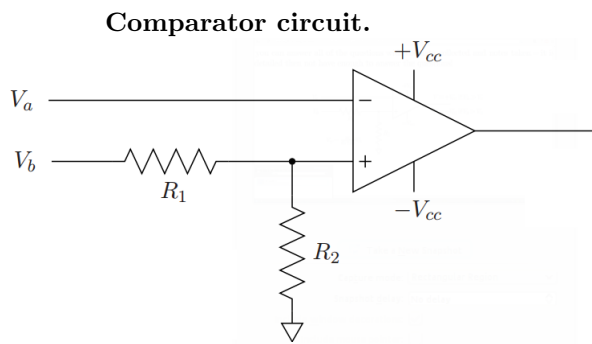


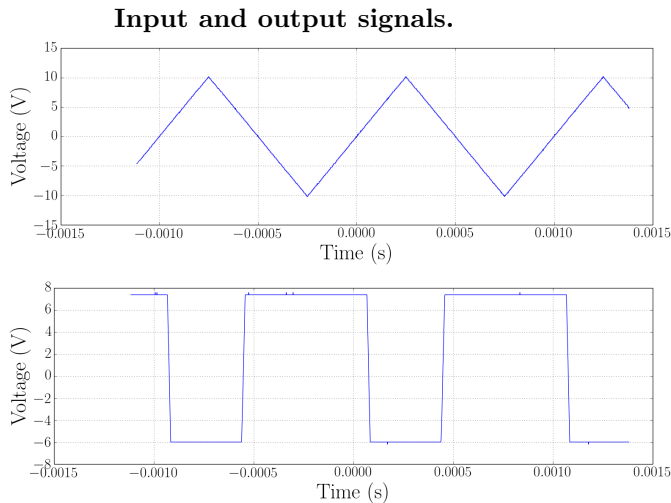
## 7.1 Simple Comparator.

a. We built the circuit using  $V_b = +V_{cc} = 8\text{ V}$ .  $R_1 = 100\text{ k}\Omega$ .  $R_2 = 44.2\text{ k}\Omega$  potentiometer.



**Figure 1:** a simple figure. source: lab manual

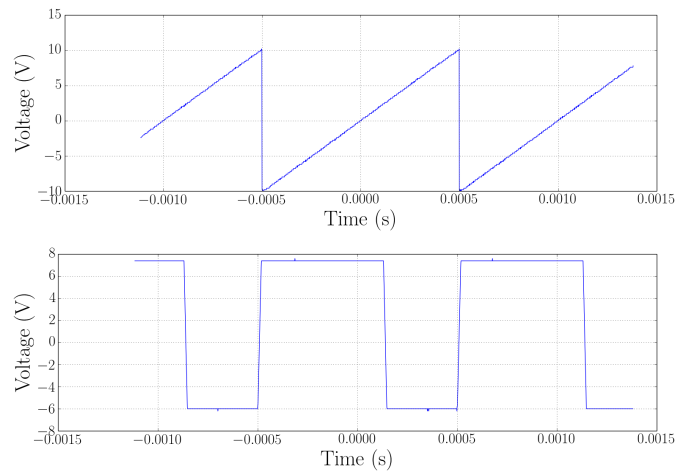
b. We applied a  $V_a = 10\text{ V}$  (peak to peak).  $V_b = V_{cc}$  still. Scope traces below.



**Figure 2:** a simple figure.

c. We applied the same  $v_a$  signal as in part b, but this time, we modulated it with 50 kHz, at 10% depth.  $V_b = V_{cc}$ .

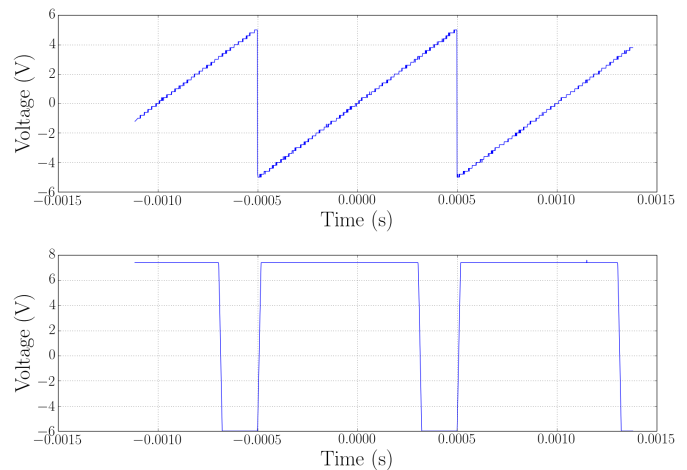
### Input and output signals.



**Figure 3:** a simple figure.

We then did it again, with 10 kHz modulation.

### Input and output signals.

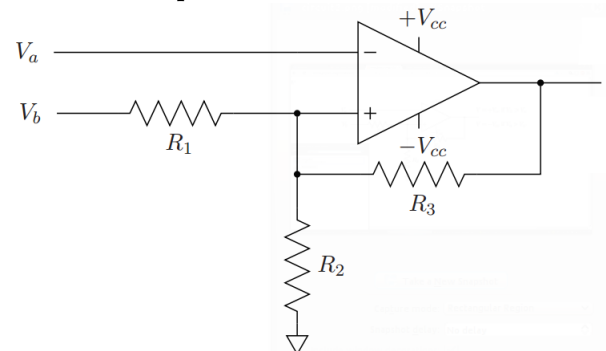


**Figure 4:** a simple figure.

## 7.2 Schmidt Trigger.

a. We used a potentiometer as  $R_3 = 25\text{ k}\Omega$ .  $\pm V_{cc} = \pm 8\text{ V}$ .

