# Building your own motion-sensor-activated mobile-sound-unit

I made mobile sound units for a collaborative project with the Anti-Advertising Agency. For our project we needed a small battery powered unit which could play back interview clips about advertising. Our units were installed on the street, so they needed to be relatively loud while using an independent power source. We used a motion detector to conserve power when no one was around and ensure the unit activated when pedestrians were present.

## Materials and cost

This project requires an intermediate level of knowledge in electronics and it wouldn't hurt if you played D&D as a kid either.

This unit is made up of several components:

> CD player with random feature
> small amplifier and speakers (recycled external computer speakers will do nicely)
> small motion sensor (model KC7738R)
> various resistors and capacitors for an RC circuit
> low power 555 timer and 8-pin IC socket
> relays
> 2 LEDs
> 22 and 24 gauge stranded wire
> perforated board
> battery packs
> batteries (9-volt and AAs)

## How to do it?!



Do this under a table light and use a magnifying glass to make things easier.

Step 1. How to get the CD player to play automatically when powered on. Carefully unscrew and open your CD player. Use the continuity function on a multi-meter to locate an acceptable place to hack into the play button (+) and (–). Drill a hole through the CD player casing to run 24-gauge stranded wire through. Use hot glue to secure the wires in place before soldering. (Unsecured wires will rip the circuitry loose from the circuit)

Solder the wire into these locations, being incredibly carefully not to disturb any if the other sleeping electronic circuitry. (I ruined many CD players attempting this)

Connect the play button wires using a switch. I used headers and this "cap" that I scavenged out of existing electronics. With the cap on, the play button is automatically triggered whenever the CD player powers on. Remove the cap to program the CD player functions later.
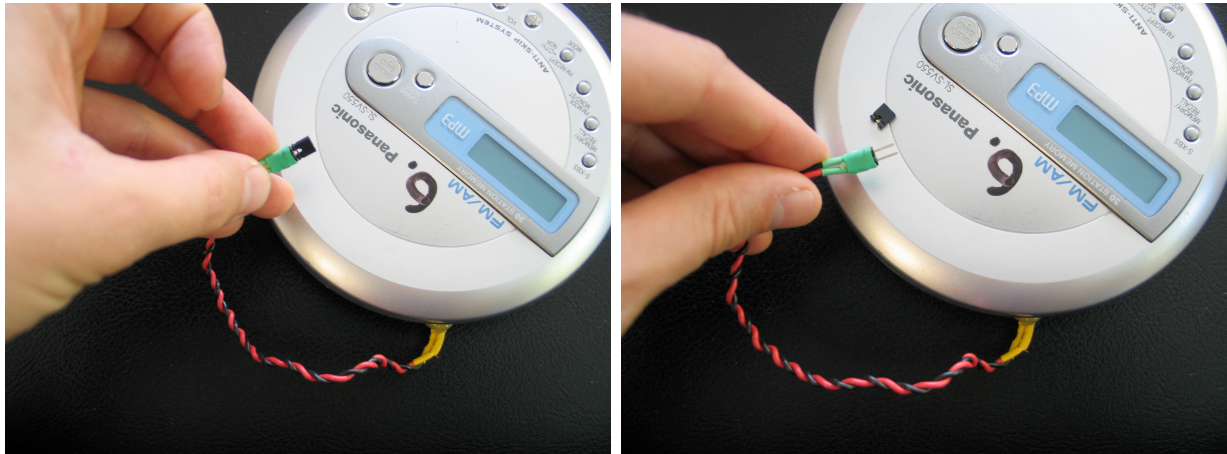


Step 2. Calculate the duration that your components will be activated. With the switch from the play button wires ON, test the lag time between the CD player power up and when it begins playing. (mine was longer than I expected at 7 seconds) Adding this lag time, determine the length of time you wish your CD player and amplifier to remain on once the motion sensor is triggered. Use this time to calculate your RC circuit's resistor and capacitor values for your 555 timer monostable circuit based off the following formula.

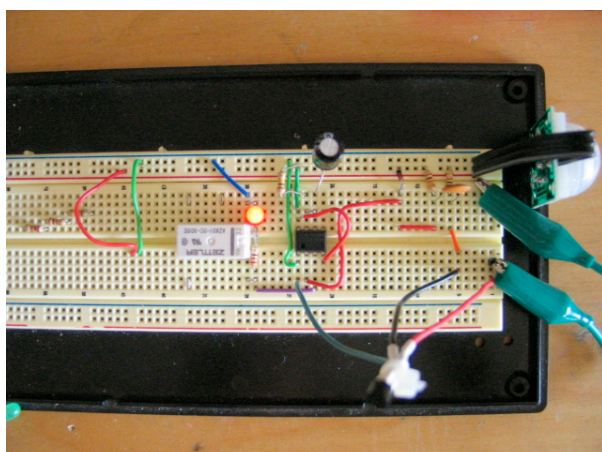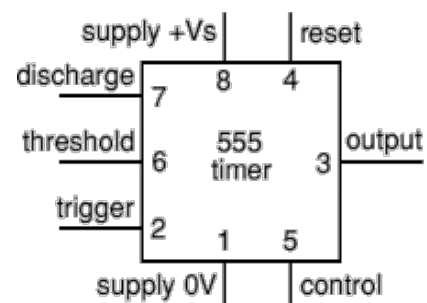(there are also online monostable RC calculators that do this for you)



$$T = 1.1 \times R1 \times C1$$

T  = time period in seconds (s)
R1 = resistance in ohms ($\Omega$)
C1 = capacitance in farads (F)
(The maximum reliable time period is 10 minutes.)



