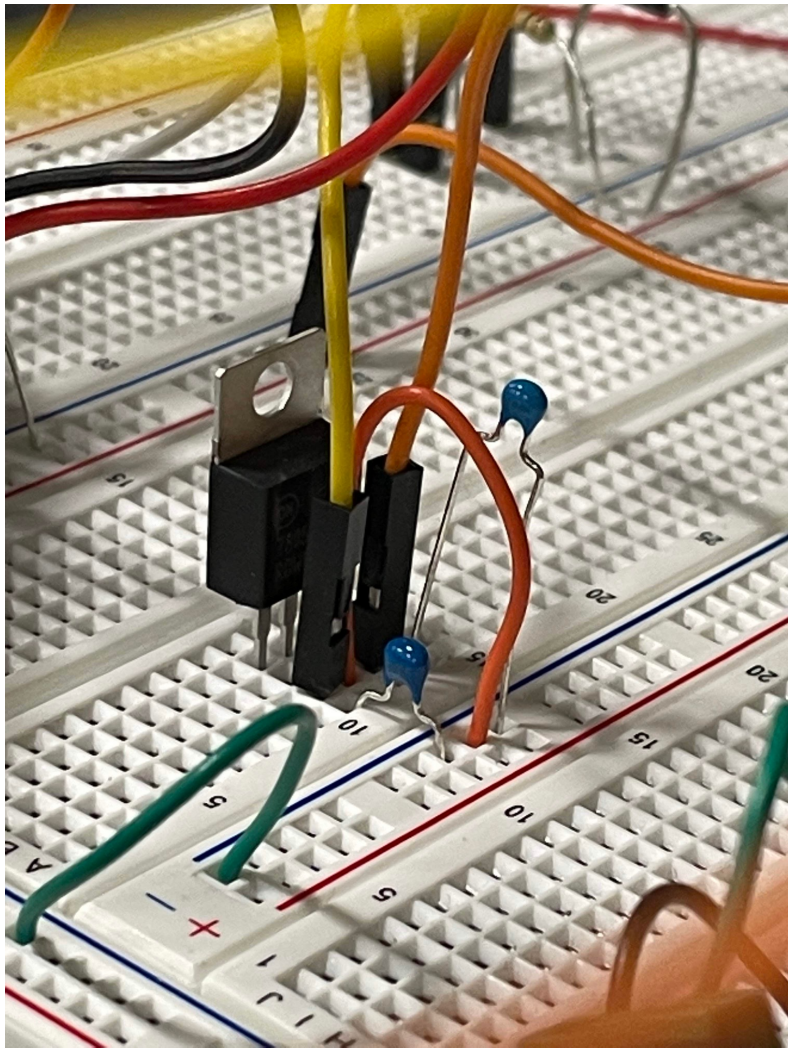
- Voltage regulator in the original PCB design, but it failed to function when soldered.
  - Voltage Input (Max) - 18V
  - Voltage Output (Min/Fixed) - 5V
  - Current Output - 1.2A



