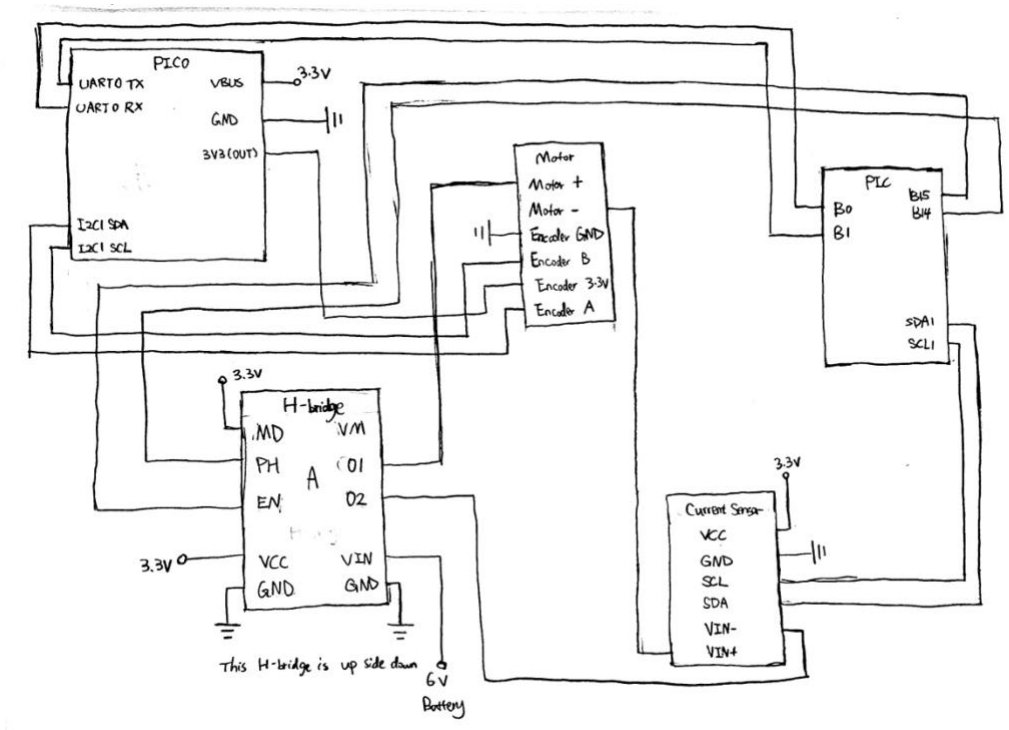
Homework 10
28.4.1
Design Decisions:

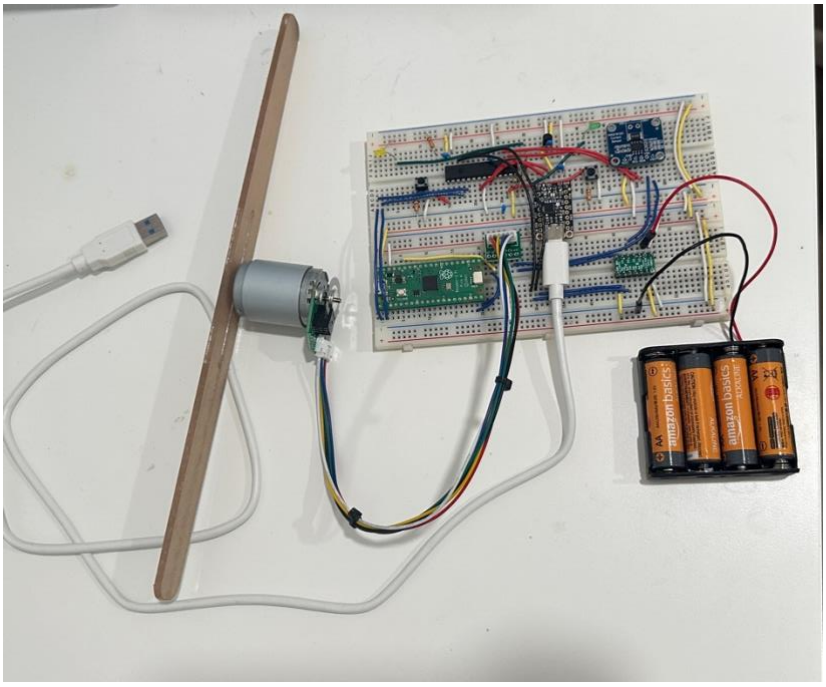
- Based on the encoder library and the instruction document, I connected UART0 TX from the Pico to B1 on the PIC, and I connected UART0 RX to B0 on the PIC.
- Furthermore, I connected the motor's encoder A to the Pico's GP14 pin and encoder B to the Pico's GP15 pin, following the guidelines provided in the encoder library and the instruction document.
- I selected B15 and configured it for OC1 to generate PWM signals, connecting it to the enable pin on the H-bridge. I also chose B14 as the output pin for transmitting data to the phase pin on the H-bridge.
- For the PWM signal, I am utilizing Timer3 to achieve a frequency of 20 kHz. Timer2 is set up for a 5 kHz current control ISR, and Timer4 is used for a 200 Hz position control ISR.

