Table 1: Recorded potentiometer measurements

Angle (deg)	Output (V)
0°	0.990
30°	1.53
60°	2.05
90°	2.63
120°	3.27
150°	3.64
180°	4.23

slope	offset.
54.3.	-51.6

1.1.2 Calibrate the Potentiometer

校正传感器

14. Click on the **Calibrate Sensor** tab to calibrate the output of the potentiometer in terms of angular position (in degrees).
15. Use the **Slope (deg/V)** and **Offset (deg)** numeric controls to enter the slope and offset values you obtained during the data collection step.
16. Test the accuracy of your calibration. To do this, set the potentiometer knob to different angles and verify that the correct angular position is displayed in the **Calibrated Output** waveform chart as well as the **Pot Angle (deg)** meter indicator.
17. Press the **Stop** button.

screenshot. Output = 180 deg

picture 5.

1.2 Measuring Angular Displacement using an Encoder

The Virtual Instrument (VI) used to collect data from and calibrate the encoder is shown in Figure 2.

5. Wait for the **Initialized?** LED indicator to turn on.
6. In non-quadrature decoding only signal A is used. Rotate the encoder knob in the clockwise direction. How does the **Edge (count)** numeric display change?
7. Rotate the knob in the counter-clockwise directions. How does the **Edge (count)** numeric display change?

Note: At any time you can press the *Reset* button to reset the counter. This will rest the **Edge (count)** and **Angle (deg)** numeric displays to zero.

8. Using the **Edge (count)** numeric display, determine the number of pulses the encoder generates per each full revolution (PPR).

Note: PPR is determined in non-quadrature mode. It refers to the total number of pulses generated by *Signal A* when the encoder makes one full revolution. The value of PPR will be used to calibrate the encoder pulses in terms of angular displacement in degrees.

9. Continue to the next section.

1.2.2 Calibrate the Encoder

10. Calibrate the pulses of the encoder in terms of angular displacement. To do this, enter the PPR value which was calculated in the previous section in the **PPR** numeric control and press the **Enter** key.
11. Verify the accuracy of your calibration. To do this, first press the **Reset** button then rotate the encoder knob and verify that the correct angular position is displayed in the **Angle (deg)** numeric indicator.
12. Continue to the next section.

1.2.3 X2 Decoding

13. From the **Decoder** drop-down menu, select **X2**.
14. Press the **Reset** button.
15. In X2 decoding both signals A and B are used. Rotate the encoder knob in the clockwise direction. How do the **Edge (count)** and **Angle (deg)** numeric displays change?

    Note: An encoder will have a fixed PPR value regardless of the decoding algorithm that is used.

16. Rotate the knob in the counter-clockwise direction. How do the **Edge (count)** and **Angle (deg)** numeric displays change?
17. Examine the behavior of signal A and signal B.
18. What is the resolution of the measured angular displacement?
19. Continue to the next section.

1.2.4 X4 Decoding

resolution 7.50

20. From the **Decoder** drop-down menu, select **X4**.
21. Press the **Reset** button.
22. Rotate the knob in the clockwise and counter-clockwise directions. How do the **Edge (counts)** and **Angle (deg)** numeric displays change?
23. What is the resolution of the measured angular displacement?
24. Examine the behavior of signal A and signal B as you slowly rotate the encoder knob in the clockwise direction. In particular, compare the behavior of signals A and B and you rotate the encoder in the clockwise direction with the state machine diagram shown in Figure 2-4. Take a screenshot of your results.
25. Press the **Stop** button.

resolution 3.75