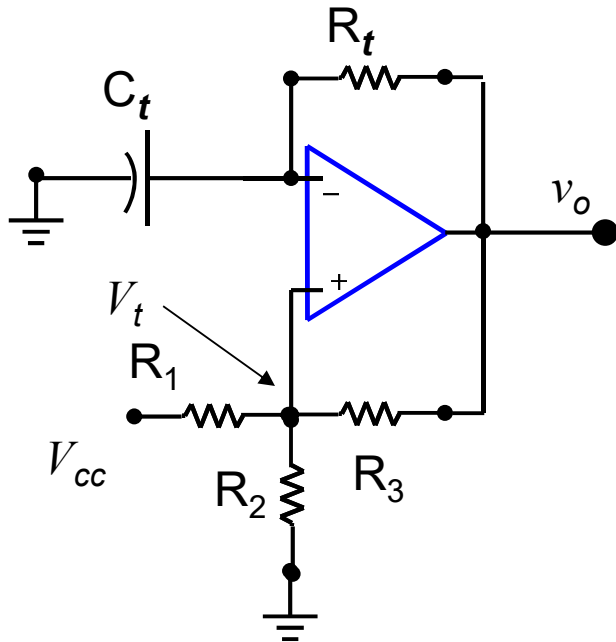


Capstone Design

Paced Breathing Simulator

Timer



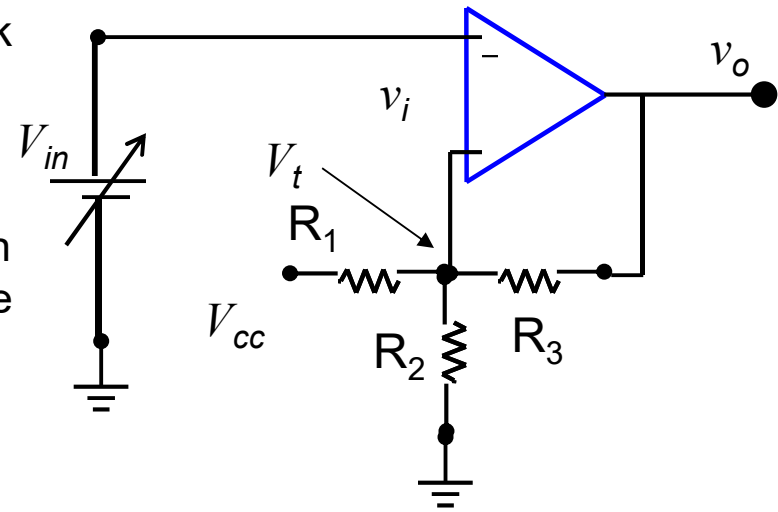
Design a timing circuit which will provide a clock to a paced breathing device for a rate of 12 breaths per minute.

Use a single power supply, the $100\mu\text{f}$ capacitor, and any of the resistors in your kit.

Assume the output saturates at 0 and V_{cc} . Also assume $R_1=R_2=R_3$.

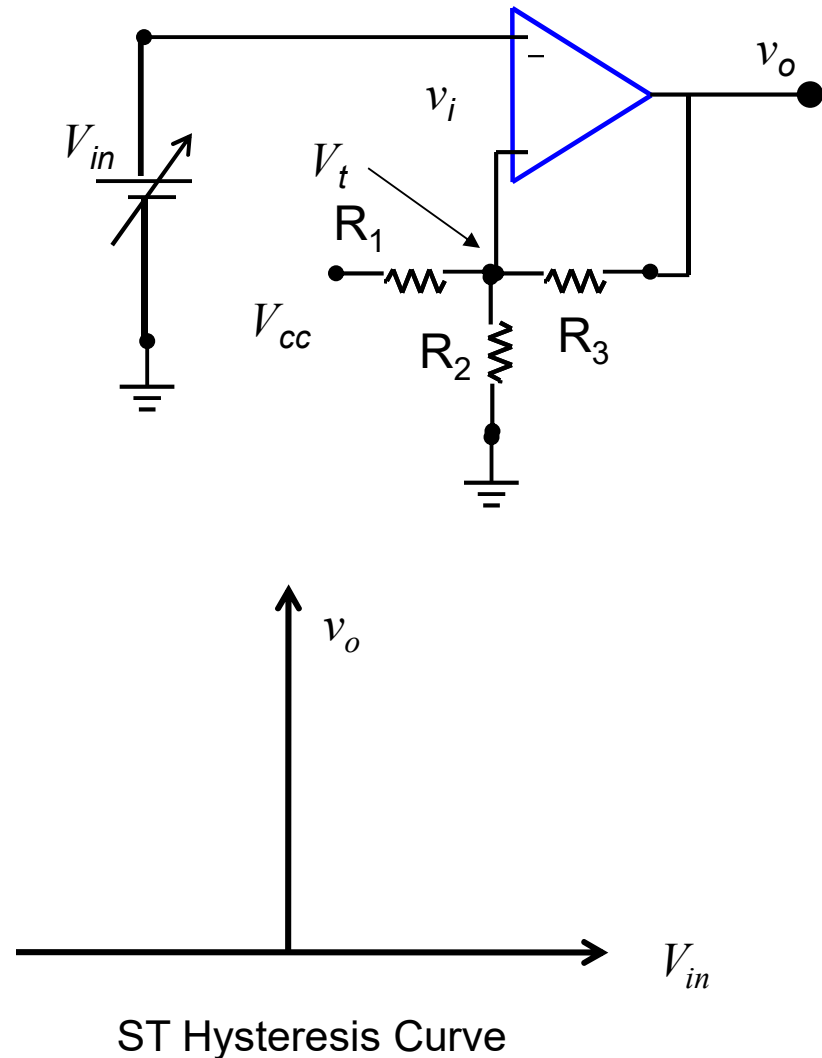
Procedures

1. Use 100k resistors for the Schmidt Trigger (ST) thresholds if the RC network resistor is in the 10k range since you want more current to flow in the RC network than in the threshold network.
2. First build the ST (i.e., without the RC network) and verify that it works properly. Since this is an inverter, test it by applying a variable DC voltage to the input of the ST.
 - a) Set the ST input voltage to a value greater than the upper threshold (you should have the hysteresis curve already calculated and readily available to you).
 - a) Note the output voltage of the ST _____
 - b) What should it be? Is this correct?