24.4.7
Please check my code and the comments for this section.

28.4.9
8.



(Circuit Diagram: PIC, Pico, H-Bridge, Motor, and Current Sensor)

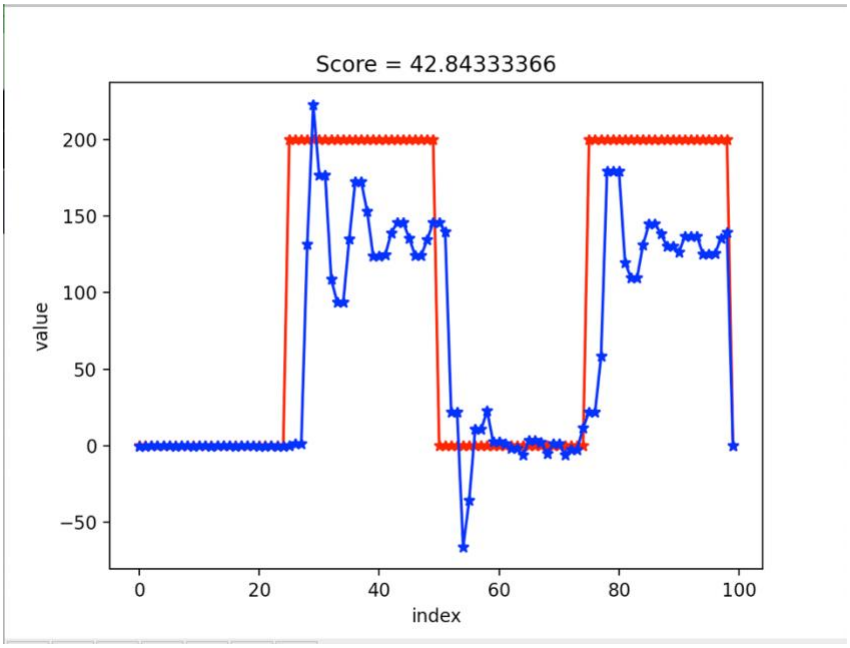


(Wiring of my board)