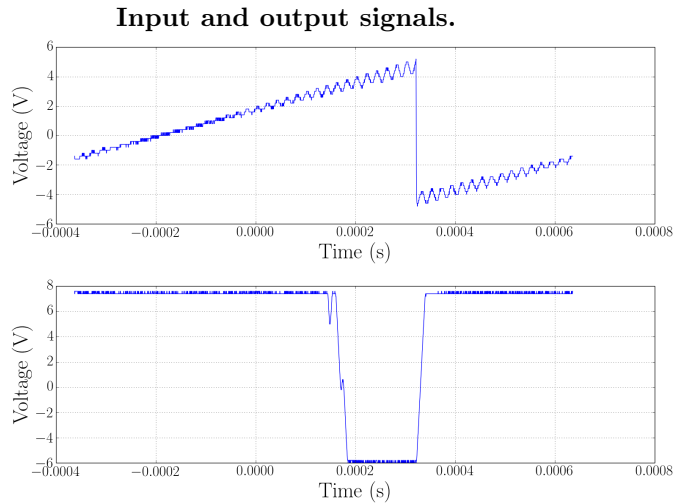
### Comparator circuit.



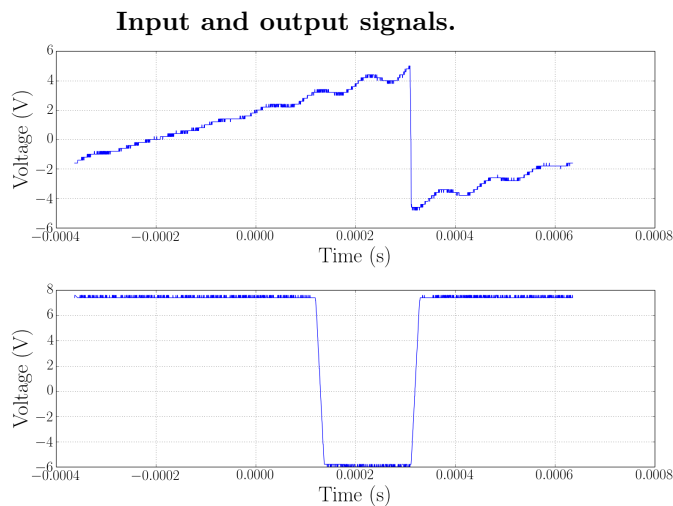
**Figure 5:** a simple figure. source: lab manual

b.  $V_a = 10\text{ V}$  peak to peak ramp wave, at  $1\text{ kHz}$ .

c. Three screenshots, same as in part b, but we adjusted  $R_3$  values to be:  $22.7\text{ k}\Omega$ ,  $1.7\text{ k}\Omega$ ,  $5.7\text{ k}\Omega$  in that order. Symmetric sawtooth wave. Screenshots below.



**Figure 6:** a simple figure.



**Figure 7:** a simple figure.

d. Changed  $R_2 = 10\ \Omega$ . This lowered our reference voltage for the comparator. Screenshot below.

### 7.3 Temperature Controller.

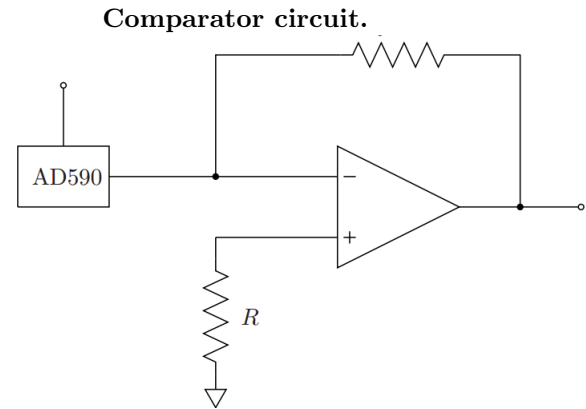
a. We built the circuit. We wanted  $313\text{ mV}$  at  $313\text{ K}$ , so  $R_2 = 30\ \Omega$ ,  $R_1 = 928.4\ \Omega$ . Closest we could get was  $R_2 = 30\ \Omega$ ,  $R_3 = 910\ \Omega$ . This gives us  $319\text{ mV}$  as our switch point (pre-schmidt trigger); good enough.

b. For the schmidt trigger, we used  $R_3 = 130\text{ k}\Omega$ . From this, we obtain

$$V_{high} = 317\text{ mV}, \quad (1)$$

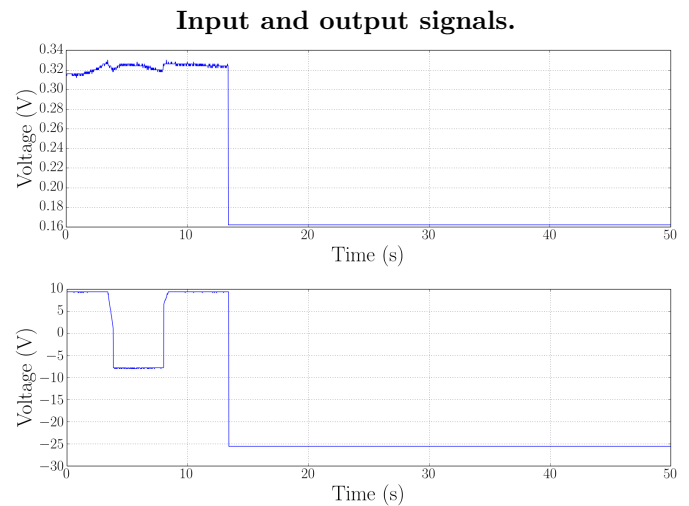
$$V_{low} = 320.55\text{ mV}. \quad (2)$$

c. Stuck a transistor in. Final circuit shown below.



**Figure 8:** a work-in-progress figure. source: lab manual

And here's the scope trace.



**Figure 9:** a simple figure.