28.4.1.1

I would use the SPI4 channel. It uses SDI4 (F4), SSO4(F5) and SCK4(B14) on the NU32 board.

28.4.1.2

I would use AN0 as the ADC input. It is the B0 pin on NU32.

28.4.1.3

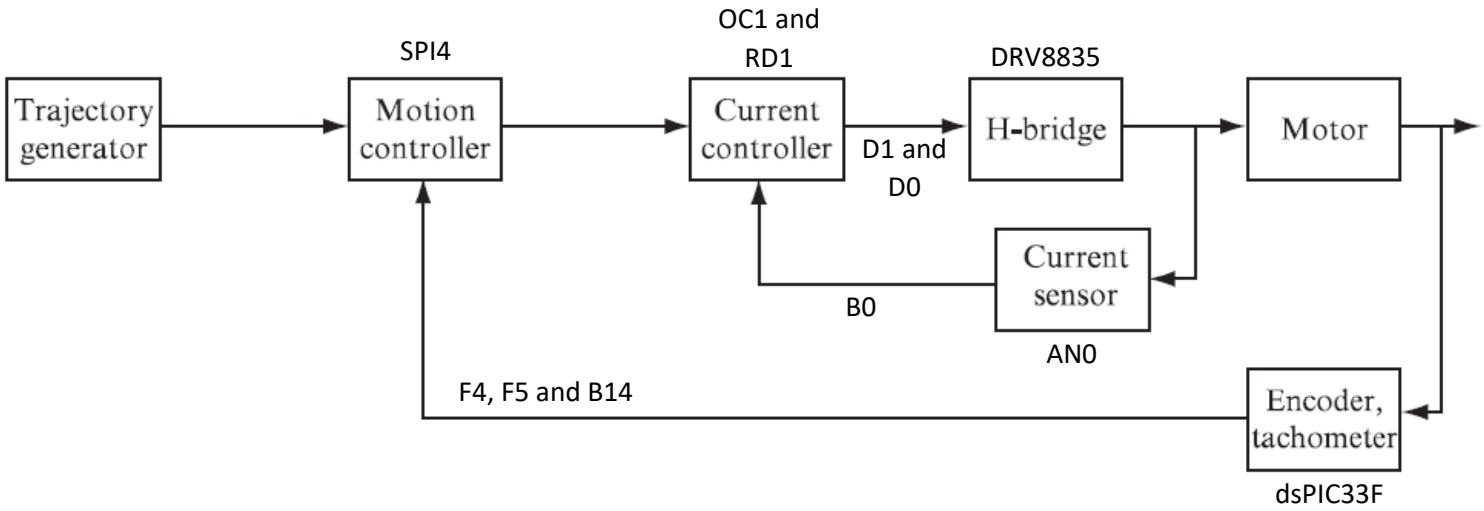
I would use RD1(D1) as the digital output and OC1(D0) with Timer3 as the Output Compare for the PWM.

28.4.1.4

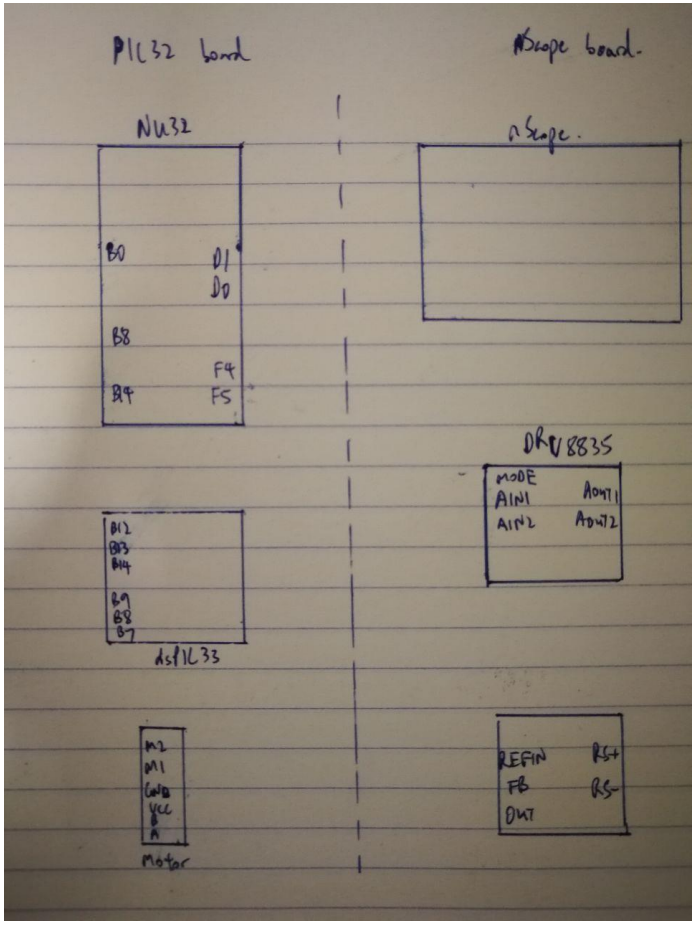
I would use the Timer2 for the 200Hz position control and use priority = 6.