# Power Subsystem

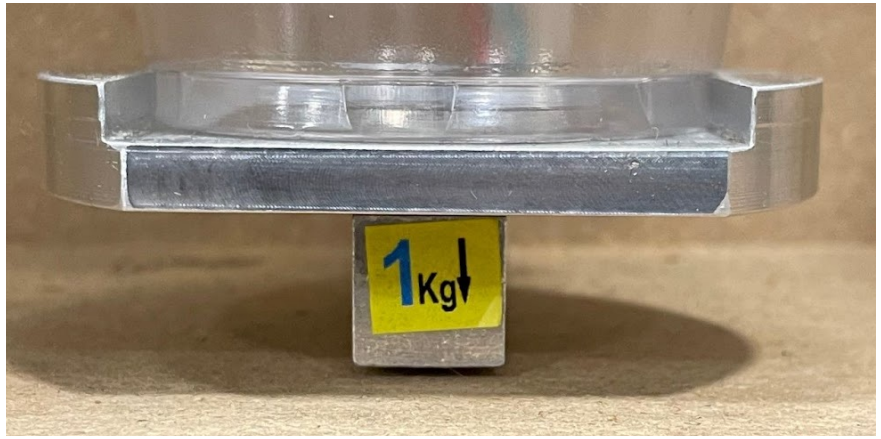
## LM7805

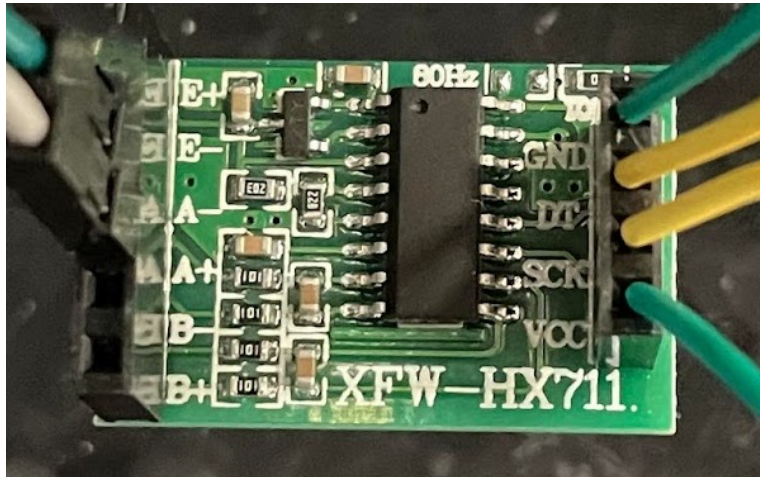
- Used different regulator when breadboarding the circuit.
  - Voltage Input (Max) - 35V
  - Voltage Output (Min/Fixed) - 5V
  - Current Output - 1A
- 12V input to the circuit attached to all positive leads of solenoids/motor
- Regulated 5V connected to ATMEGA328