Step 3. Testing the 555 timer. Using a breadboard and 9-volt battery, construct your timing circuit based off the values you got for R1 and C1. Use resistors and capacitors in series and/or parallel to get the correct values. Connect a 22K resistor and a LED from the 555 output to test the duration of the RC circuit.

**Step 4.** Building your circuit. Using the following diagram, construct you circuit. The inputs to the 555 timer's pin 6 and 7 will be your R1 and C1 values. Put a 0.1uF bypass capacitor from pin 5 to (–).
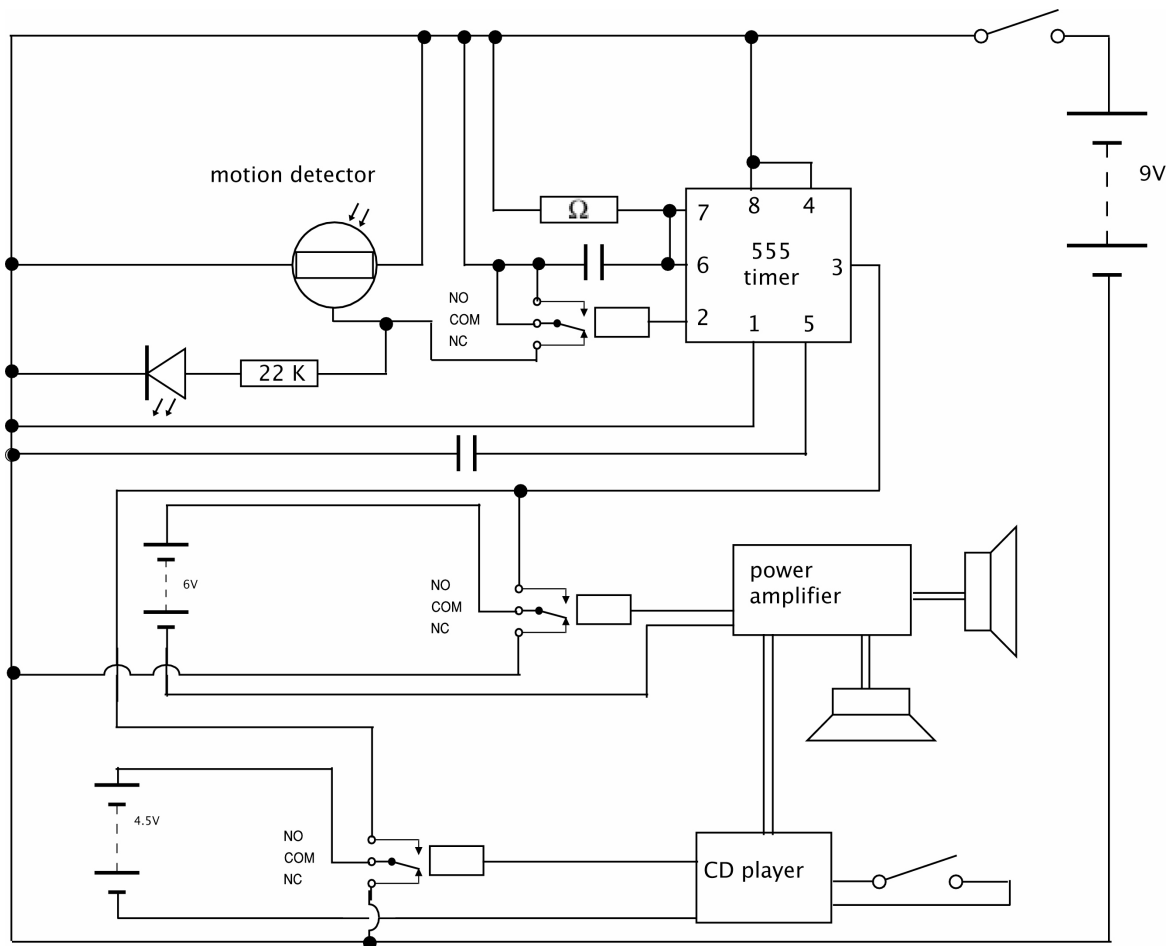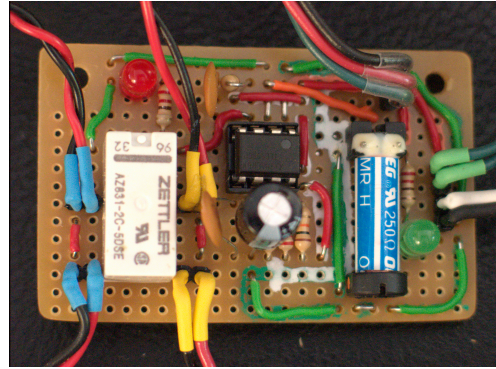




### Further thoughts

Having completed the project with this method, I would like to try again using a low-level PIC. The timing would be more accurate, easier to program, and would make for a much simpler circuit. Advanced users may want to attempt using this latter method from the beginning.