I would use Timer1 with 1:1 prescaler for the 5kHz current control ISR and use priority = 5.

28.4.1.5



28.4.1.6



28.4.7.2

Measured: V = 6V and R_{motor} = 12Ω

Then I_{max} = 0.5A

28.4.7.3

V_{max} = 0.015Ω x 0.5A = 0.0075V

28.4.7.4

G = 1.65V / 0.0075V = 220 → R_2 / R_1 = 219

Select R_1 = 10 kΩ, R_2 = 2000 kΩ (R_2 / R_1 = 200)

28.4.7.5

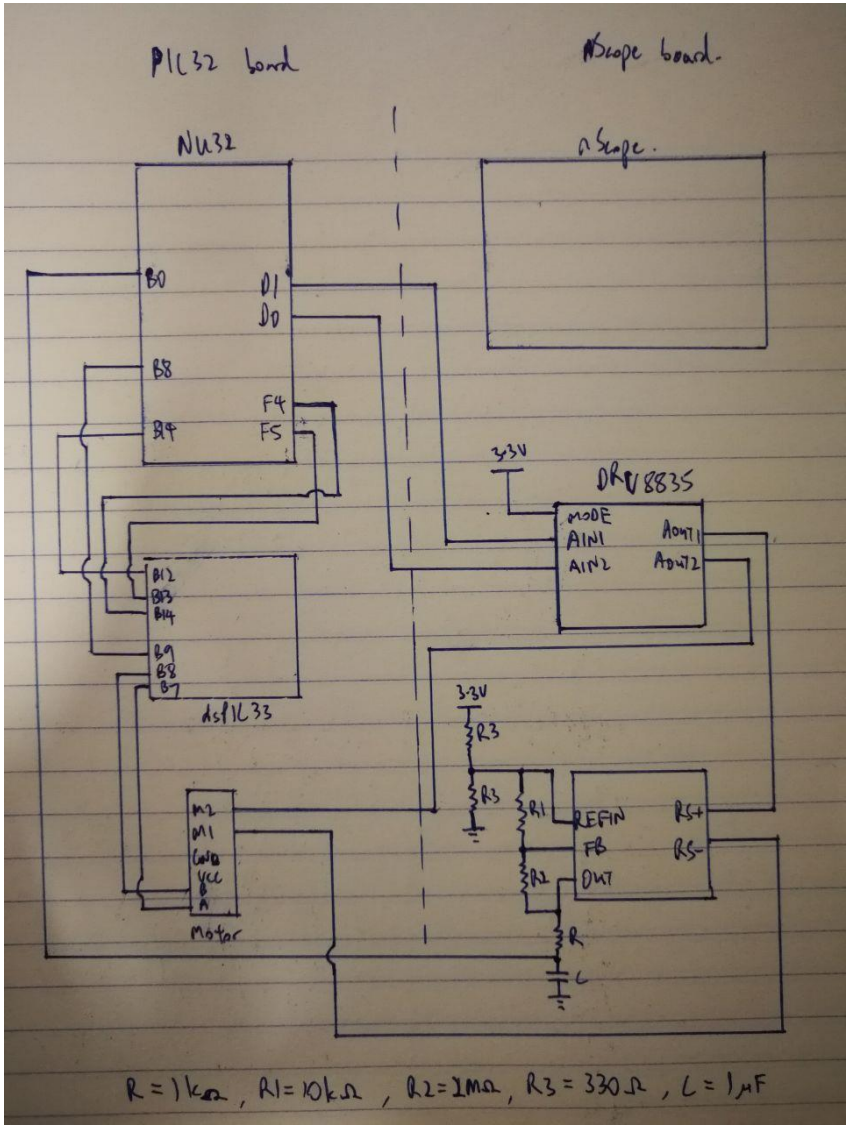
R = 1 kΩ, C = 1 µF → f = 160 Hz (close to 200 Hz)