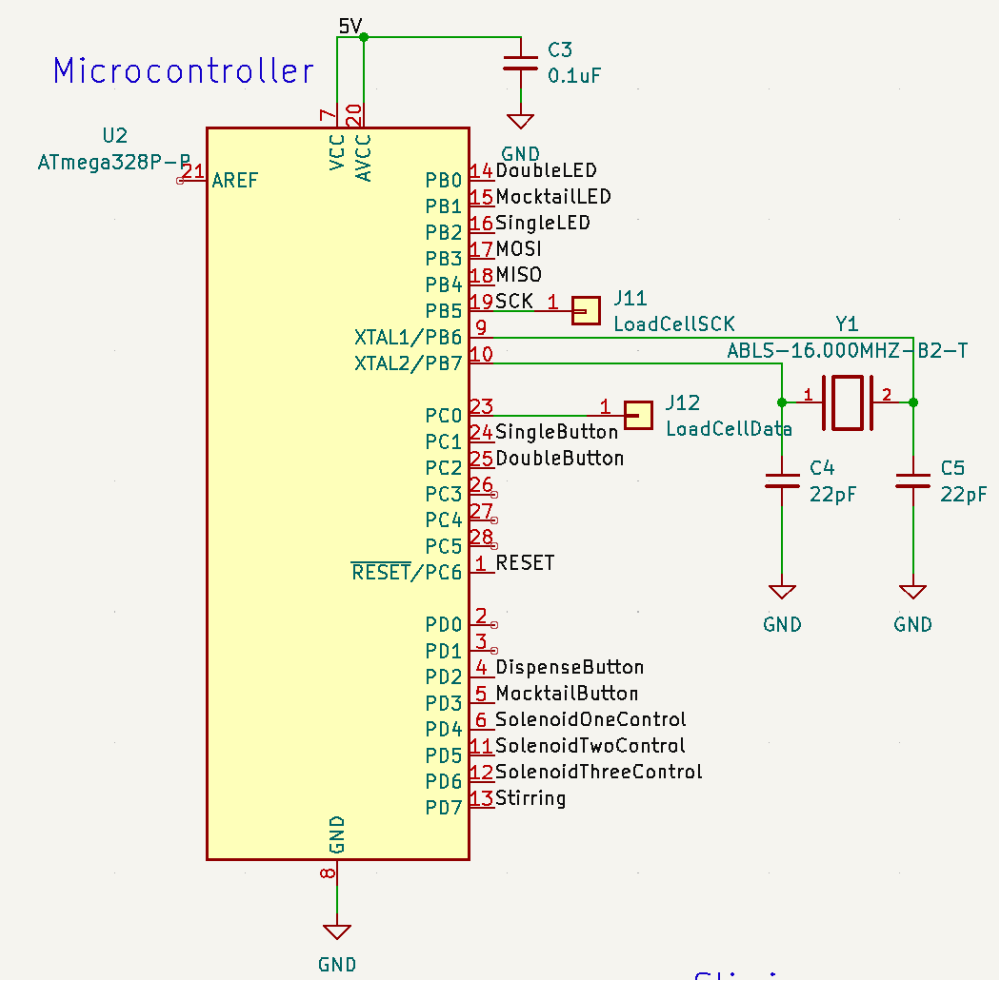
# Load Cell Subsystem

- 1kg Load Cell sensor
- HX711 Load Cell Amplifier (ADC)
- Tested with Arduino Uno for calibration



# Microcontroller



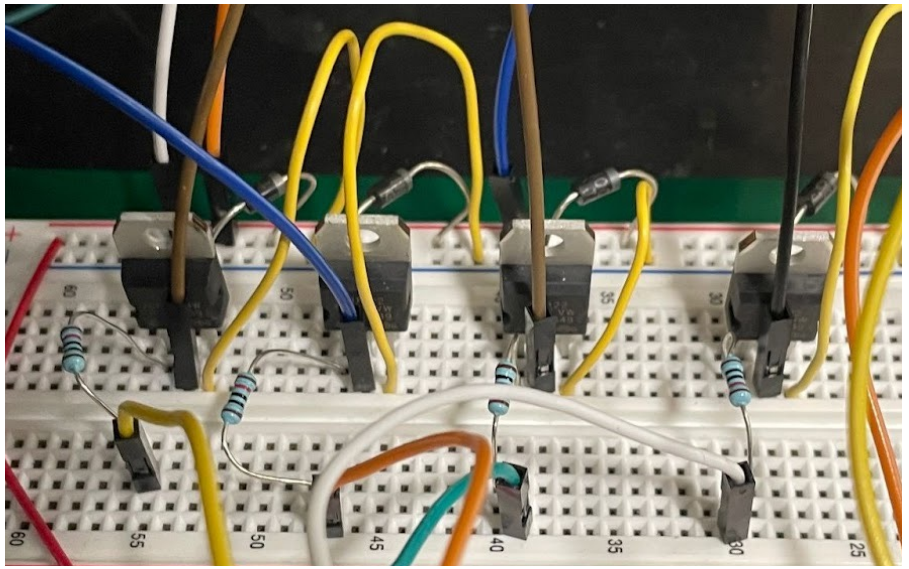

## ATMEGA328P-P

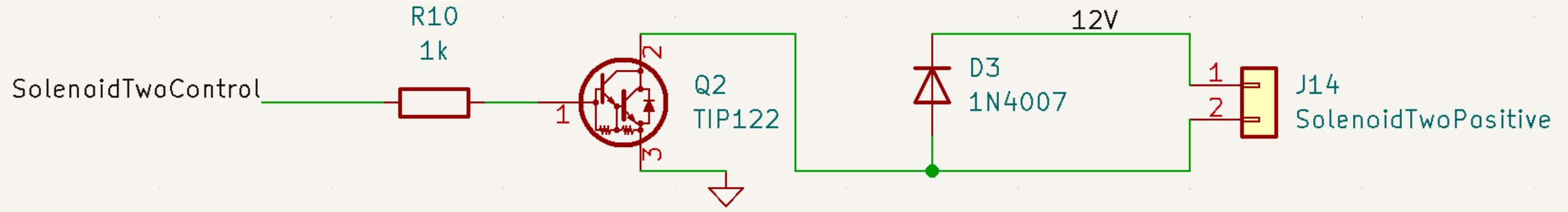
- 1.8V – 5.5V operating voltage
- Satisfied our I/O pin requirement (23)
- 32 KB EEPROM
- Easy to test as our Arduino Uno shares the same microcontroller
- Capacitors chosen to help regulate oscillation

## Control

- Original design: MOSFET
- Final design: Darlington Transistor (TIP122)

- Flyback diode prevents voltage spikes (1N4002)
- Resistors used at the base of the transistor limits current





## Ratings

- Electric Solenoid Valves
  - 12V DC Operating Voltage
  - Current Rating – 2A
  - Actual Current – 1A

- 50 RPM Gear Motor
  - 12V DC Operating Voltage
  - Current Rating – 600 mA
  - Actual Current – 180 mA

