



Kyle Fox Engineering Journal - Senior Design 2023-2024

09/15: - Meeting with Dr. Brown about what system

09/19: - Group planning & discussion at work

09/21: - Solidifying tasks, using GIT, planning items for each
or us to work on
- Find IC, ADC, Hardware for system

09/26: - IC = Raspberry Pi Pico
- Next to Solidify ADC
- Use one-shot pulse generator for pulse
- Use Charge circuit for amplifier

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

09/29: - Meet Dr. Brown again
- 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 - meet with
+ Design amplifier
+ System Setup, Block Diagram



+ $1/54\text{kHz} \rightarrow 18.5\text{ns}$

+ $1/500\text{kHz} \rightarrow 2\text{ns}$

+ 555 minimum pulse $0.5\text{ns} \rightarrow 500\text{ns}$

10/03: - Wait ≈ 7.5 min to charge capacitor initially
- 15 GPIO pins for Controller/display system
- Stop button flow at 11V
- Fuses connected to I2C
+ 5.6K & 3nF

+ Filter input to ADC
+ Multiplexer input for ADC
+ ADC Buffer chip [FPGA]
+ DAC components

10/05: - Presentation

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 Dr. Brown
- will use oscilloscope in future work, won't design one

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

10/26: - SPI & SPD
- Purchase list cleaning
- Presentation prep

10/31: - Oscilloscope work
[CH1
- Sine wave 50Hz, 400mV
CH2
- Pulse 50Hz, 4V, 0V offset, 200ns pulse width]

- SRS & SDA Finalization V2
2.3 & 4.3 specs

11/02: - Presentation 5

11/07: - Purchasing Items
- Planning RP Pico Control
- Addressing with oscilloscope

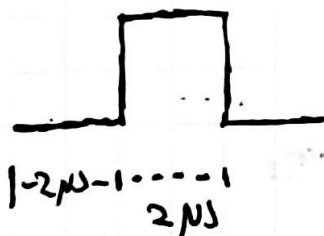
11/09: - Planning build process

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

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

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

11/28: + 2 μ s pulse



$$T = 2 \mu s$$
$$f = \frac{1}{T} = \frac{1}{2 \mu s} = \frac{1}{2 \times 10^{-6}} = 500 \text{ KHz}$$

Pico freq = 500 KHz

Set(Pin, 0)

1 cycle

Set(Pin, 1)

2 cycle

Set(Pin, 0) [3]

3-6 cycle

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

11/30 \rightarrow 12/7: - Class Presentation 5
- Prepping Presentation for our group presentation
- 3-min video

01/11: - Box Planning & location Budget

01/16: - "

01/18: - "

01/23: - cutting holes in box
+ using Dremel to square the holes

01/25: - Setup Computer
User: Jeffery
Pw: PASSWORD
Question: PASSWORD

01/30: - Finalize Computer Setup
+ Finish Computer Hardware for charging

02/03: - Coding Pico Controller

02/06: - "
+ Restart to restoration the code

02/08: - Plan PCB Layout
- Work on Computer System

02/13: 11 Output led
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	60 1
If Start	Store Select value and begin	60 2
If Select	Change Select drive	60 3

② Run State

Start running timer	: After the select	60 1
Monitor ADC values		
Set warning lights		
Control pulse	: If SMA	60 1

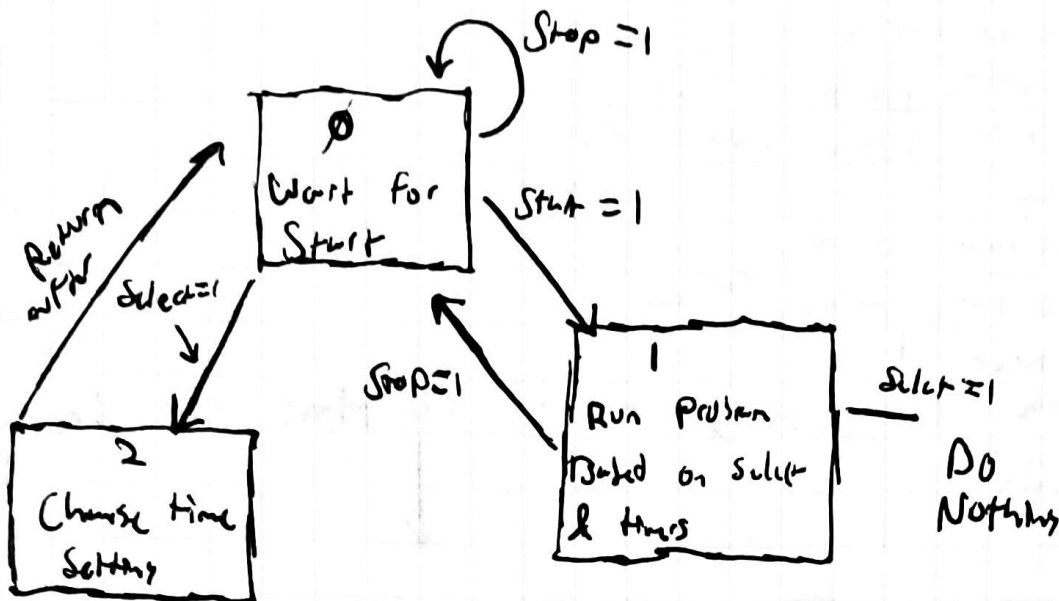
③ Update State

Change Select value when button pushed	60 1
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Max ADC 3.1 V-54

