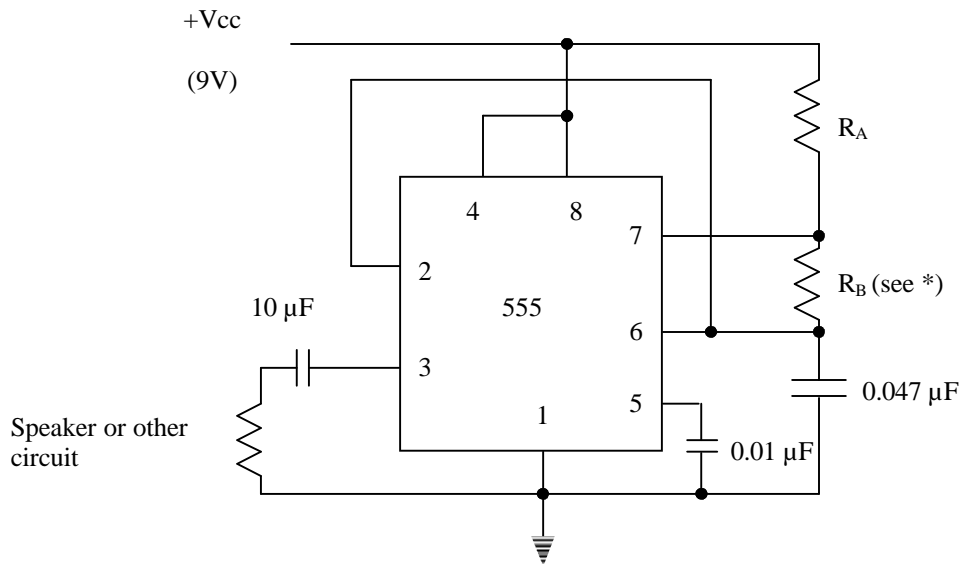


Syracuse University Saturday Morning High School Physics Teacher Workshop

Variable Frequency Square Wave Generator Using a 555 Timer

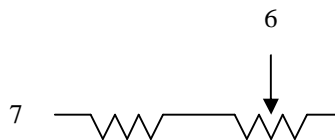
You will construct a square wave generator. The frequency and duty cycle are variable and determined by the values of the external resistors and capacitors used. In your kit, you should find:

Quantity	Item
1	Breadboard
1	555 integrated circuit (chip)
1	.05 μF capacitor
1	.01 μF capacitor
1	10 μF capacitor
2	1 k Ω resistor
2	10 k Ω resistor
1	10 k Ω variable resistor
1	9 V battery
1	9 V battery connector



Circuit for astable operation

* $R_B = 10\text{ k}\Omega$ and 10 k Ω pot wired in series



- **Make the power connections last!**
- Wire the circuit as shown on page 1, leaving off the speaker.
- Double check to make sure you wired it properly. Forgetting a wire is very easy.
- Make sure the component leads are not accidentally touching.
- Connect the negative (black wire) ground.
- Connect the positive (red wire) V_{cc} .
- Look at output waveform on oscilloscope. Make sure you make a ground connection to the oscilloscope. This is best done by adding an extra wire dangling from the ground bus.
- If you do not get a waveform, remove the power supply and check all connections again.
- If you get a waveform, try the following 'experiments'.

For each case below, how does the waveform change?

Change the variable resistor.

Change R_A . You have 1 k Ω resistors in your kit.

Borrow another .047 μ F capacitor and connect it in series or parallel.

Repeat the above with a speaker connected.

Which resistor combination gives you the greatest frequency range?