FG Servo using LabView

Equipment needed: Transistor 2N3904(NPN), transistor 2N3906(PNP), Hall element, 1k resistor, DC motor, magnet, DAQ6009, PC with LabView 8 installed.

Notes: **Suggested supply voltage is about 5~7 V, and also make sure that supply current is no larger than 0.1 A.**

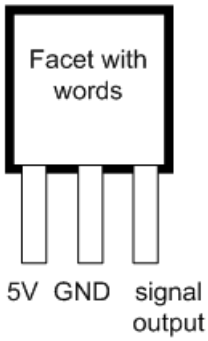
1. Experiment 1 – Sensor rotation frequency

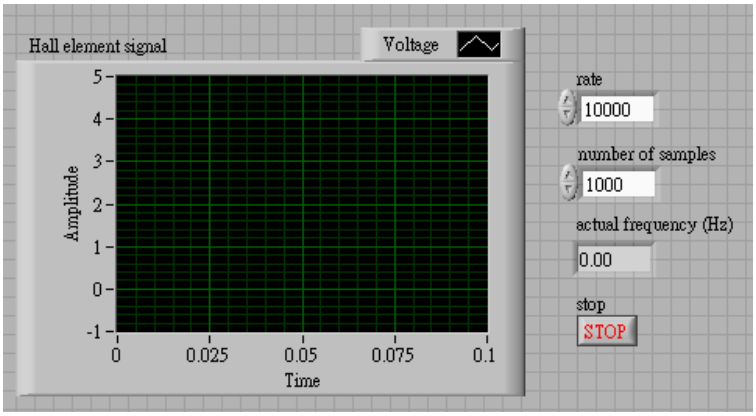
2. Experiment 2 – Open loop calibration

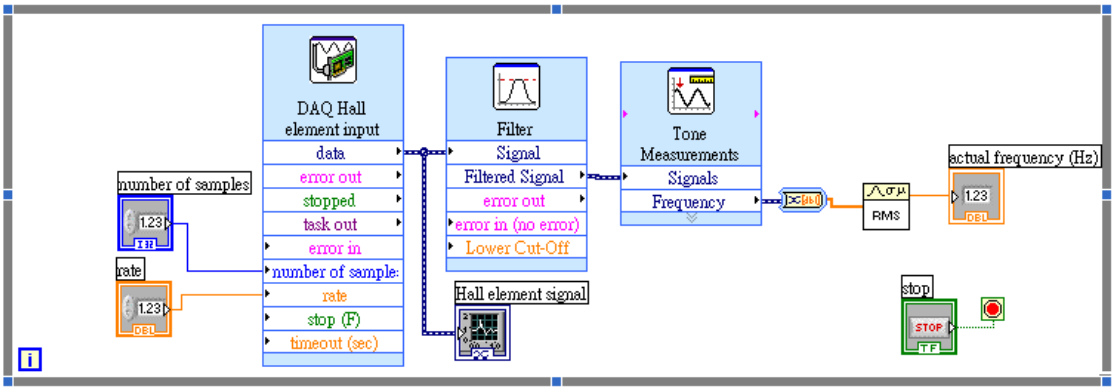
3. Experiment 3 – Feedback sensor signal

Experiment 1 – Sensor rotation frequency/ speed

1. The Hall element can be used to sensor magnetic flux. Attach the magnet to the rotation shaft of the motor, wire the pins as indicated to DAQ6009, and then connect the lead-out wires of the motor to the power supply.
2. Complete the program shown below, and see if the LabView can indicate the rotation frequency/ speed correctly.

