Kyle Fox
Engineering Journal - Senior Design
2023-2024

09/25: - Meeting with Dr. Brown about current system

09/19: - Group planning & discussion of work

09/21: - Solidifying Tasks, using GIT, planning items for each of us to work on
- Find IC, ADC, Hardware for System

09/26: - IC = Rasperry Pi pico
- Need to Solidify ADC
- Use oneshot pulse generator for pulse
- Use Charge Circuit per amplifier

09/28: - Documentation [SDD SRS]
+Look into pulse amplifiers
+Look into ADC's

09/29: - Meet Dr. Brown asap
- 80 MSPS needed for ADC
- Possible expansion of more inputs
- Need Design check before Purchase of items
- Create a platform for him to send us next task
+ Design amplifier
+ System Setup, Block Diagram

+ 1/54kHz → 18.51 NS

+ 1/500kHz → 2 NS

+555 minimum PULSE 0.5 NS → 500nS

10/03: - Wait ~7.5 min to charge capacitor initially
- 15 GPIO pins for controller/display system
- Stop button flow at 11V
- Fans controlled by I2C
+5.6K & 3nF

+Filter input to ADC
+Matching impedance for ADC
+ADC Buffer Chip [FPGA]
+BNC connectors

10/05: - Presentations

10/10: - Looking over new ADC
- Timing Circuit

10/12: - Discussion of future plans

10/17: - Moving things to my lab
- Discussion

10/18: - Meeting with D. Brown
- will use oscilloscope in future work, won't design one

10/25: - Purchase planning
- Work with oscilloscope
-

10/26: - SRS + SPD
- Purchase list clearance
- Presentation prep

10/31: - Oscilloscope work

[CH1
-Sine wave 50Hz, 400mV

CH2
-Pulse 50Hz, 4V, 0V offset, 200NS pulse width]

- SRS & SDD Finalization V2
  2.5 & 4.3 Sections

11/02: - Presentations

11/07: - Purchasing Items
- Planning RP Pico control
- Assisting with oscilloscope

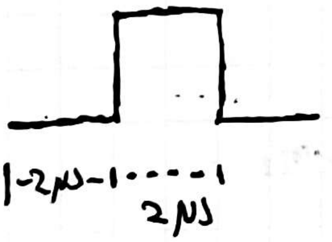
11/09: - Planning build process

11/14: - Parts arrive michael verify
- Planning & RP2040 code

11/16: - Work on RP2040 code
- Soldering timing chip/reviewing Datasheet

11/21: - Prep for pre-break items & our break items

11/28: + 2µs pulse



$T = 2\mu s$

$f = 1/T = 1/2\mu s = 1/2E{-}6 = 500\ KHz$

pio freq = 500 KHz

set(pins, 0)	1 cycle
set(pins, 1)	2 cycle
set(pins, 0) [3]	3-6 cycle

- Presentation modification [ADD Rx/Tx section]
- Final Test plan Document

11/30 → 12/7: - class presentations
- prepping presentation for our group presentation
- 3-min video

01/11: - Box Planning & location Designs

01/16: - "

01/18: - "

01/23: - Cutting holes in box
+ Using Dremel to square the holes

01/25: - Setup Computer
User: Jeffrey
Pass: PASSWORD
Question: PASSWORD

01/30: - Finalizing Computer Setup
+ Finding Computer Hardware for Charging

02/01: - Coding PID Controller

02/06: - "
+ Research on restoration the code

02/08: - Plan PWM Code
- Work on Computer System

02/13: 11 Output leds
3 ADC input
Start/Stop/Select Switch
2 pull down control pins

SM: ①

① Control State
Wait for Stop to go high
Start
Select

If Stop	Do nothing	Go 1
If Start	Store Select value and begin	Go 2
If Select	Change Select value	Go 3

② Run State

Start running timer: After the select		Go 1
Monitor ADC values		
Set warning lights		
Control pulse	If SW A	Go 1

③ Update State

Change Select value when button pushed		Go 1

Max ADC 3.1 V-ish

④ ERROR

Cap Voltage	Divider voltage
0	0
25	.138
48.5	.278
88	.504
138.7	.797
192.5	1.114
241	1.707
347	2.071
397	2.37
400	2.42
444	2.744
458	2.80
467	2.865
475	2.931
480	2.965
481	2.968