28.4.7.6

For V = 6V:

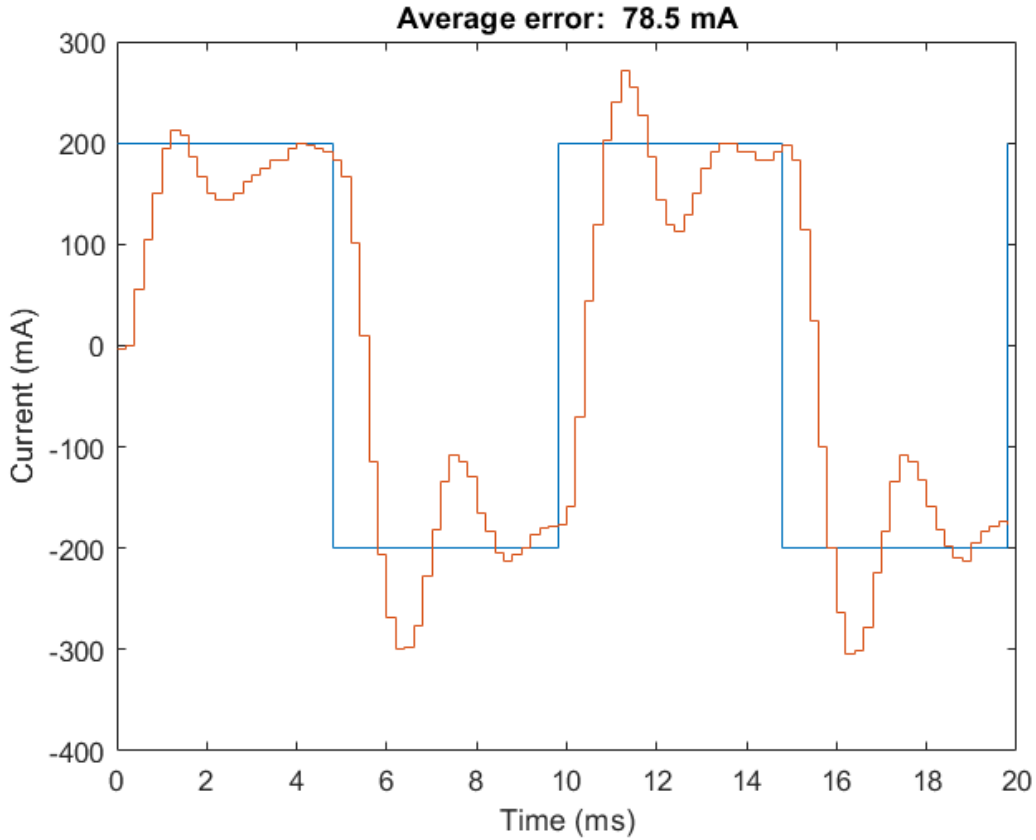
R0 (Ω)	Expected I (mA)	Measured I (mA)	Sensor (V)	ADC (counts)
10 (to RS+)	600	522	2.42	761
20 (to RS+)	300	288	2.06	639
40 (to RS+)	150	150	1.86	574
Open Circuit	0	0	1.65	502
40 (to RS-)	-150	-150	1.39	427
20 (to RS-)	-300	-280	1.20	360
10 (to RS-)	-600	-508	0.81	239