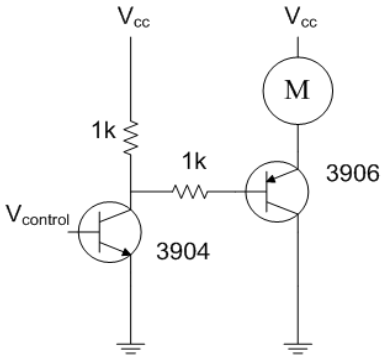




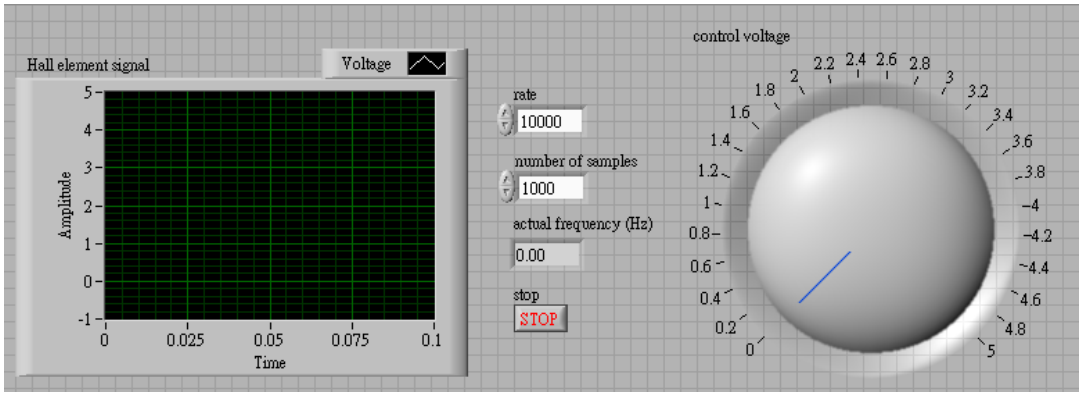


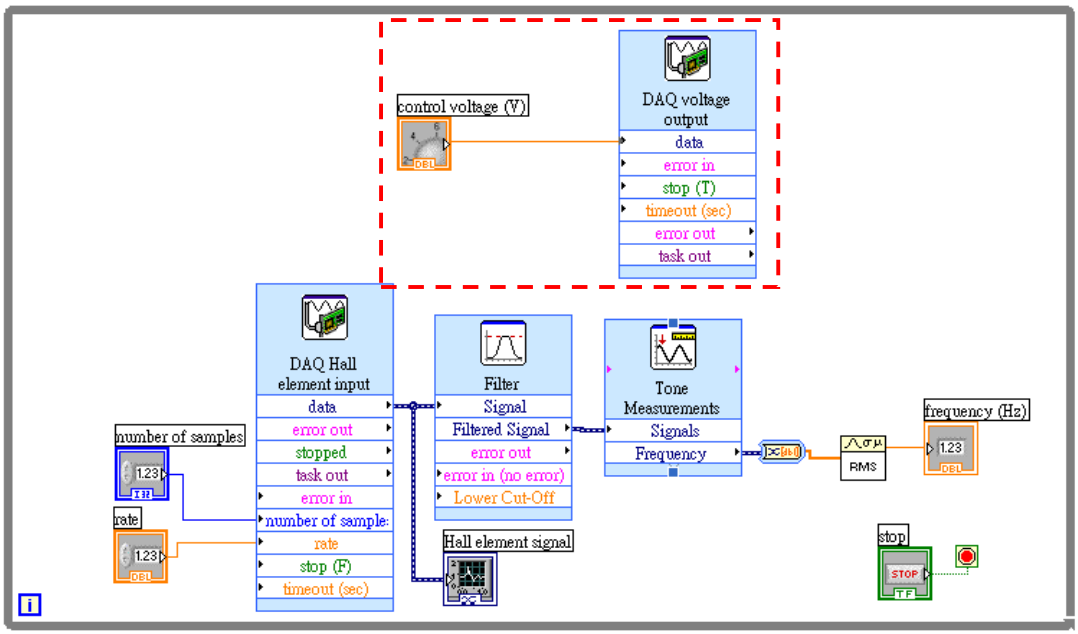
Experiment 2 – Open loop calibration

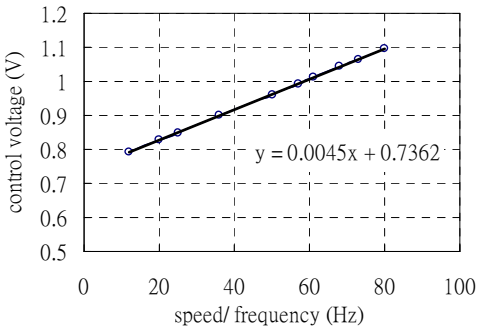
1. Now we want to control the motor with DAQ6009 instead of the power supply. Complete first the circuit drawn below with transistors and resistors.