Pin Map:

0		
1		
GND		
2	1	LED control
3	2	
4	3	
5	4	
GND		
6	5	
7	6	
8	7	
9	8	
GND		
10	9	
11	10	
12	11	
13	12	
GND		
14	Control #1	
15	Control #2	

	A2
	AGND
Voltage #2	A1
Voltage #1	A0
	RUN
[illegible]	22
	GND
[illegible]	21
Start	20
Stop	19
Select	18
	GND
	17
	16

02/24/25

→ PicoScope 4824A, 12bit, 80MS/s, 20 MHz bandwidth, 256MS buffer
- PicoScope SDK to control
- python wrapper for SDK

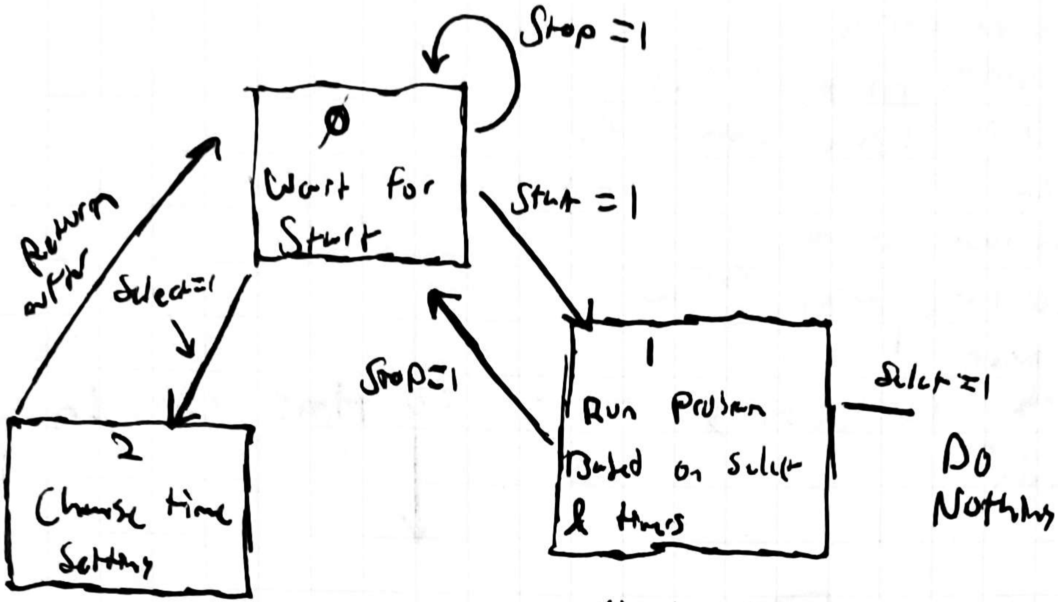
02/28

- Not present
+ worked on RP2040 controller
+ Began finalizing Pin mapping & Design of system control hardware

+ Run() runs the system
+ Setup() sets up pin outputs
+ button() waits for button & changes state

02/22 +

+ State machine



- Check for voltages validity
- Use PID to time properly

- Time Steps of

- Install proscope libraries → Uninstalled
- 6hr test, 12, 24, 48, 72

02/26

- State 2 →
  Array of time values
  increment array 1
  return new value

02/29

- ~~Turn on Relay control #1 → ISolution~~
- ~~Check voltage on ~~transistor~~ transistor~~
- ~~Pulse through control #2~~

- ~~Check Capacitor Voltage~~

- Presentation March 7th
- SDD, SRS March 3rd

Check rubric for partner

20 min

407-404-1210 - Layton's #

~~Trigger Fault~~

- First 10 min has passed
- Check Capacitor voltage
  - if at acceptable margin, Continue
  - if not, wait 1 min, check again
- Turn on relay
- Check transducer voltage
- if @ acceptable margin, Continue
  - if not wait 1 min
- pulse both oscilloscope & transducer 50 times even 1ms
- wait 10 min