EEE 352 Automatic Control Systems Laboratory

Week 2 : Experiment #1

Basic Components of a Feedback System

1. Prelimiary Work

Give brief definitions of the following:

1.1. Open-loop Control System,
1.2. Closed-loop Control System,
1.3. Feedback,
1.4. Off-set
1.5. Sensor.

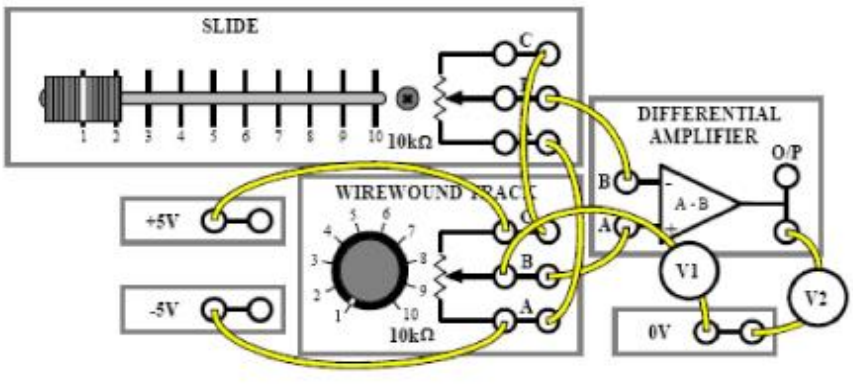
Do not forget to include a list of your references!

2. Experimental Work

2.1. Investigation of Components

2.1.1. Consider the 10k wire wound resistor in Figure 1. Connect lead C to 12 volts and lead A to 0 volt. Change the resistor's setting by increments of 2 and record the voltage at lead B. Draw the curve for this voltage versus resistor setting.

2.1.2. Consider the differential amplifier as given in Figure 1. Apply voltages to the leads of the device using DC voltages (0V, ±5V). Vary these voltages and observe the output voltage of differential amplifier.



Input		Output
A	B	$V_A - V_B$
-3	-3	
+1	+1	
+2	+4	
0	+3	
+4.2	+2.2	
+2	-3	
-2.7	+3.6	

Figure 1. Differential amplifier set-up

2.1.3. Observe the input-output characteristic of the power amplifier by applying different input voltages.

2.1.4. Consider the tacho generator (Connect Figure 2 **excluding Amplifier #1**). Rotate the DC motor in different speeds. Collect data of tacho-generator output versus the speed in rmp using LED display device with sloted opto-transducer. Rotate the motor at 4, 6, 8, 10, ..., 26 rev/s.

2.2. A sample Feedback Control System: Speed Regulation of a DC Motor

Set up the circuit given in Figure 2.

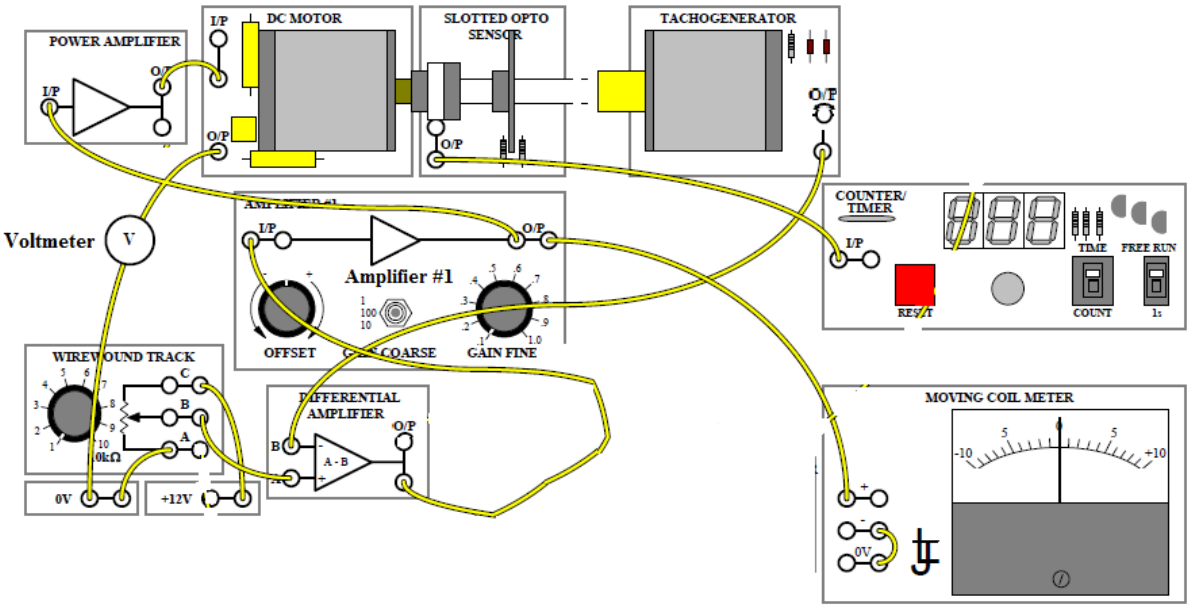


Figure 2. Speed regulation with P control

2.2.1. Disconnect the motor from the circuit and adjust the voltage output from the variable resistor so that it is equal to the voltage to be observed at the tacho-generator output for 600 rpm of motor speed. Set the **amplifier #1 gain to 1** (Before you connect make the off-set adjustment).

2.2.2. Reconnect the circuit and turn on the set. **For amplifier #1 gain values of 1, 2, 3,** observe and record the values of variable resistor output R, tacho-generator output B, differential amp. output E, amplifier #1 output P, and power amp. output M by looking at the block diagram representation of experimental set-up given below.

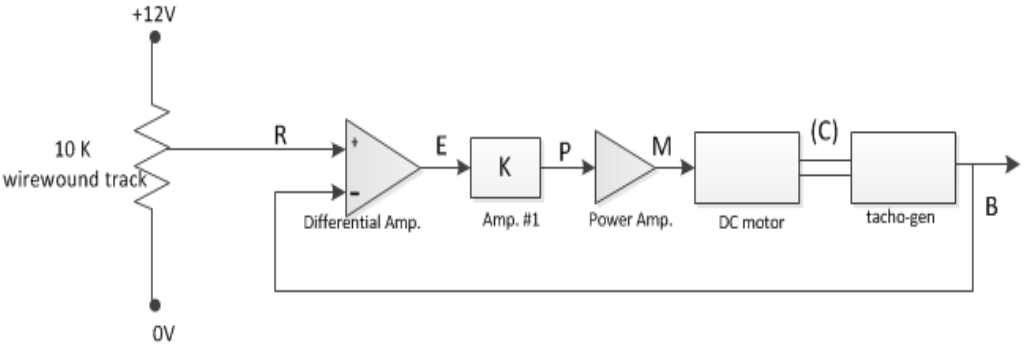


Figure 3. System block structure

3. Results and Conclusions

3.1. What are the functions of the differenatial amp., amp. #1, power amp., DC motor and the tacho-generator in this system?

3.2. Consider 2.2.2. Give names and short descriptions of the signals R, C, B, E, P and M, using the control systems terminology.

3.3. Draw block diagram representing the system in Figure 3. Indicate all signalss and blocks with their names in the control systems terminology.

3.4. Give a short conclusion about the experiment summarizing what has been achieved and gained as a result.