28.4.9.8


PIC32 board
Scope board.
NU32
Scope.
B0
B8
B9
B12
B13
B14
B7
B6
B5
dsPIC33
F4
F5
D1
D0
3.3V
DRV8835
MODE
AIN1
AIN2
AOUT1
AOUT2
R3
R1
R2
R
C
REFIN
FB
OUT
RS+
RS-
Motor
R = 1 kΩ, R1 = 10 kΩ, R2 = 1 MΩ, R3 = 330 Ω, C = 1 μF

28.4.10.5

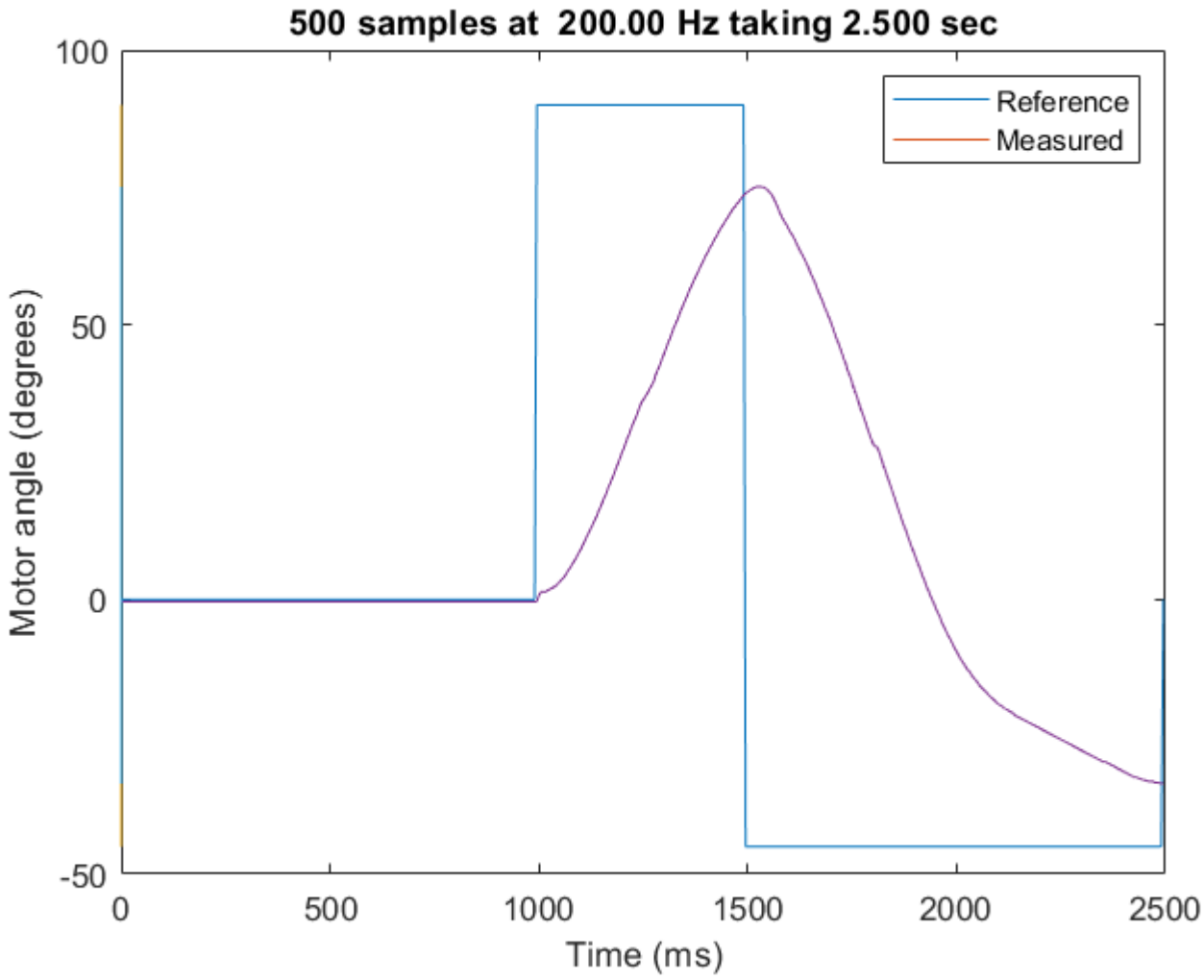