# Results

# Initial Dispense Trials

| Input | Projected Values | Solenoid 1 | Solenoid 2 | Solenoid 3 |
|---|---|---|---|---|
| Mocktail | 0, 0, 205 | 0 | 0 | 203 (-2) |
| Single | 41, 82, 205 | 46.33 (+5.33) | 85.33 (+3.33) | 202 (-3) |
| Double | 82, 164, 205 | 85.67 (+3.67) | 163.33 (-0.67) | 203 (-2) |

*Table 1: Initial Dispense Trials by Solenoid (in grams)*

# Updated Dispense Trials

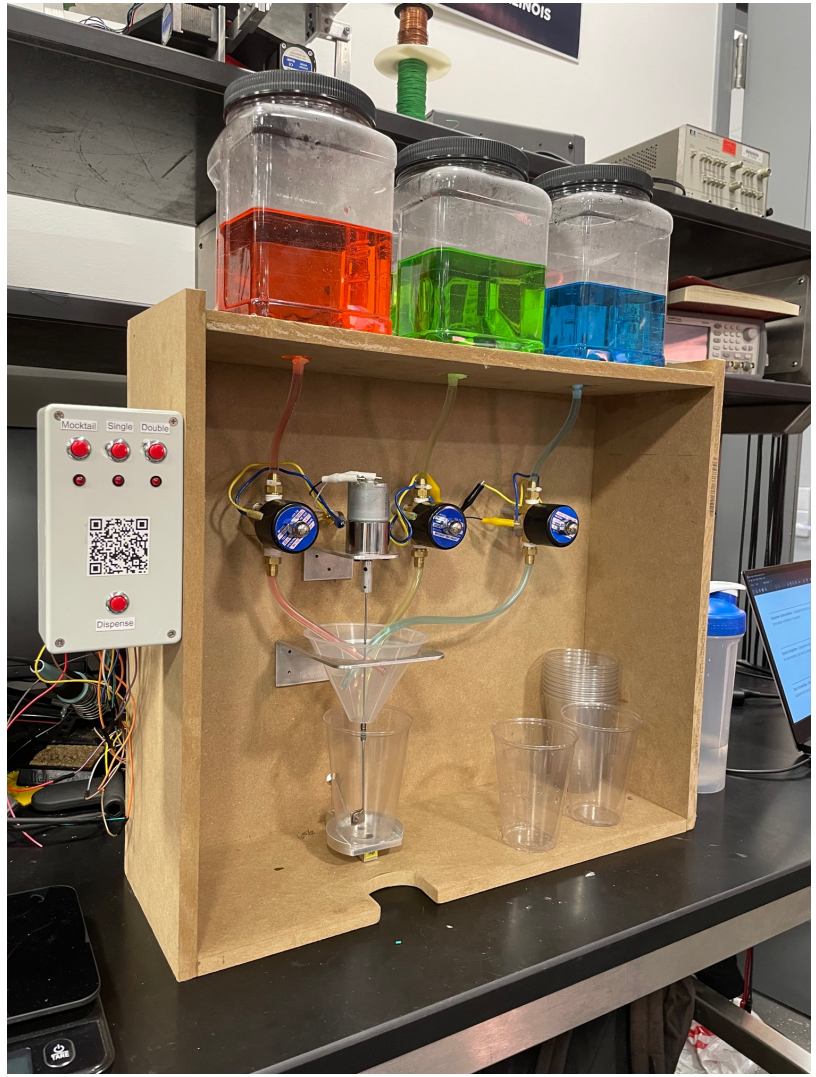
| Input | Updated Values | Solenoid 1 | Solenoid 2 | Solenoid 3 |
|---|---|---|---|---|
| Mocktail | 0, 0, 207 | 0 | 0 | 205 |
| Single | 34.5, 78.5, 207 | 41 | 82 | 205 |
| Double | 78, 164.5, 207 | 82 | 164 | 205 |