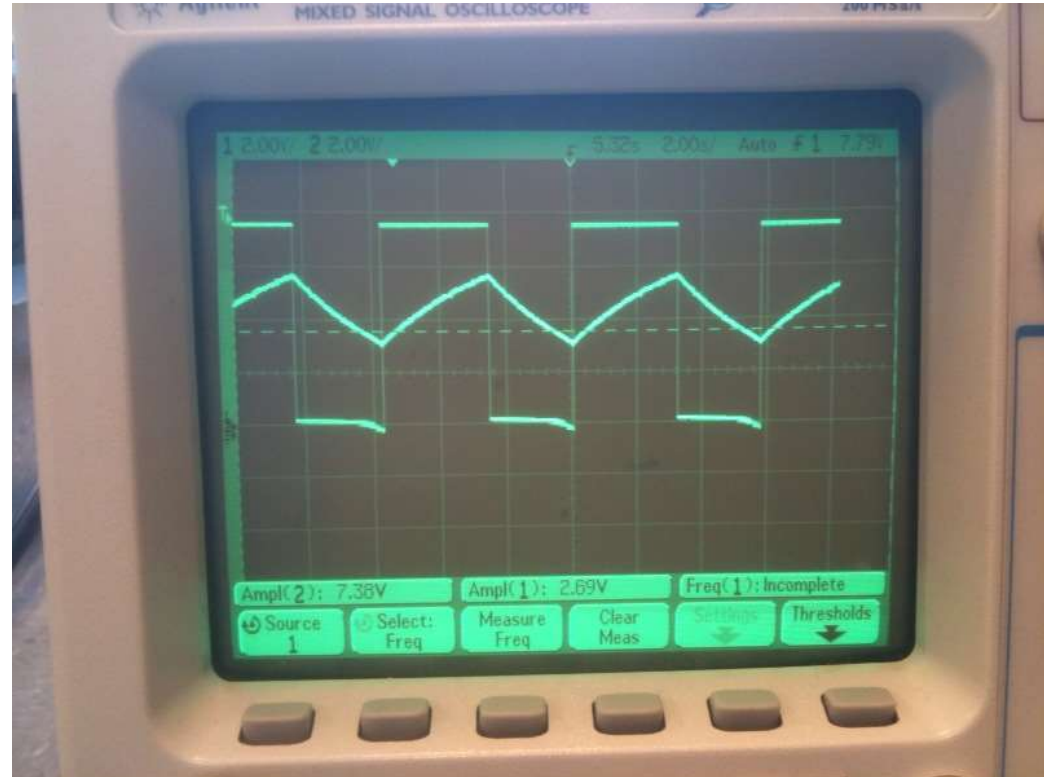
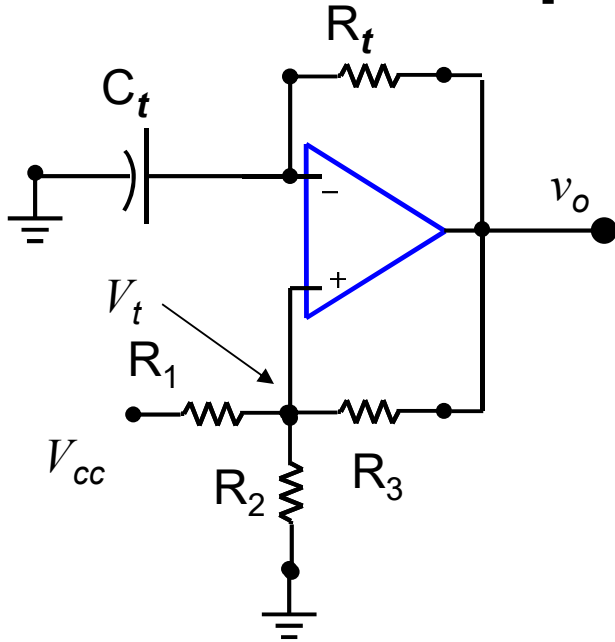


Procedures

- b) Slowly lower the input voltage.
 - a) Note the input and the output voltages when the output switches. V_{in} _____ v_o _____
- c) Continue to lower the input voltage to a value just above the minimum output value.
- d) Now increase the input voltage
 - a) Note the input and the output voltages when the output switches. V_{in} _____ v_o _____
- e) Now compare these four values to the hysteresis curve for the ST and make sure they are correct or if not justify why.
- f) If you can't get the ST to display any sort of hysteresis, check everything. Change the Op amp on the chip; change the chip; etc.



Procedures



3. If the ST works, now connect the RC network and view the voltage across the output and the capacitor. They should be identical or close to the photo attached. The values of output voltages should correspond to the output voltages in 2.b) and 2.d) and the capacitor max and min voltages should correspond to the threshold values also found in 2.b) and 2.d)