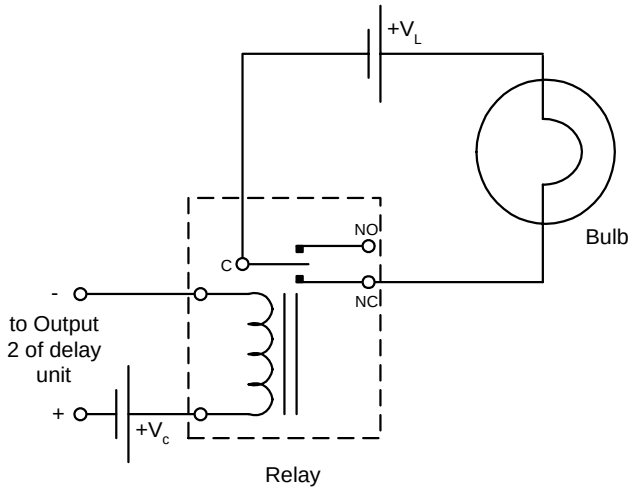
Triggering a Relay with a Delay Unit

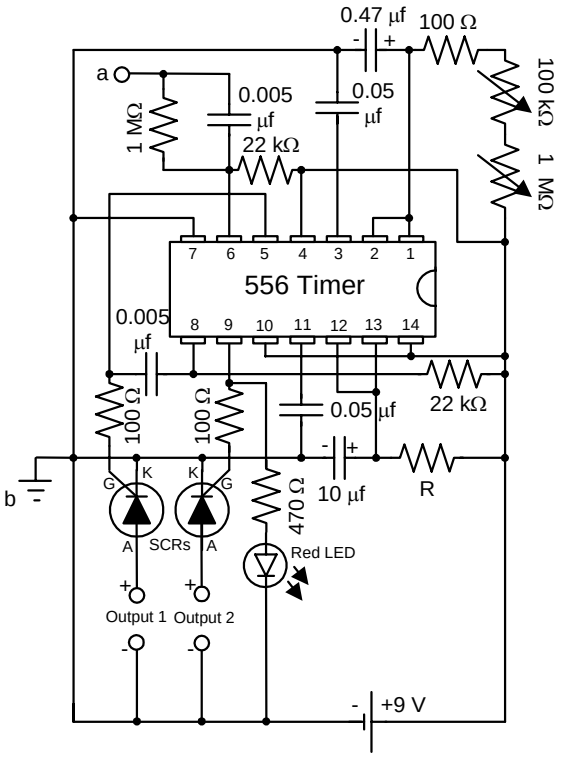
While the delay unit is typically used to trigger a flash unit or a camera, it can be used to turn on other external circuits. The steady-state current in the external circuit should be limited to about 0.5 A, although the SCR can handle higher surge currents. One possible application is for the delay unit to operate an electromagnetic relay which, in turn, switches a circuit with an incandescent bulb.

In the schematic of a delay unit to the right, Output 2 is the delayed output. When the input at point *a* is shorted to ground at *b*, Output 2 will turn on after an amount of time T_d that is determined by the settings of the 100 kΩ and 1 MΩ variable resistors. The LED will also turn on at this instant. Output 2 and the LED remain on for an amount of time determined by the value of R. This is called the timeout. A value of R of 100 kΩ gives a timeout of about 1 second. In general, the timeout can be determined as follows:

Timeout (in seconds) = R (in kΩ) ÷ 100.

Now consider the circuit below.





Output 2 is used to switch an electromagnetic relay. The relay must have its own power source. This is indicated as V_c in the diagram. Note that the negative side of V_c is connected to the positive side of Output 2.

Let's take as an example the Radio Shack SPDT relay, part no. 275-005. The coil of the relay operates on a 9-V battery; hence V_c would be 9 V in this example. In order to verify that the current would not exceed 0.5 A, we use the resistance of the coil. This is given as 500 Ω in the specifications. The current in the coil would be (9 V)/(500 Ω) = 0.018 A. In actuality, the current would be a bit less than that, since the SCR has some inherent resistance. In any case, this is well below the limit of 0.5 A.

Now suppose that we want to use the delay unit-relay combination to turn off a bulb and keep it off for half a second. The bulb is connected to the normally-closed (NC) and common (C) contacts of the relay. This means the bulb will be on when the relay coil is *not* energized. When the delay unit receives an input, the relay coil will be energized and the relay contact will be switched to the NO position after time T_d. The bulb will go out and remain out for the duration of the timeout. For a timeout of 0.5 s, R = 50 kΩ.

If you connected the bulb to the normally-open (NO) contact, the bulb would be off initially and would switch on for a time of 0.5 s after the delay T_d.

Note in the above that there are three energy sources. The delay unit, relay, and bulb each have their own energy source. If the relay contacts are designed for 120 VAC—this is the case for the Radio Shack relay in the example above—then a normal household bulb of the type that plugs into a wall outlet can be used. In that case, see the note below.

Important note of caution when using AC: In order to connect a bulb to the relay, you would have to cut one line of the AC electrical cord and connect the two cut ends to NC and C. Don't try this unless you're experienced in home electrical wiring. Also, for operating safety when using AC, the relay must be housed in a fully-insulated box and any bare wires or contacts carrying AC must be inside the box so that there is no danger of touching a hot wire.

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