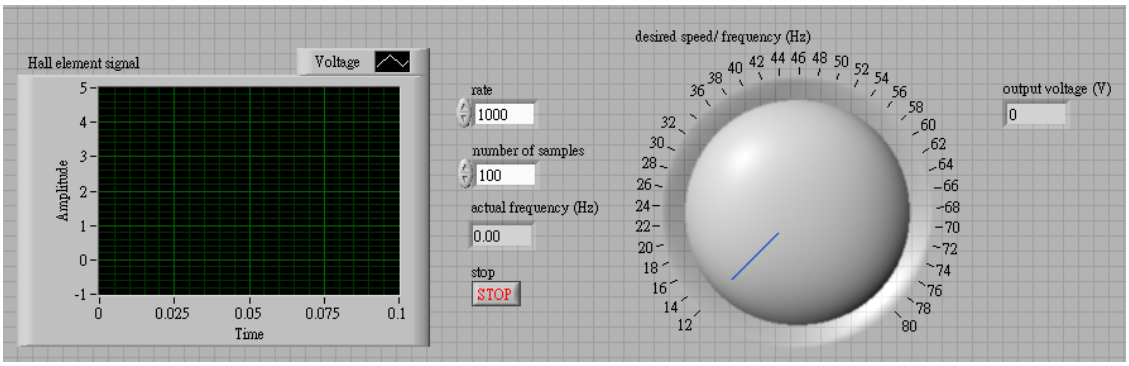
2. It is known that higher the voltage supplied, faster the rotation frequency/ speed. The main purpose of Exp. 2 is to construct the relation between these two. Complete the program shown below, adjust the control voltage to get the corresponding frequency/ speed, and then type these data in Excel using frequency/ speed as abscissa, and voltage as ordinate.