Kp = 830, Ki = 230



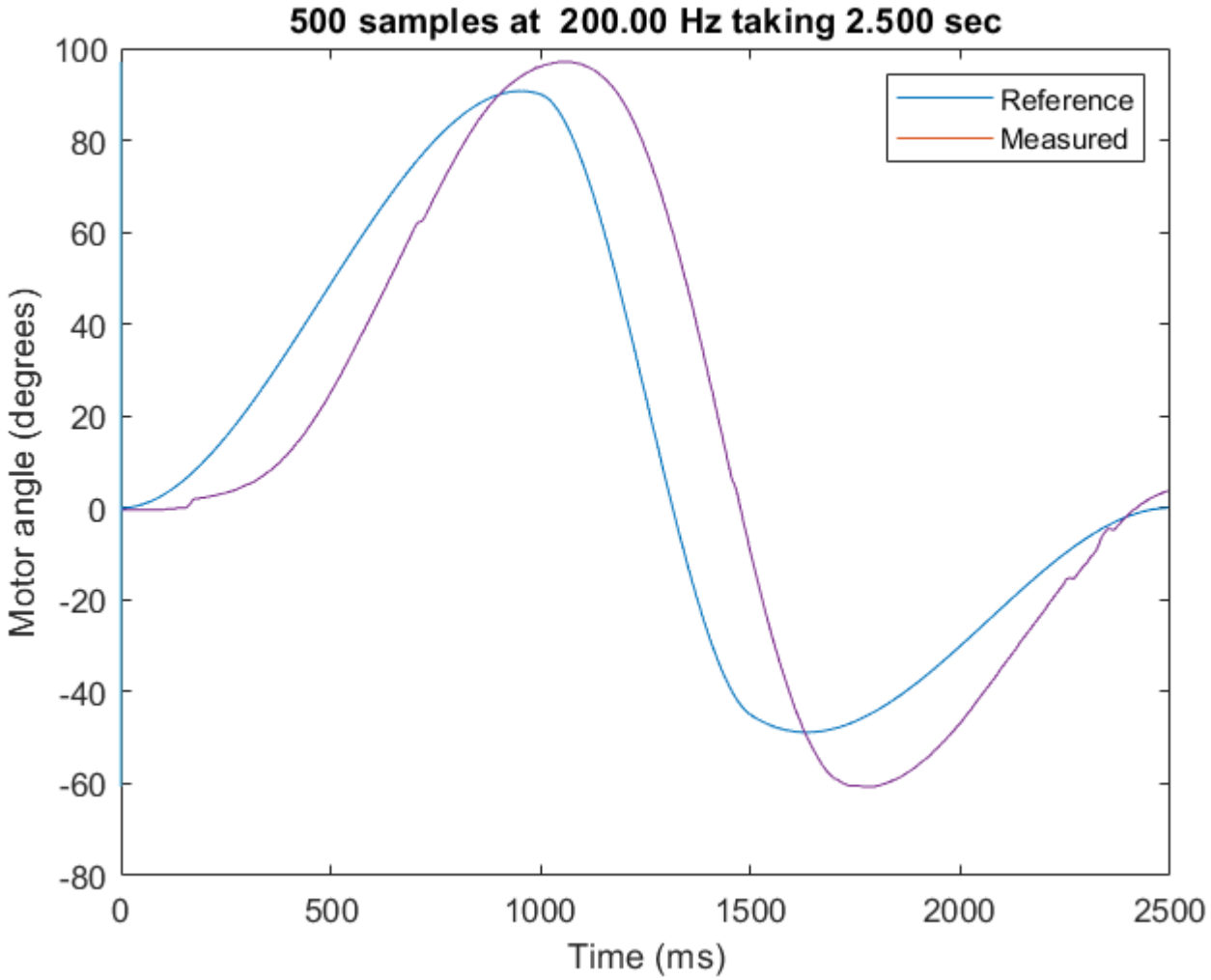
28.4.12.5

Kp = 500, Ki = 10, Kd = 150:

STEP INPUT



CUBIC INPUT


500 samples at 200.00 Hz taking 2.500 sec
Reference
Measured
Motor angle (degrees)
Time (ms)
100
80
60
40
20
0
-20
-40
-60
-80
0
500
1000
1500
2000
2500