④ ERROR

02/22 +
+ State machine



- Check for voltages validity
- Use PIO to time properly

- Time steps of

- Install proScope libraries → Uninstall
- for test, 12, 29, 48, 72

02/26

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

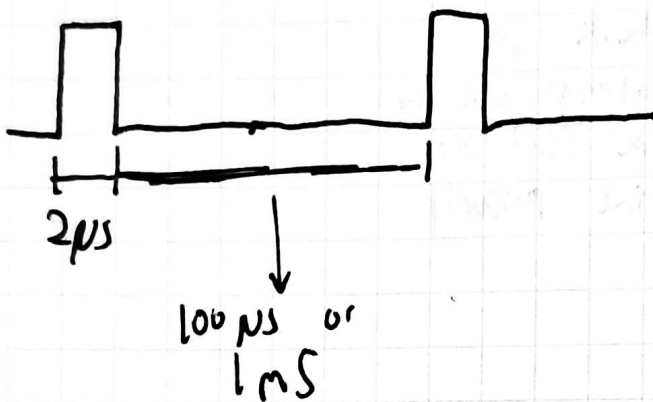
02/29

- Turn on Power control 4th → 5th
- Check voltage on ~~control~~ 4th
- Pulse through control 4th
- Check Capacitor voltage
- Check voltage for power 20 min
- Activation March 2th
- SDD, SRS March 3th

407-404-1210 - Lark's #

~~Test~~

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



08/05

- Class Presentations

LED #	PIN	Description
2	2	Over heat
3	3	SD Card Full
4	4	Low Battery
5	5	Test running
6	6	6 Hr test
7	7	12 Hr test
8	8	24 Hr test
9	9	48 Hr test
10	10	72 Hr test
11	11	System ready
12	12	Spare
13	13	Spare

03/07:

- Code flow checks

03/12 - 03/11:

+ BREAK

03/14:

+ DOENDING

03/21:

- Code flow

- PIO Coding

- Button Interrupt

03/26:

- Code flow

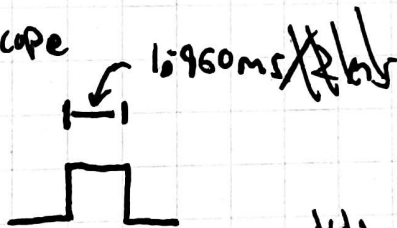
- PIO Code

- PIO Timing

- Testing with oscilloscope

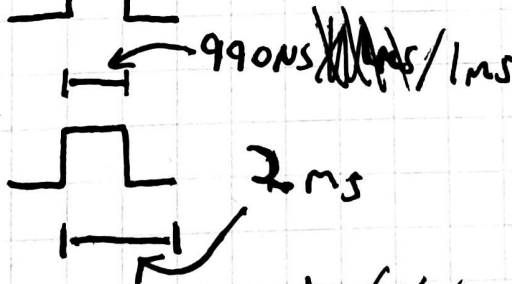
$f = 500 \text{ KHz}$

→



$f = 1 \text{ MHz}$

→



$f = \#X$

→ pulse width = $\frac{1}{X} \text{ / } 1/\text{Hz}$

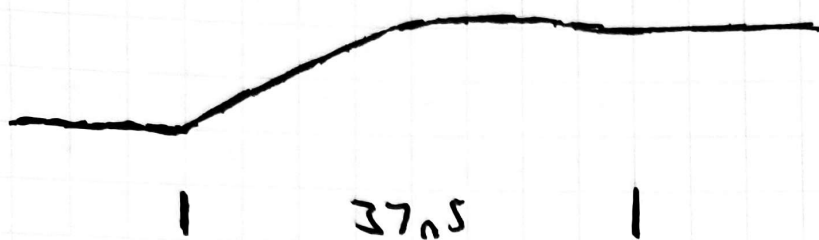
$$\cancel{\frac{2\text{ns}}{1} = \frac{1}{X} \cdot 0.5} \rightarrow \cancel{2\text{E-}5 / 0.5 = 1/X} \rightarrow \cancel{(2\text{E-}6 / 0.5) X = 1}$$

$$T = \frac{1}{f} \quad f = \frac{1}{T}$$

- CODE WRONG CHANGE LATER

- IMPROPER DELAY & CLK DEVELOPER CODE PIO

03/28,



- 3.4V

- 0V

- Rise time ↗

- Modified code to hit block to reach speed