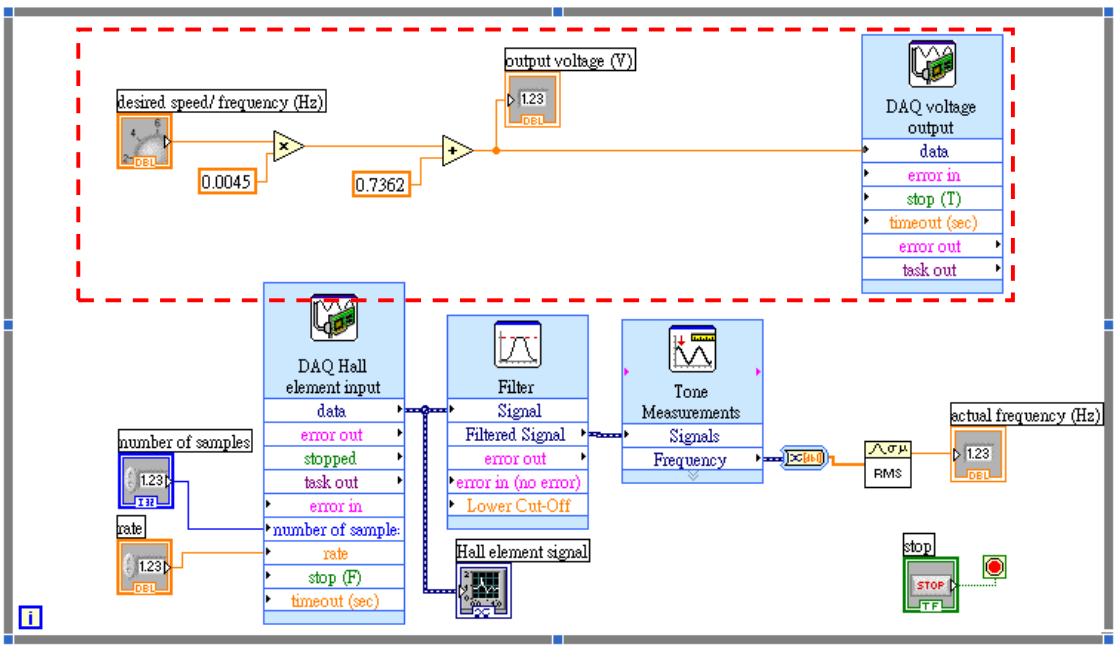






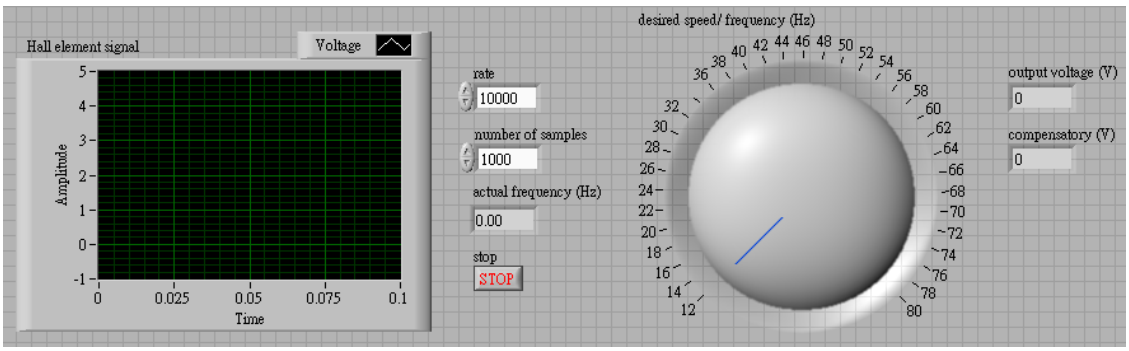
3. Construct the block diagram shown below. Using this relationship we can make a knob to adjust the desired frequency/ speed by generating a corresponding control voltage. See if the actual frequency/ speed is near the desired frequency/ speed.

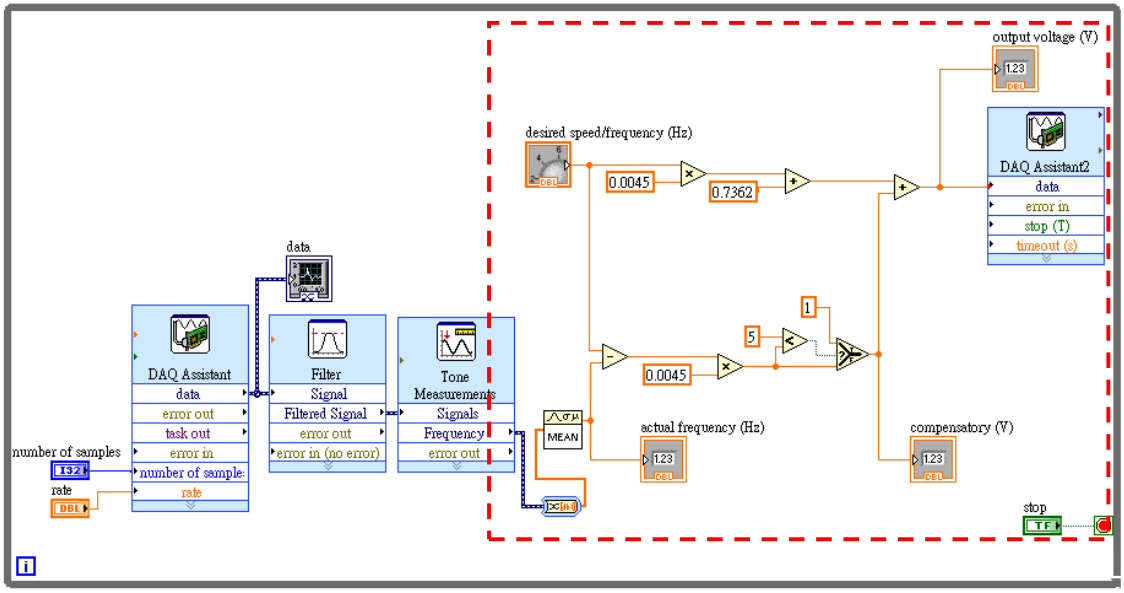




Experiment 3 – Feedback sensor signal

1. The actual speed may defer from the desired speed, so in the LabView program shown below we use the sensor signal to produce a compensatory voltage added to the voltage output.





2. See if the result gets better after using the feedback signal.