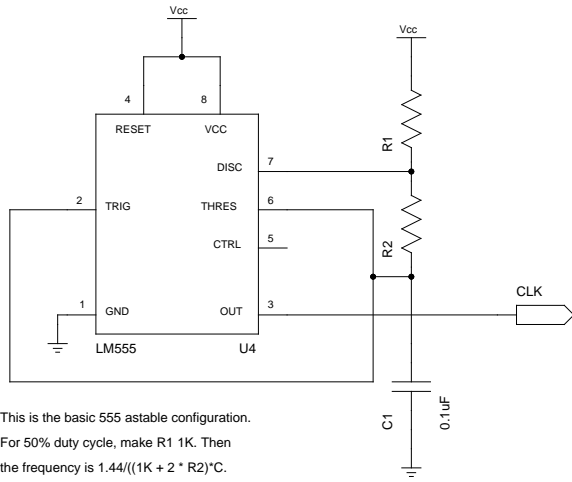
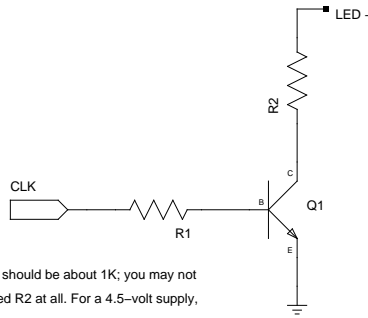


Connect the output to one of the other circuits shown here, or something else.



This is the basic 555 astable configuration. For 50% duty cycle, make R1 1K. Then the frequency is  $1.44 / ((1K + 2 * R2) * C)$ . See <http://tinypurl.com/ym8qtq>

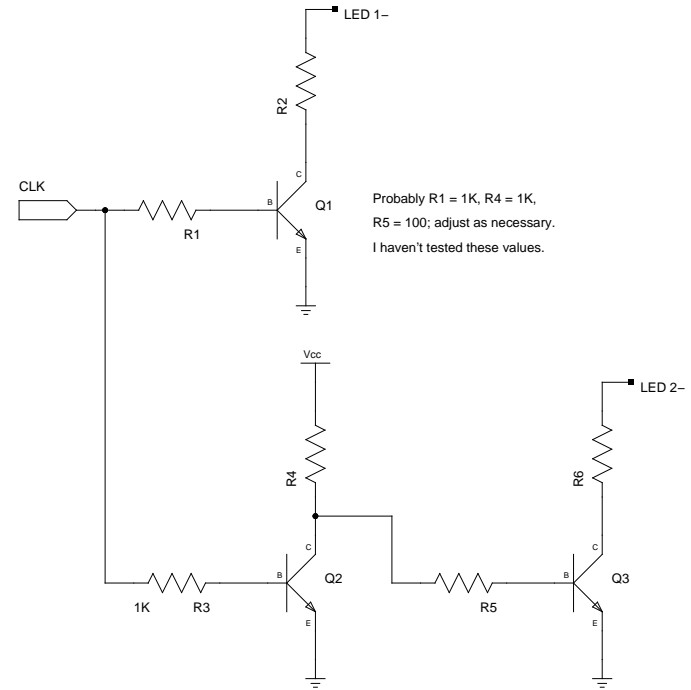
Case 1: One set of LEDs flashing on and off. This is a piece of cake:



R1 should be about 1K; you may not need R2 at all. For a 4.5-volt supply,  $hfe * 2.2V / R1 = I_c$  (roughly) where hfe for most transistors is on the order of 100 and  $I_c$  is the current you want to see at the collector.

You can determine a good value for R1 by experimenting.

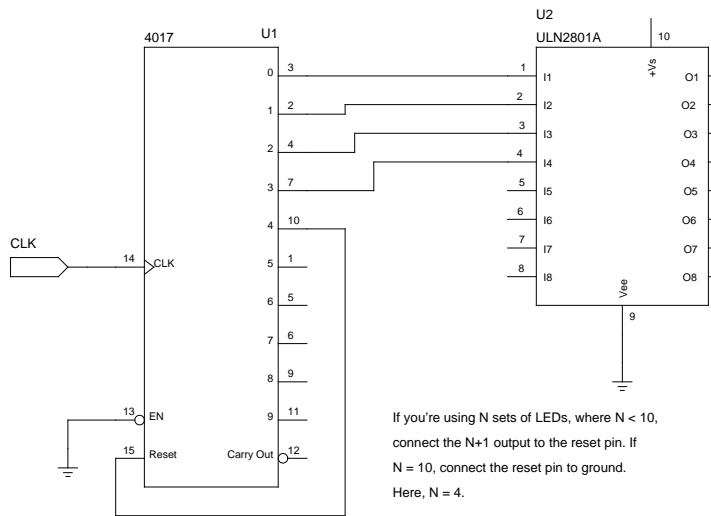
Case 2: two sets of LEDs alternating.



Probably R1 = 1K, R4 = 1K, R5 = 100; adjust as necessary. I haven't tested these values.

In these circuits, the transistors that drive LEDs need to be able to handle moderately high collector currents, on the order of half an amp. The 2N3904 ( $I_c=200mA$ ) will not do; a 2N2222 will work fine. You can even use a 2N3055 (the prac phys transistor) or a TIP29C or some other power transistor.

Case 3: more than two sets of LEDs lighting up in sequence



If you're using N sets of LEDs, where  $N < 10$ , connect the N+1 output to the reset pin. If  $N = 10$ , connect the reset pin to ground. Here,  $N = 4$ .

Be careful with the pin numbering on the 4017. The numbers on the OUTSIDE of the box in the diagram are the pin numbers.

As with the other circuits, you may be able to get away with omitting the resistors.

Instead of a ULN2801, you can use a ULN2803; gschem doesn't have a symbol for this chip.

Nothing gets connected to pin 10 of the ULN2803.

The ULN2803 is actually just an array of NPN transistors in a chip, so you can use discrete transistors, as in Case 1, if you want.

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