*Table 2: Updated Dispense Trials by Solenoid (in grams)*


# Demonstration

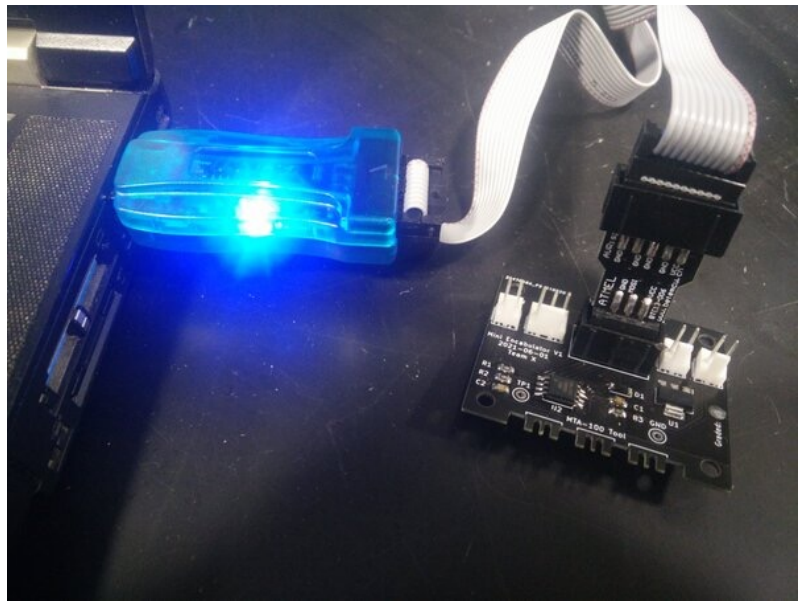
# Successes

1. Dispense the user's chosen drink with no selection error.
2. Dispense the correct quantity of each ingredient for each respective cocktail with ~10% accuracy (i.e. mass of the finished cocktail is 205g).
3. Mix the drinks uniformly after a successful dispense.



# Challenges

- Voltage Regulation (PCB)
- AVR Programmer
- Inaccurate Drink Selection

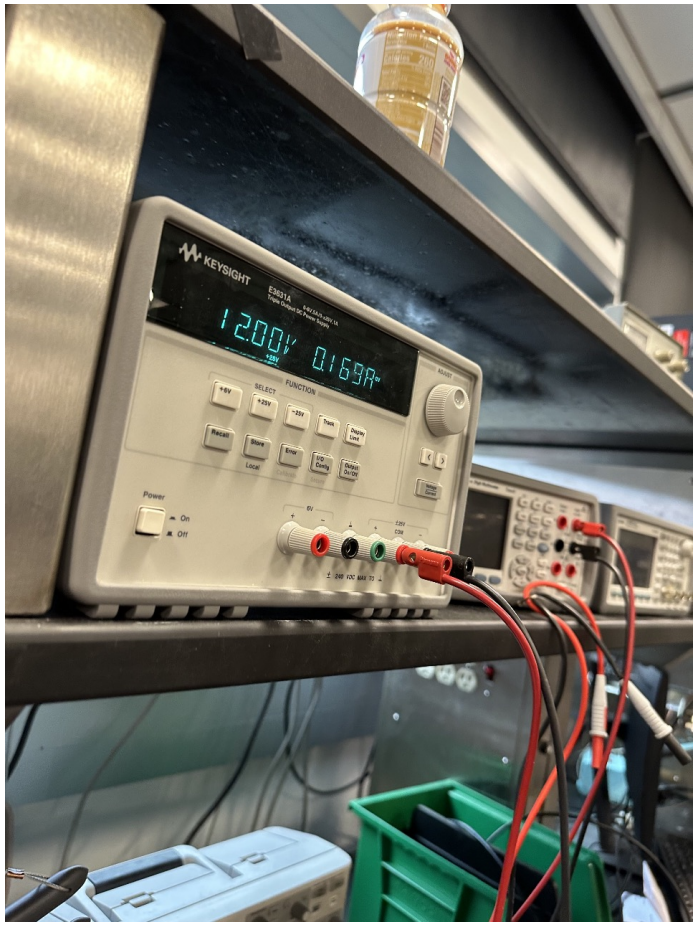


```
146  if (disp_butt_pressed) {
147    LoadCell.tareNoDelay();
148    delay(3000);
149
150    delay(2000);
151    digitalWrite(SOL1_PIN, HIGH);
152    if (sol1_mass)
153      readLoadCell(sol1_mass);
154    digitalWrite(SOL1_PIN, LOW);
155
156    delay(2000);
157    digitalWrite(SOL2_PIN, HIGH);
158    if (sol2_mass)
159      readLoadCell(sol2_mass);
160    digitalWrite(SOL2_PIN, LOW);
161
162    delay(2000);
163    digitalWrite(SOL3_PIN, HIGH);
164    if (sol3_mass)
165      readLoadCell(sol3_mass);
166    digitalWrite(SOL3_PIN, LOW);
167
168    delay(2000);
169    digitalWrite(MOTOR_PIN, HIGH);
170    delay(20000);
171    digitalWrite(MOTOR_PIN, LOW);
172    delay(5000);
173
174    disp_butt_pressed = false;
175
176  }
```

