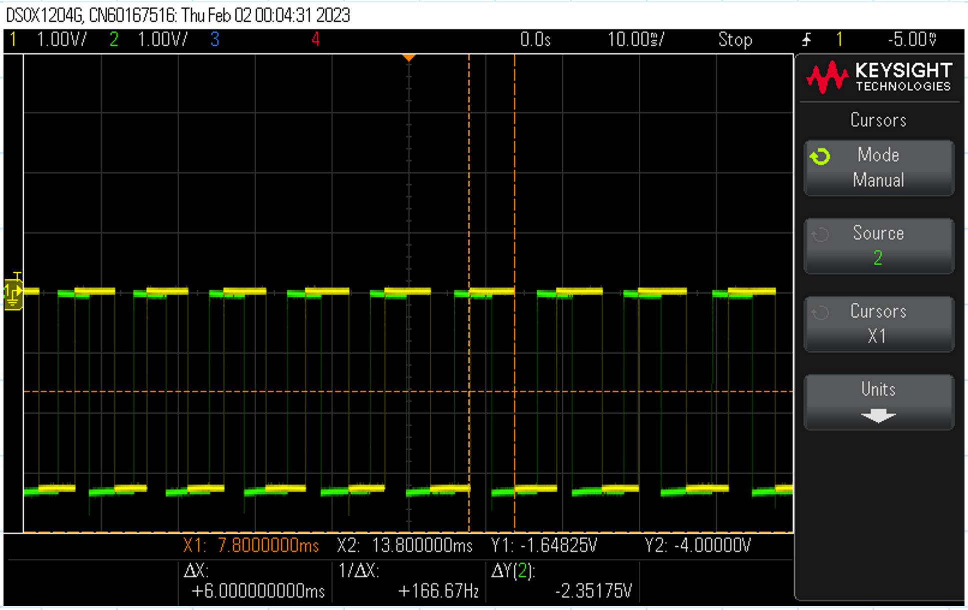
# Encoder

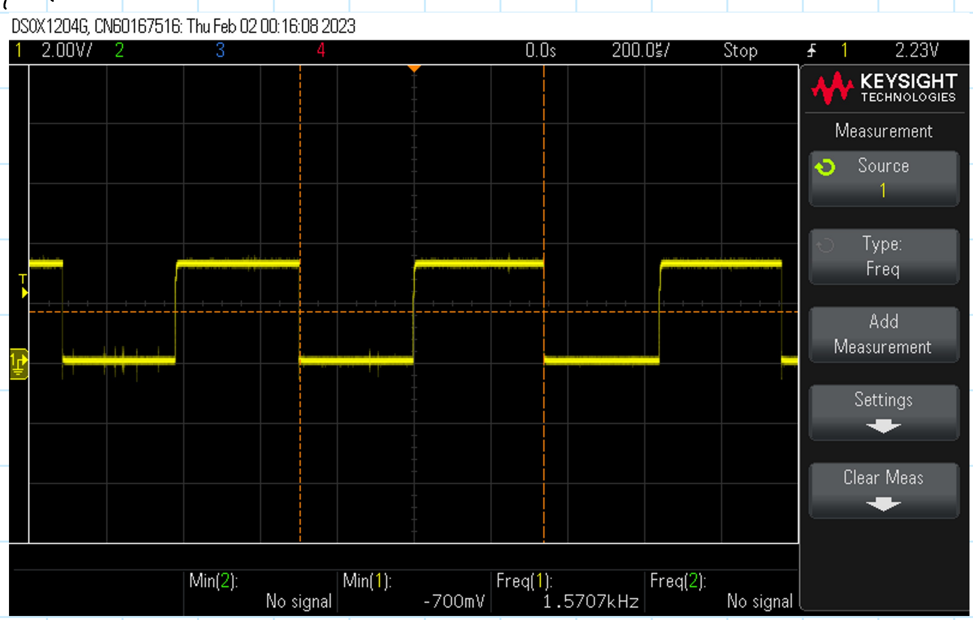
Wednesday, February 1, 2023 9:00 AM

A0




The signals has similar frequency, just one signal just has a delay

A1




A2

I used my phone camera's slow-mo camera to measure the rpm, I got 240 rpm for my motors

A3

Given the rpm of 240 and wheel radius of 4.1cm we can calculate how fast the robot runs

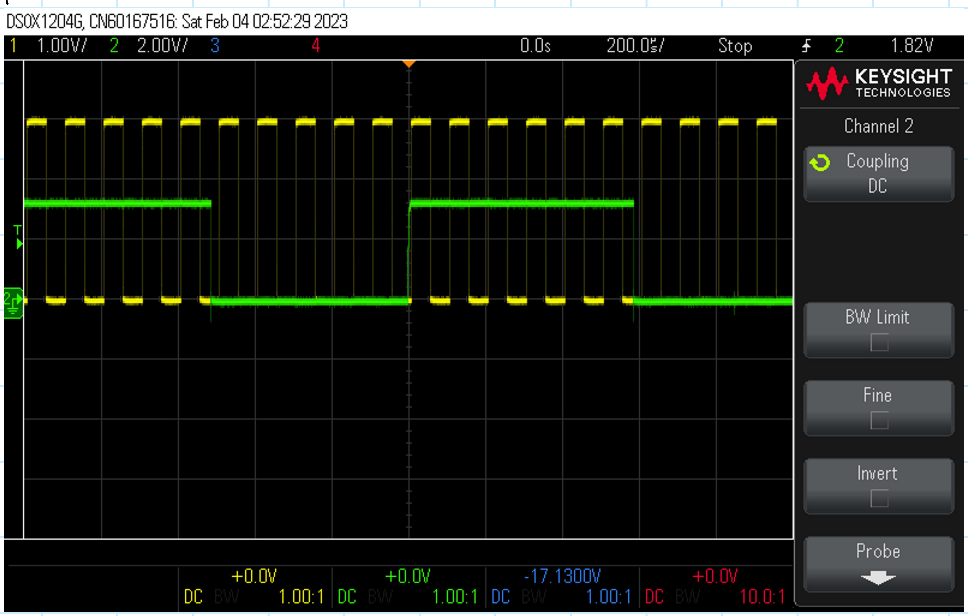
$240(4.1cm)(2\pi) = 6182$ cm per minute

A4

1570.7rpm *2*60/6 = 31414rpm

31414rpm/240rpm=131

A5




A8

| Duty | Frequency |
|---|---|
| 0% | 0Hz |
| 5%(minimum to start) | 57Hz |
| 10% | 158Hz |
| 15% | 257Hz |
| 20% | 362Hz |
| 25% | 457Hz |
| 30% | 561Hz |
| 35% | 658Hz |
| 40% | 757Hz |
| 45% | 852Hz |
| 50% | 939Hz |
| 55% | 1.060kHz |
| 60% | 1.108kHz |
| 65% | 1.173kHz |
| 70% | 1.295kHz |
| 75% | 1.448kHz |
| 80% | 1.460kHz |
| 85% | 1.510kHz |
| 90% | 1.611kHz |

| | |
|---|---|
| 80% | 1.460kHz |
| 85% | 1.510kHz |
| 90% | 1.611kHz |
| 95% | 1.642kHz |
| 99% | 1.712kHz |

B2

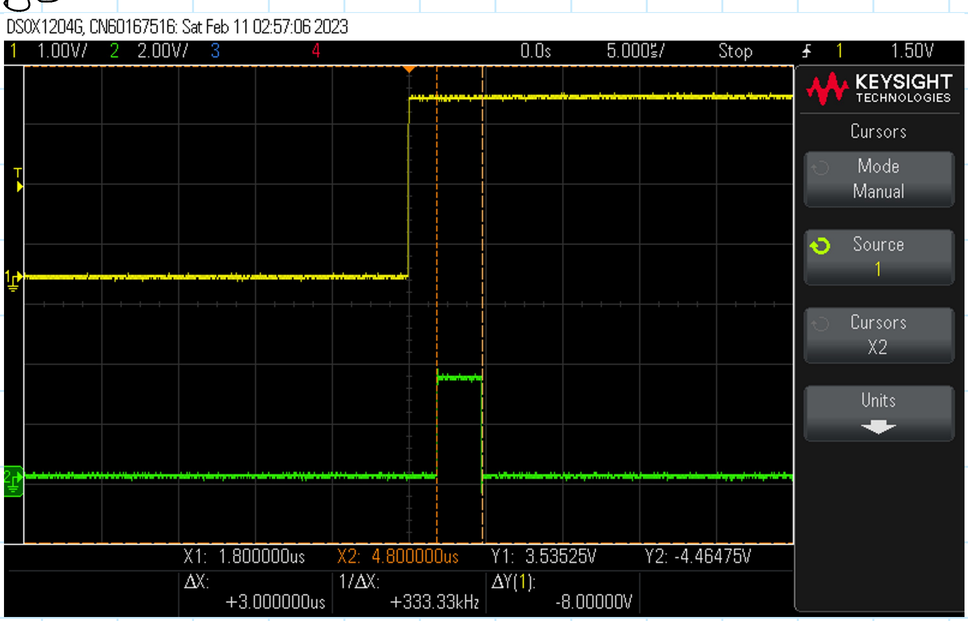
The four colums means the n numbers of times the code ran and the second and fourth is period

B4

| Frequency | Period1 | Period2 |
|---|---|---|
| 10Hz | 10994 | 20303 |
| 20Hz | 10994 | 10151 |
| 50Hz | 10994 | 43382 |
| 100Hz | 10994 | 54459 |
| 200Hz | 10994 | 59998 |
| 500Hz | 10994 | 23999 |
| 1000Hz | 10994 | 12000 |
| 2000Hz | 10994 | 6000 |
| 5000Hz | 10994 | 2400 |
| 10kHz | 10994 | 1200 |
| 20kHz | 10994 | 600 |

The pattern is that the period1 stays the same while after 200 Hz the period cuts in half before the period change

B5




Part B5
Takes 3us
Takes 1us after the rise

C2

It slightly runs to the right. when it runs 10 ft it is off by 1 ft to the right

1 fps = 1828.2 cm per minute

6182 cm per minute = 3.38 ft per second

$$\frac{1828.2\,(180)}{6182\text{cm}} = x$$

$x = 53.23$

53.23

54 (131) = 7074 rpm

$$7074\text{rpm}\left(\frac{1\text{min}}{60\text{sec}}\right)(3)$$

353.7 Hz

$$\frac{362\text{Hz}}{20\%} = \frac{353.7\text{Hz}}{x}$$

$x = 19.54\%$