28.4.10

5. For the current control:

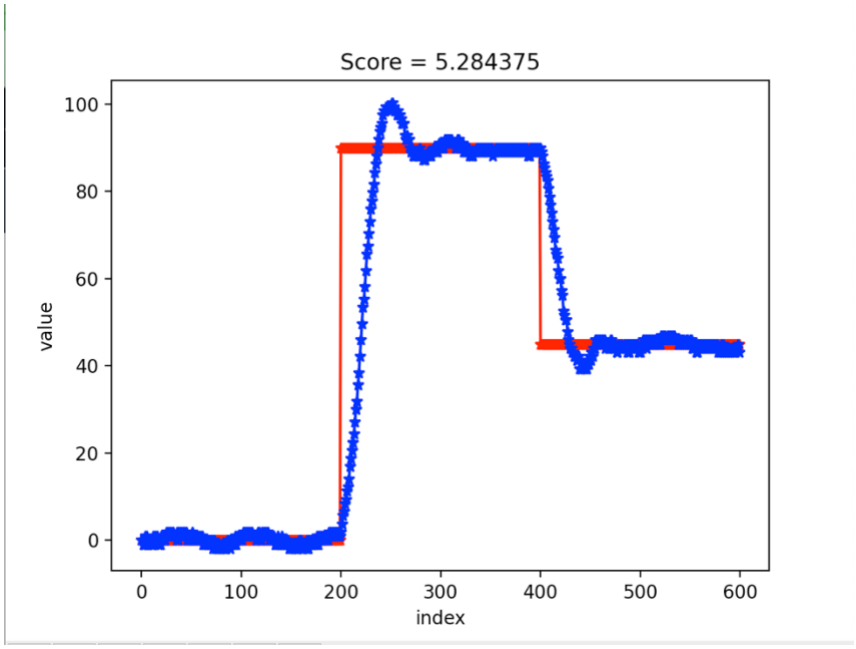
- I have set the current gains with kp equal to 0.12 A and ki equal to 0.005 A.



(ITEST plot, the red curve represents the reference current, and the blue curve represents the actual current)

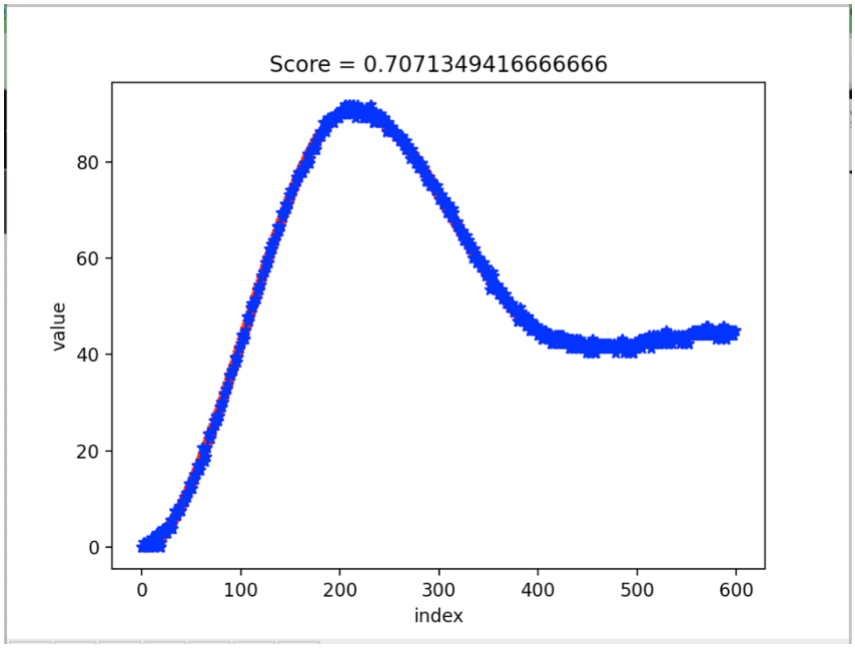
24.4.12

5. For the position control:
   - For the step trajectory:
     - I have set the position gains with kp equal to 0.1 degrees, ki equal to 0 degrees, and kd equal to 1 degree.



(Step trajectory plot, the red curve represents the reference position, and the blue curve represents the actual position)

   - For the cubic trajectory:
     - I have set the position gains with kp equal to 0.1 degrees, ki equal to 0 degrees, and kd equal to 0 degree.



(Cubic trajectory plot, the red curve represents the reference position, and the blue curve represents the actual position)