# Conclusion

# What we Learned

- Even "simple" projects require significant R&D and planning
- Extra time should be allotted for unexpected setbacks
- Balancing responsibilities can be difficult
- Realistic expectations are important
- Data collection is crucial for any successful project
- Thoughtful decisions are better than quick decisions

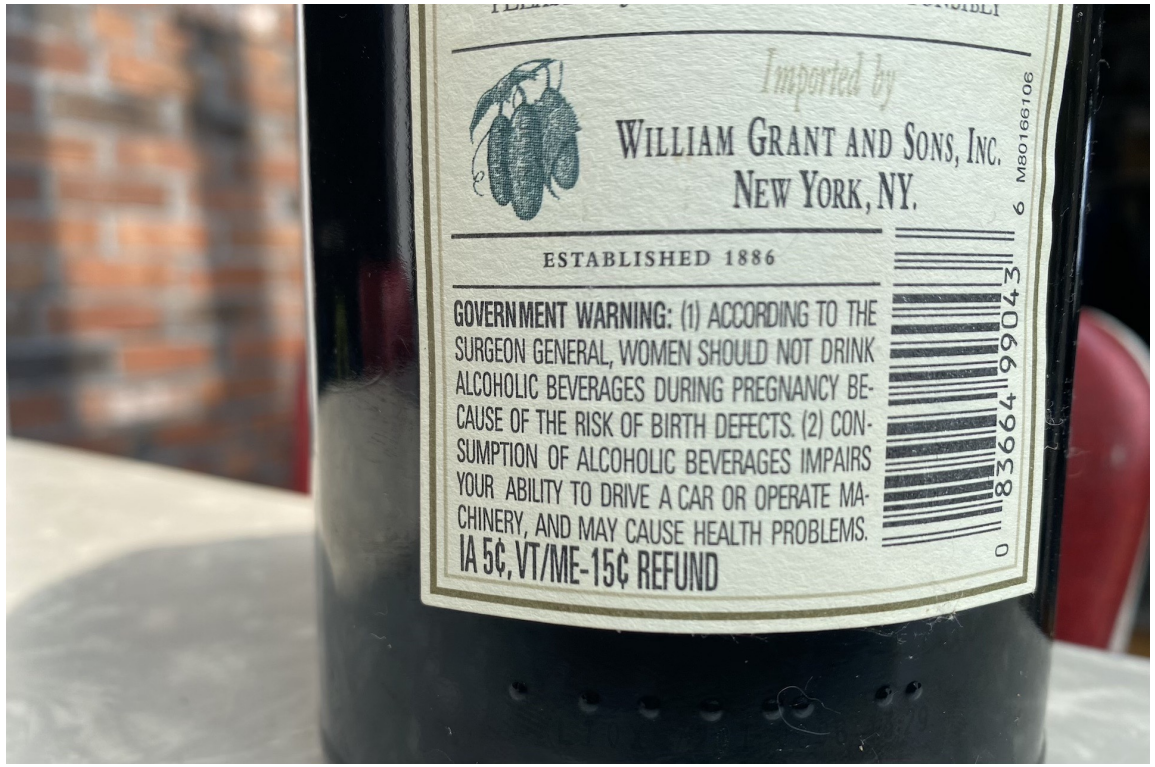


# Future Changes/Design Revisions

- Higher RPM motor
- Retractable and/or removable motor
- Quick release tubing for easier cleaning
- On device screen which displays menu and modifies masses according to currently selected drink
- Wider dispensing plate to allow for more cups
- More ingredient containers

# Ethics

- Underage drinking
  - Default drink mocktail
- Website warnings



# Questions?

# Thank You

## Contact Information:

Carson Van Pelt: carsonv2@illinois.edu

Ben Thuma: bthuma2@illinois.edu

Caleb Kong: calebk3@illinois.edu

# The Grainger College of Engineering

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN